NEVADA DOT
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Nevada Freight Plan Update

July 2022

Nevada Freight Plan Update

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ACRONYMS AND ABBREVIATIONS

3D	Three-Dimensional
AADTT	Average Annual Daily Truck Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACT	Advanced Clean Truck Act
AFC	Alternative Fueling Corridor
AFV	Alternative Fuel Vehicle
AMG	Automated Machine Guidance
ATM	Active Traffic Management
ATRI	American Transportation Research Institute
AV	Autonomous Vehicle
AV/CV	Automated Vehicle/Connected Vehicle
BESTUFS	Best Urban Freight Systems
BIL	Bipartisan Infrastructure Law
CAFE	Corporate Average Fuel Economy
CAMPO	Carson Area Metropolitan Planning Organization
CARB	California Air Resources Board
CMAQ	Congestion Mitigation and Air Quality Improvement program
CRFC	Critical Rural Freight Corridor
CSMP	Corridor System Master Plan
CUFC	Critical Urban Freight Corridor
CV	Connected Vehicle
DC	Distribution Center
DCFC	Direct Current Fast Charger
DOC	Diesel Oxidation Catalyst
EAR	Exploratory Advanced Research
EPA	Environmental Protection Agency
EVSE	Electric Vehicle Supply Equipment
FAA	Federal Aviation Administration
FAC	Nevada Freight Advisory Committee
FAF	Freight Analysis Framework
FAF5	FHWA Freight Analysis Framework
FAST Act	Fixing America's Surface Transportation Act

ACRONYMS AND ABBREVIATIONS (CONTINUED)

FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FSP	Freeway Service Patrol
GHG	Greenhouse Gas
GOE	Governor's Office of Energy
GOED	Nevada Governor's Office of Economic Development
GRP	Gross Regional Product
hazmat	Hazardous Material
HEV	Hybrid Electric Vehicle
IIJA	Infrastructure Investment and Jobs Act
LEV	Low-Emission Vehicle
LPKC	Logistics Park Kansas City
LQ	Location Quotients
MEP	Mobility Enhancement Plan
MMTCO2e	Millions of Metric Tons of Carbon Dioxide Equivalent
MODA	Multi-Objective Decision Analysis
MPO	Metropolitan Planning Organization
MY	Model Year
NDOT	Nevada Department of Transportation
NEH	Nevada Electric Highway
NEVI	National Electric Vehicle Infrastructure
NHFN	Nevada Highway Freight Network
NHFP	National Highway Freight Program
NHTSA	National Highway Traffic Safety Administration
NPMRDS	National Performance Management Research Data Set
NSFP	Nevada State Freight Plan
PEV	Plug-In Electric Vehicle
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation
PSR	Precision Scheduled Railroading
REV West	Regional Electric Vehicle Plan for the West

ACRONYMS AND ABBREVIATIONS (CONTINUED)

RMG	Rail-Mounted Gantry
RNO	Reno-Tahoe International Airport
RTC	Regional Transportation Commission
RTP	Regional Transportation Plan
SCR	Compact Selective Catalytic Reduction
SE LV	Southeast Las Vegas
SECT	State Environmental Commission
SHSP	Nevada Strategic Highway Safety Plan
STRACNET	Strategic Rail Corridor Network
STRAHNET	Strategic Highway Network
TEU	Twenty-Foot Equivalent Unit
TIM	Traffic Incident Management
TPAS	Truck Parking Availability System
TRIP	Towing and Recovery Incentive
TRPA	Tahoe Regional Planning Agency
TSE	Truck Stop Electrification
TSMO	Transportation Systems Management and Operations
TTTR	Truck Travel Time Reliability
UAVs	Unmanned Aerial Vehicles
UCC	Urban Consolidation Center
USDOT	U.S. Department of Transportation
USMCA	United States-Mexico-Canada Agreement
ZEV	Zero-Emissions Vehicle

1. Freight Trends and Needs

The objective of the Nevada Freight Plan is to provide a strategic framework for enhancing freight transportation safety, mobility, and sustainability as part of broader efforts to support the economic vitality of freight-related sectors in Nevada. The Freight Plan also makes specific recommendations on improving the state's freight infrastructure to strengthen and diversify Nevada's economy. The vision of the freight plan is to strengthen Nevada's competitive advantage by creating a multimodal system of superior safety, condition, and performance.

The plan is organized around ten subject areas as recommended by the Federal Highway Administration for the development of a State Freight Plan as required by 49 U.S.C. 70202. This plan was developed in consultation with the Nevada Freight Advisory Committee (FAC), which is further described in Chapter 10.

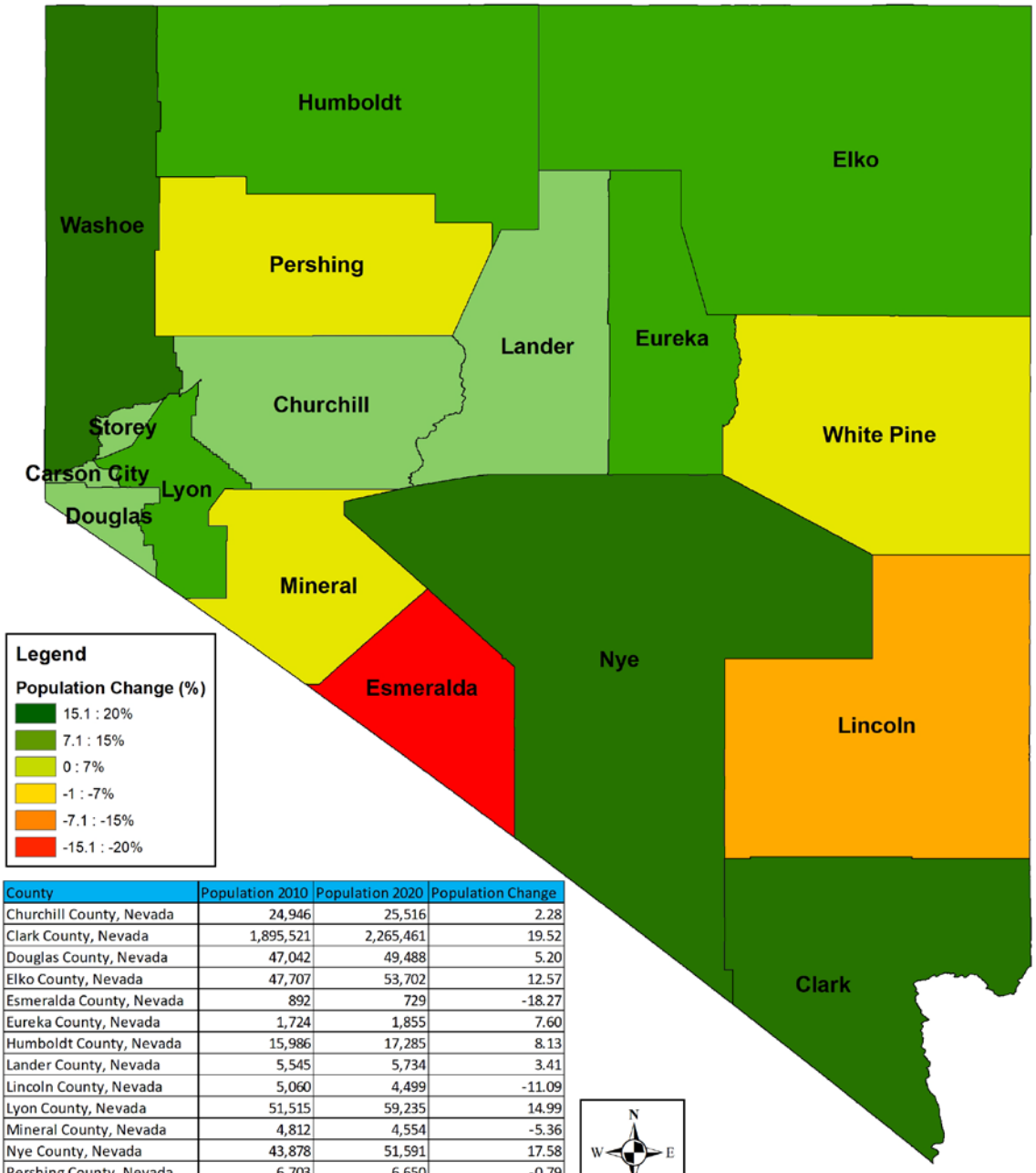
1.1 Nevada Freight System Trends and Needs

Nevada freight system trends are influenced by population and employment growth, logistics practices of Nevada's economic sectors, the transition toward a green economy to reduce and mitigate climate change, and national freight trends. Other influences include Nevada's trade with other states, availability of alternative freight modes, the types of commodities shipped, and the growth of industries in Nevada supporting e-commerce. Safe and efficient freight movement is essential to Nevada's economic prosperity and is a key driver of transportation infrastructure needs.

1.1.1 Economic Conditions

Nevada's freight demand is linked to several key economic conditions—including population growth, employment trends in freight-dependent industries, and efforts by the state to diversify the economy.

Nevada's population grew by 15 percent from 2010 to 2020—the 5th fastest rate in the nation—reaching over 3.1 million residents. Strong population growth is a major driver of the growth in freight demand, and Nevada's population growth has primarily been concentrated in its two major urban counties—Clark and Washoe. Clark County experienced the highest rate of growth between 2010 and 2020, at almost 18 percent. While the state's urban areas attracted new residents, many of its rural counties either lost population or experienced lower growth rates. Figure 1-1 illustrates population change by county.



County	Population 2010	Population 2020	Population Change
Churchill County, Nevada	24,946	25,516	2.28
Clark County, Nevada	1,895,521	2,265,461	19.52
Douglas County, Nevada	47,042	49,488	5.20
Elko County, Nevada	47,707	53,702	12.57
Esmeralda County, Nevada	892	729	-18.27
Eureka County, Nevada	1,724	1,855	7.60
Humboldt County, Nevada	15,986	17,285	8.13
Lander County, Nevada	5,545	5,734	3.41
Lincoln County, Nevada	5,060	4,499	-11.09
Lyon County, Nevada	51,515	59,235	14.99
Mineral County, Nevada	4,812	4,554	-5.36
Nye County, Nevada	43,878	51,591	17.58
Pershing County, Nevada	6,703	6,650	-0.79
Storey County, Nevada	4,016	4,104	2.19
Washoe County, Nevada	412,844	486,492	17.84
White Pine County, Nevada	9,765	9,080	-7.01
Carson City, Nevada	55,375	58,639	5.89

Figure 1-1. Population Change by County, 2010-2020

The Nevada economy continues a rapid recovery following the record unemployment rates at the height of the COVID-19 pandemic. The state added 6,300 jobs during February 2022, for a total employment of 1,434,100 and an unemployment rate of 5 percent. This represented an increase in employment of 126,700 from February 2021.[1] Freight activity is directly related to employment in the mining, construction, manufacturing, and transportation industries. In March 2022, these sectors represented almost 275,000 jobs and 20 percent of overall employment in the state.[2] A summary of employment by sector is provided in the table below.

Table 1-1. Seasonally Adjusted Employment: Nevada, March 2022

Goods-producing		
Mining and logging	14,900	1.00%
Construction	99,300	6.90%
Manufacturing	63,900	4.40%
Total goods-producing:	**178,100**	**12.30%**
Service-providing		
Private service-providing	1,101,300	76.50%
Trade, transportation, and utilities	288,400	20.00%
Wholesale Trade	38,300	2.70%
Retail trade	154,000	10.70%
Transportation, Warehousing, and Utilities	96,100	6.70%
Information	15,800	1.10%
Financial activities	72,600	5.00%
Professional and business services	205,400	14.30%
Education and health services	152,100	10.60%
Leisure and hospitality	327,700	22.80%
Other services	39,300	2.70%
Government	161,000	11.20%
Total service providing:	**1,262,300**	**87.60%**
Total Nonfarm:	**1,440,400**	**100.00%**
Total portion that is private:	1,279,400	88.80%

Source: DETR, https://nvlmi.mt.gov/_docs/Dashboards/CES-Industry-Dashboard

The Nevada Governor's Office of Economic Development (GOED) has identified several critical industries for Nevada in terms of business attraction and retention[3]. Specifically, GOED highlights the most freight-dependent of these key industries – aerospace and defense, manufacturing and logistics, and mining.

[1] Nevada Department of Employment, Training, and Rehabilitation (DETR), https://www.nevadaworkforce.com/

[2] DETR, https://nvlmi.mt.gov/_docs/Dashboards/CES-Industry-Dashboard

[3] https://goed.nv.gov/key-industries/. Accessed in January of 2022.

Nevada is currently undertaking strategic efforts to diversify its economy beyond the leisure and hospitality sectors, while continuing its recent growth trajectory. This includes recruitment of companies in the GOED target industries, targeted workforce training, identification of suitable company locations, and development of necessary infrastructure to support the operations of current and future companies. Part of this effort has been to take initiative and leadership in studying, testing, and implementing progressive legislation for various freight-related technologies and advancements, including automated and connected vehicles and trucks (AV/CV), zero emission vehicle technologies, longer combination vehicles, truck platooning, and aviation drones.

1.1.2 National and Global Freight Trends

Changing patterns of global economic activity have resulted in shifts in trade corridors and hubs that are impacting Nevada. For example, surging international trade at the Ports of Los Angeles and Long Beach has filled the capacity of many freight facilities in Southern California—including terminals, warehousing, and transload facilities—creating new opportunities for Nevada and other locations to become inland trade hubs. Along with rapidly evolving technologies and the merging and alliances of various businesses, these changing patterns offer great opportunities and present significant challenges for the state of Nevada to reposition itself within the global, national, and western U.S. freight network.

The state of Nevada has the potential to greatly benefit from the major shifts taking place in the world economy. Understanding the new trade patterns is fundamental to understanding Nevada's fit within the national and continental economies. The major trade corridors linking the United States to the world economy have shifted from the Atlantic to the Pacific, resulting in the growth of trade across the western United States and the state of Nevada. Total trade through the West Coast ports has surpassed the once dominant ports of the East Coast. This has led to the vast expansion of trade flows from the West Coast to the larger consumer markets on the East Coast via the primary corridors extending from the three major port concentrations at Los Angeles, San Francisco, and the Pacific Northwest.

Most of Nevada's economic activity is concentrated in its metropolitan areas, with important contributions from its mining, resource extraction, and agricultural components found in the rural areas of the state. The growing importance of Nevada's metropolitan areas is that they represent concentrated centers of economic activity and serve as incubators for development and innovation. Nevada has a specific advantage over many of the metropolitan areas in the western United States because it is located in close proximity to the massive economic centers in Northern and Southern California. Between the Nevada metropolitan areas and the dense pattern found in the eastern United States, are a set of cities that are much more isolated and function as more independent economic units. Capitalizing on Nevada's proximity to California will create a greater economic synergy between the two states that will be of significant benefit to both as synergy increases the potential of both components.

Disruptions to the global supply chain resulting from the COVID-19 pandemic have highlighted the interdependencies of markets across the world. Health and safety driven workplace shutdowns resulted in shortages of supplies such as semiconductor chips, medical supplies, steel, and lumber. Labor shortages impacted most industries as a result of COVID-19, and contributed to slowdowns at ports, truck driver shortages, and other shipping delays.

Nevada is at the forefront of the nation's efforts to transition to a sustainable and green economy. The Nevada Climate Strategy identifies a path to reducing greenhouse gas emissions and encouraging growth in industries such as electric vehicle manufacturing and production of renewable energy. This

shift has placed heightened focus on the materials needed for electric battery production, such as lithium, as well as the need to find sustainable ways to recycle used batteries.

1.1.3 Freight Supply Chains and Trends by Mode

Trends in goods movement by mode help identify long range transportation needs. The Federal Highway Administration (FHWA) works through a partnership with the Bureau of Transportation Statistics to develop the Freight Analysis Framework (FAF) data by combining information from several sources, most notably the 2017 Commodity Flow Survey. The FAF provides tonnage and value estimates for 2017 and 2050 for each state in the U.S. by freight modes and across commodity categories.

Figure 1-2 shows the major trading partners for goods with Nevada destinations by weight and by value. By weight, Nevada is the top destination for goods made in the state representing two-thirds of all the shipments. Neighboring states of California, Oregon, Arizona, and Utah are among the top destinations with the state of Texas being the only non-neighboring state in the top six. Origin-destination pairs with high relative shares in terms of weight are important to understand because they are the heaviest users of Nevada's freight transportation system and typically contribute more heavily in terms of wear and tear, travel delay, and safety.

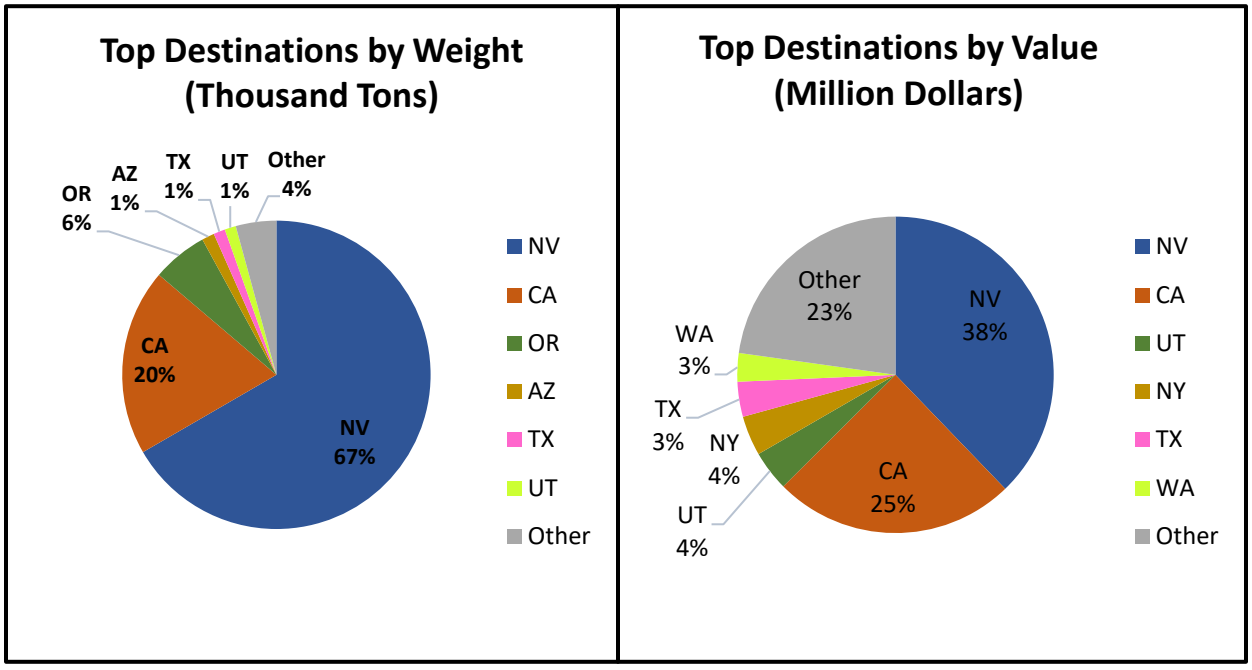


Figure 1-2. Top Destinations for Nevada Goods by Weight and Value, 2017

Source: FHWA Freight Analysis Framework.

By value, the top destinations are less weighted towards Nevada and more weighted towards states with large economies such as California, Texas, New York, and Washington. Origin-destination pairs with high relative shares in terms of value are important to understand because they are important to Nevada's economy.

Figure 1-3 is similar to Figure 1-2, except that it shows inbound goods for Nevada by weight and value. It also shows that there is a heavy concentration of freight trips by weight with both Nevada origins and destinations. However, Utah is the top out of state trading partner by weight with 21 percent of the

total volume. California is second the highest with 13 percent followed by Arizona, Idaho, and Texas. By value, California is the top trading partner followed by Nevada, Utah, Texas, Arizona and Illinois. Similar to Figure 1-2, these states skew significantly towards those with larger economies.

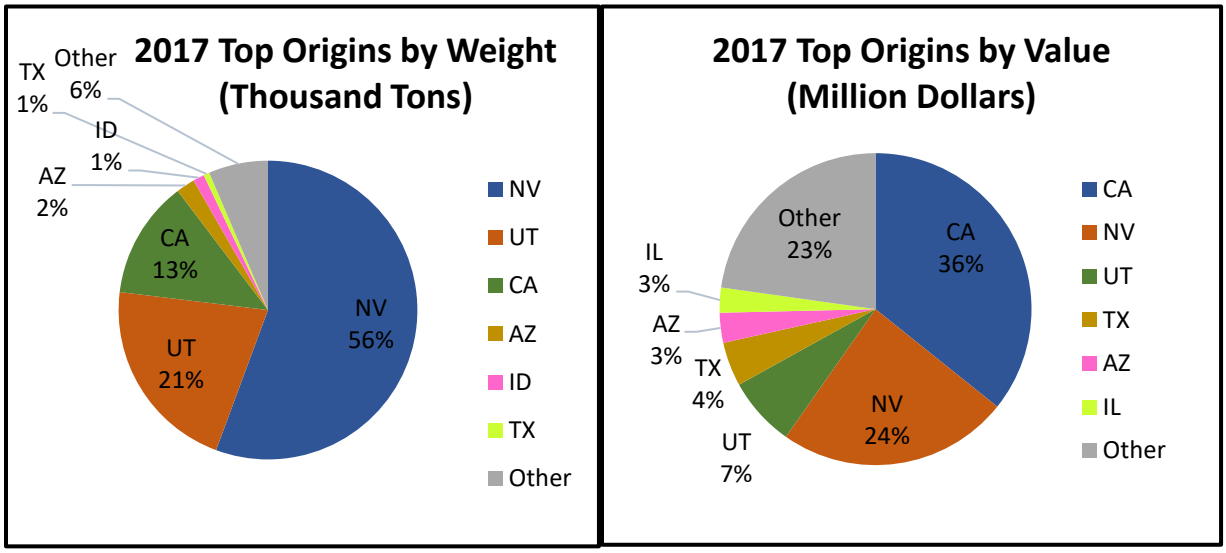


Figure 1-3. Top Origins for Nevada Goods by Weight and Value, 2017

Source: FHWA Freight Analysis Framework.

Figure 1-4 depicts the mode share by weight for goods leaving or arriving in Nevada. The figure shows that trucking is the dominant mode both in terms of weight and value in 2017. This reinforces the need to have an efficient and reliable road network to allow for a productive freight transportation system in Nevada. By weight, there are also large flows of goods traveling in 2017 by pipeline in and out of the state with rail and multiple modes (primarily rail intermodal traffic) each containing slivers of traffic by weight.

By value, multiple modes is the second largest mode utilized due to the relatively high value of the rail intermodal traffic and small package/parcel delivery that is included. Air cargo represents approximately 10 percent of the total traffic making it the third largest mode by value with pipeline being the fourth largest in terms of value despite it being the second largest in terms of volume.

The FAF data forecasts tremendous growth for freight between 2017 and 2050. Figure 1-4 shows that this growth is roughly 50 percent by weight and nearly 100 percent by value. The modal distribution in 2050 does not exhibit significant changes relative to 2017. This indicates that the issues and needs of the freight transportation system are likely to worsen without improvements to manage the increased demand expected to occur by 2050.

Figure 1-5 shows the most significant commodities that are being moved in Nevada by weight and value. By weight, the commodities with the largest share are bulk goods, including coal used for power generation, three products used for construction (nonmetallic mineral products, gravel, and natural sands), and waste/scrap. These commodities constitute over two-thirds of the goods shipped in Nevada by weight and are forecast to grow by nearly 50 percent between 2017 and 2050. In terms of value, the most significant goods are electronics, miscellaneous manufacturing products, mixed freight, coal, and textiles. These products represent just less than half of all shipments by value and therefore a significant component of Nevada's economy.

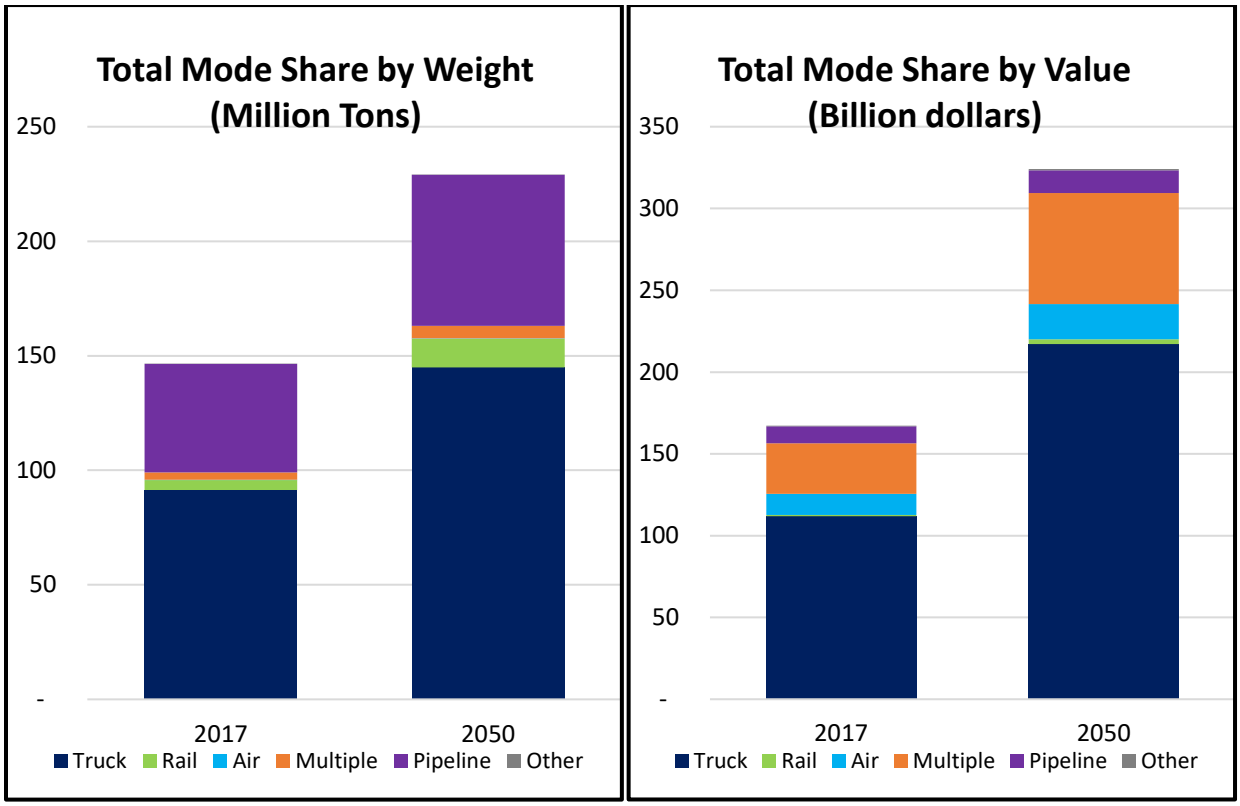


Figure 1-4. Modal Distribution of Freight Trips by Weight and Value, 2017 and 2050

Source: FHWA Freight Analysis Framework.

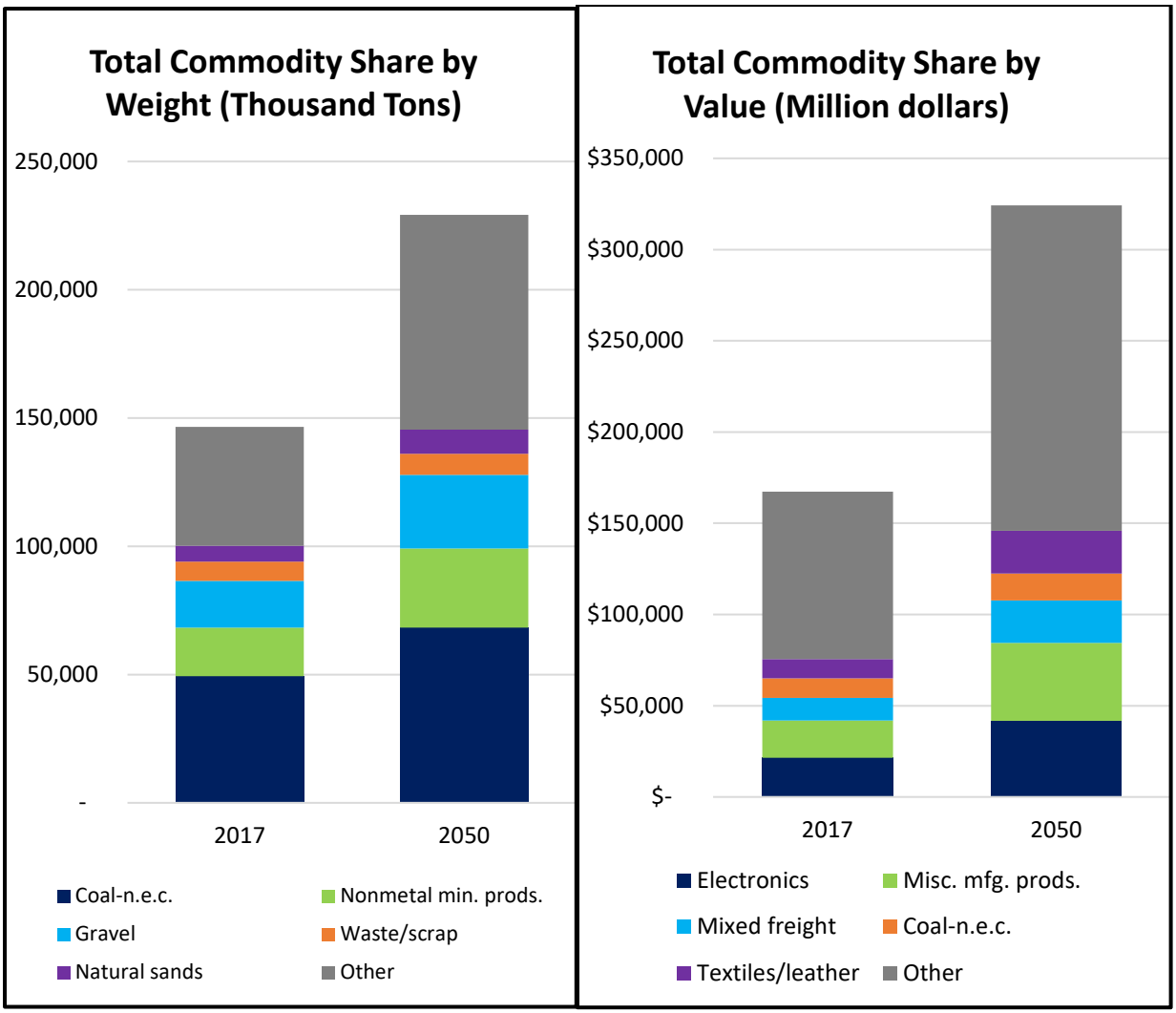


Figure 1-5. Top Commodities by Weight and Value, 2017 and 2050

Source: FHWA Freight Analysis Framework.

1.1.4 Supply Chain Summary Trends for Select Key Industries

Supply chains support freight-related sectors by organizing the people, companies, activities, information and resources involved in delivering products to end consumers. Freight transportation infrastructure is a critical component of supply chains as they are used to move goods between locations as the goods are transformed from raw materials to processed goods and ultimately to end consumers. Supply chains vary significantly by sector and subsector. For the aerospace industry, the vast majority of the production and consumption occurs in the Las Vegas and Reno metropolitan areas. However, given the multi-tiered and multi-national structure of the industry, this sector relies on roadways, air cargo, rail, and ocean-borne freight to move parts, components and systems that make up manned and unmanned aerial vehicles. Much of Nevada's aerospace sector supports military activity, so there is limited publicly available information on the volumes, specific commodities, or origin-destination patterns of this industry.

For the supply chain and distribution logistics industry, goods movement is also focused on urban areas. However, much of the activity is the distribution of goods for final consumption. This is particularly true for the rapidly growing e-commerce portion of local goods movement distribution. A key focal point for this industry is the set of warehouse and distribution centers that exist and are planned in Nevada's two major metropolitan regions. The roadways connecting these facilities are the most important components of the freight transportation system for supply chain and distribution logistics. Additionally, movements by intermodal rail are important for domestic long-haul goods, while port activity is critical for importing goods from overseas and connecting Nevada's exports to international markets. The extensive reach of Las Vegas's Harry Reid International Airport means that there is belly cargo capacity to most major cities around the world.

The mining supply chain is primarily focused outside the heavily urbanized portions of Nevada. This industry has the simplest supply chain in that it primarily extracts goods that are delivered to their final destination with some minimal processing typically occurring close to the final destination of the goods. Rural roads are critical for the movement of extracted goods and the ability to harvest mines that are spread across virtually all counties in Nevada. Rail infrastructure could theoretically be utilized, but there is not currently sufficient infrastructure to support the wide range of geographic locations where mines are present. Mining is Nevada's largest export by dollar value. Exports of precious metals such as gold and silver likely ship by truck and air cargo to reach their final destinations. Exports and imports of bulk goods likely rely on a combination of truck and ship to reach their final destination.

2. Freight Policies, Strategies, and Performance Measures

This chapter identifies the goals and performance measures of the Nevada Freight Plan. This plan builds upon the work conducted by NDOT through other initiatives, such as the One Nevada Transportation Plan and Nevada State Rail Plan. A summary of key findings from these targeted planning studies is provided in this section. In addition, this plan incorporates the freight priorities identified by the four Metropolitan Planning Organizations (MPOs) in the state, as described in their regional transportation plan.

State and federal transportation agencies have long used asset and performance management techniques to assess, measure, and gauge system infrastructure and its operational capabilities. Nevada has been involved in performance management since 2007 when Legislative Assembly Bill 595 was passed. The bill requires NDOT "to develop a performance management plan for measuring its performance, which must include performance measures approved by the Board of Directors."

In an effort to incorporate uniformity in these measures and emphasize a performance-based approach in applying the Federal Highway Administration Program, the U.S. Department of Transportation (USDOT), by way of MAP-21 legislation, proposed several performance measures across key management areas, including safety, pavements, bridges, freight, emissions, performance, and reliability. This approach will incorporate performance management into federal and state transportation programs, unify high-level national transportation goals, and link key measures to state and local funding opportunities.

Figure 2-1. Transportation Performance Management

The performance management process, illustrated in Figure 2-1, begins with shared goals and objectives, performance measures and targets for gauging progress, and a plan for achieving the goals. To avoid confusion and facilitate achieving consensus, the definitions below provide clarity and consistency in communications:

- ***Vision:*** An inspirational statement defining the optimal desired future state
- ***Goal:*** What the organization wants to achieve over the long term
- ***Objective:*** A specific accomplishment that helps to achieve a goal
- ***Performance measure:*** The measure used to systematically track and periodically assess progress toward accomplishing an objective or goal using quantitative and/or qualitative data

- ***Performance target:*** A specific, measurable target that helps to achieve an objective—how much of a desired result and by when
- ***Performance plan:*** A set of strategies (projects, programs, or policies) for achieving the targets, and ultimately the goals, including implementation actions
- ***Target achievement:*** A measure of the performance to assess if and how well a target is achieved
- ***Performance reporting:*** A report documenting performance and target achievement, helpful for re- evaluating goals and plans

This chapter documents Nevada's efforts in establishing freight goals, objectives and establishing freight system performance measures aligned with NDOT's vision:

Establish a competitive advantage by creating crossroads of national commerce within a multimodal system of superior safety, condition, and performance.

2.1 Freight Plan Goals

The Freight Plan identifies eight strategic goals and related objectives to guide current and ongoing freight-related planning efforts to meet the state's freight transportation needs. The goals identified for Nevada's freight transportation system were informed by federal, state, and local planning efforts (see Nevada Context). Together, the goals listed in Table 2-1 address the areas of economic competitiveness, mobility and reliability, safety, infrastructure preservation, technology, environmental sustainability, and livability, funding, and collaboration.

Table 2-1. Crosswalk Linking Federal Freight Goals to Nevada State Freight Goals

USDOT Strategic Freight Goals	USDOT National Freight Goals (adapted from FAST Act)	Nevada Freight Plan Goals
Safety Improve the safety, security, and resilience of the national freight system	Improve the safety, security, efficiency, and resiliency of multimodal freight transportation	**Safety** Improve the safety of the freight transportation system.
Infrastructure Modernize freight infrastructure and operations to grow the economy, increase competitiveness, and improve quality of life.	Achieve and maintain a state of good repair on the National Multimodal Freight Network	**Infrastructure Preservation** Maintain and improve essential multimodal infrastructure within the state.
	Improve the economic efficiency and productivity of the National Multimodal Freight Network	**Economic Competitiveness** Improve the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness.
	Improve the reliability of freight transportation	**Mobility & Reliability**

USDOT Strategic Freight Goals	USDOT National Freight Goals (adapted from FAST Act)	Nevada Freight Plan Goals
	Improve the short- and long-distance movement of goods that— (A) travel across rural areas between population centers; (B) travel between rural areas and population centers; and (C) travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network	Provide an efficient and reliable multimodal freight transportation system for shippers and receivers across the state.
	Reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network	**Environmental Sustainability & Livability** Reduce adverse environmental and community impacts of the freight transportation system
		Collaboration, Land Use, and Community Values Establish an ongoing freight planning process to coordinate the freight transportation system and ensure consistency with local land use decisions and community values.
Innovation Prepare for the future by supporting the development of data, technologies, and workforce capabilities that improve freight system performance.	Use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Multimodal Freight Network	**Advanced Innovative Technology** Use advanced technology, innovation, competition, and accountability in operating and maintaining the freight transportation system.
N/A	N/A	**Sustainable Funding** Fully fund the operations, maintenance, renewal, and expansion of the freight transportation system.

Source: Adapted by CPCS from USDOT National Freight Strategic Plan, FAST Act, Nevada State Freight Plan (2017)

2.2 Freight Plan Performance Measures

In addition to articulating goals for the state's freight transportation system, objectives, performance measures, and performance targets are identified for each goal, with emphasis on highways that are under NDOT's control. Achieving these objectives will make concrete, measurable progress toward the attainment of the goals and ultimate realization of the Nevada freight transportation system vision.

Table 2-2 lists the goals, objectives, performance measures and targets.

Table 2-2. Goals, Objectives, Performance Measures and Targets

Goal	Objective	Performance Measure	Performance Target
Economic Competitiveness	Support and enhance the state's economic competitiveness through transportation investments that improve and sustain the following critical factors of the state's freight transportation system: mobility and reliability; safety; infrastructure preservation; advanced innovative technology; environmental sustainability and livability; collaboration land use and community values; and sustainable funding.	Composite indicator reflective of attainment in critical factor objectives below	
Mobility & Reliability	Reduce the number of locations where the average truck speed is below 40 mph	Truck speeds on I-15, I-80, I-580, US 395, US 93, US 95, I-215/CC-215	Reduce the number of locations where the average truck speed is below 40 mph. Meet the NDOT Truck Travel Time Reliability (TTTR) Target (1.26).
Safety	Improve daily highway system operations management to eliminate freight-associated motor vehicle fatalities	Number of data motor vehicle crashes involving trucks	Less than 10 truck fatalities per year. Eliminate the number of freight-associated fatalities at at-grade highway-railroad crossings.
Infrastructure Preservation	Maintain a minimum 95% of state-maintained pavements in fair or better condition	Pavement condition: percentage of state-maintained pavements in fair or better condition	Pavement condition: Category 1 (controlled access roads): 95% Category 2 (ADT above 10,000): 90% Category 3 (ADT between 1,600 and 10,000): 85% Category 4 (ADT between 400 and 1,600): 75% Category 5 (ADT less under 400): 50%
	Target of less than 5% of NDOT state-maintained bridges are in poor condition and a minimum 50% in good condition	Bridge condition: percentage of NDOT state-maintained bridges that are in good and poor condition	Bridge condition: Bridges on NHS in good condition: 5% or greater Bridges on NHS in poor condition: 7% or less Bridges on non-NHS in good condition: 35% or greater Bridges on non-NHS in poor condition: 7% or less

Goal	Objective	Performance Measure	Performance Target
Environmental Sustainability and Livability	Reduce vehicular emission by reducing travel delay, deploying technologies that improve the fuel-efficiency of commercial vehicles, and providing better mode-choice and integration to encourage utilization of the most sustainable options	Truck speeds on I-15, I-80, I-580, US 395, US 93, US 95, I-215/CC-215	
Collaboration, Land Use, and Community Values	Establish and foster inclusive, long-term relationships and processes between and within the public sector, private sector, communities, agencies, and other transportation stakeholders regarding freight transportation	Meet regularly with the FAC	Meeting Quarterly

2.3 Nevada Context

To inform Nevada's freight goals and objectives, established policy and planning documents prepared by various economic development, land use, and transportation planning agencies within the state were considered. The intent of this review was to ensure that Nevada's state freight plan complemented and advanced efforts led by NDOT and others that were synergistic and supported improving goods movement and economic opportunities in the state. Table 2-3 lists these prior reports and planning documents. There is significant commonality in these documents relating to the need for a robust transportation system that serves the needs of Nevada's communities and businesses. The strategic goals of the Freight Plan address the relevant themes frequently mentioned in these documents, including:

- Increasing economic competitiveness
- Improving efficiency and productivity
- Safety and security
- Proper maintenance of the infrastructure
- Environmental protection and sustainability
- Adequate funding
- Compatibility of infrastructure with local land use decisions and community values
- Economic diversification
- Intermodal connectivity

The rest of this section highlights some of the freight-related studies and plans and describes actions that Nevada has been taking to maintain and improve the freight system.

Table 2-3. A Selected List of Reviewed Literature

Category	Plan/Study	Year
Regional Transportation Plans	2050 Regional Transportation Plan (Carson Area Metropolitan Planning Organization)	2020
	Southern Nevada Regional Goods Movement Master Plan (Regional Transportation Commission of Southern Nevada)	2015
	Regional Transportation Plan, 2021-2050 (Regional Transportation Commission of Southern Nevada)	2021
	2020 Regional Transportation Plan (Tahoe Metropolitan Planning Organization)	2020
	2050 Regional Transportation Plan (Regional Transportation Commission of Washoe County)	2021
Other Transportation Plans	Southern Nevada Freight Plan Update	2022
	Nevada State Rail Plan	2021
	One Nevada Transportation Plan	2020
	Connecting Nevada Plan	2013
	Nevada Truck Paring Implementation Plan	2019
Economic Development Plans/Studies	Nevada's Plan for Recovery and Resilience (GOED)	2020
	Northern Nevada Economic Planning Indicators Committee Report (Economic Development Authority of Western Nevada)	2019
	Comprehensive Economic Development Strategy 2020 - 2025 (Western Nevada Development District)	2019
	Vision 2025: Comprehensive Economic Development Strategy (Las Vegas Global Economic Alliance)	2021
Corridor Studies	I-11 Northern Nevada Alternatives Analysis, Las Vegas to I-80	2018
	I-15 Corridor Study, Sahara to Flamingo	2021
	I-80 Corridor System Master Plan	2014
Others	Nevada Climate Initiative	2020
	Nevada Hazardous Commodity Flow Study	2019

2.3.1 One Nevada Transportation Plan

The One Nevada Transportation Plan is the state's long-range transportation plan, which equips NDOT and its partners with the strategic direction and essential actions to meet Nevada's current and future transportation needs.

Adopted and approved in 2018, the Plan provides a common foundation and shared policy framework for making more informed and responsive transportation investment decisions. The ongoing One Nevada planning process identifies and funds the best projects that achieve NDOT's six goal areas in a data-driven and transparent manner. The following goals form the basis for decision-making and investment decisions for all modes of transportation:

- Enhance Safety
- Preserve Infrastructure
- Optimize Mobility
- Transform Economies
- Foster Sustainability

- Connect Communities

Freight projects are prioritized based on modal specific data to develop a prioritized list of Division-specific actions. However, projects that will not be implemented with formula funding or grant opportunities will compete against all proposed projects for selection on the four-year fiscally constrained Statewide Transportation Improvement Program (STIP). STIP project candidates are prioritized using evaluation criteria that align with the six One Nevada goals, which are typically more general in nature than freight-specific evaluation criteria. Thus, freight projects must meet several of the One Nevada goal areas under development to be competitive for statewide programming.

2.3.2 Nevada State Rail Plan

The Nevada Department of Transportation completed the most recent update of the Nevada State Rail Plan in 2021. This agency's goal in developing this plan was to satisfy Federal Railroad Administration (FRA) requirement of assessing Nevada's current rail system, while also highlighting what an efficient freight and passenger transportation system could do when aligned with the goals of the One Nevada Transportation Plan.

The major focus areas for the plan include the following chronic challenges:

- Funding for rail infrastructure
- Follow-up organizational structure and commitment
- Regional marketplace dynamics that throttle rail expansion

The plan outlined key opportunities for each of the eight regions, including:

Region 1: Redevelop Black Mountain Industrial Center as a rail-served heavy-industry site.

Region 2: Establish transload facility for Pozzolan, which is used for concrete, and other commodities.

Region 3: Aggregate shipper needs into a viable redevelopment strategy for the Nevada Northern Railway.

Region 4: Create a corridor-wide, rail-based land development strategy for I-80 communities, establish freight rail connections with California market and ports, and expand Amtrak services.

Region 5: Support private-sector freight-rail served developments including investment in an integrated multimodal cargo transfer facility in the Fernley area, and establish public transportation service between Reno, Sparks, and the Tahoe-Reno Industrial Center.

Region 6: Focus on connecting existing truckload shippers to rail service.

Region 7: Reestablish civilian freight-rail service to Hawthorne Army Depot, build a truck-to-rail transload facility at Hawthorne, and address the need for local rail service with a transload facility in the Yerington/Wabuska area.

Region 8: Set the stage for rebuilding the rail line from Hawthorne to Clark County.

In addition to region-specific recommendations, the plan also made a series of 17 recommendations to be implemented across the state, noting which agency should lead each effort. Common themes among these recommendations were improving operations; focusing on planning for the future; strategic partnerships and funding opportunities; and using data to make informed decisions.

2.3.3 Nevada Hazardous Commodity Flow Study

The Nevada Hazardous Commodity Flow Study was completed in August of 2019. The Nevada Department of Transportation commissioned this study to document hazardous material (hazmat) transportation routes and modes in Nevada to help local, regional, State, and Federal officials and first responders better understand the volumes and nature of hazmat movement across the State.

The study used a three-part approach to document hazmat transportation in Nevada, including identifying priority hazardous materials; conducting a petroleum supply chain analysis; and conducting hazmat roadside surveys at 18 locations around the state. Ten priority chemicals were identified for the study, based on various risk factors. Facilities and routes were then classified and mapped.

Identifying top hazmat volumes, routes, and frequencies will help transportation officials better plan for future highway, rail, and pipeline facility needs. It will also allow first responders to prioritize training for the fuels most likely to be transported through their counties and help emergency managers appropriately locate hazmat response resources.

2.3.4 Nevada's Climate Initiatives

In 2019, Nevada adopted aggressive greenhouse gas (GHG) emissions reduction targets of 28 percent by 2025, 45 percent by 2030 and net-zero by 2050 (SB 254). In November 2019, an executive order by Governor Sisolak on climate change (EO 2019-22) directed state agencies to identify policies and strategies to achieve the SB-254 GHG emission reduction targets. To work towards these goals and build a policy foundation for undertaking future climates actions in the state, Nevada introduced the 2020 State Climate Strategy in 2020.4 The strategy provides a framework for reducing GHG emissions, groundwork for climate adaptation and resilience, and establishes a structure for climate action. It encompasses five emissions sectors: transportation, industry, electricity, residential and commercial and land use and land change.

Transportation plays a large role in climate emissions, and therefore is an important aspect of the state's goal of achieving net-zero by 2050. Further, climate change is impacting both transport and supply chains, and improving resiliency is essential. The 2020 State Climate Strategy's policies for the Transportation sector focus on:

- Adopting low and zero-emissions vehicle standards
- Implementing a clean truck program
- Adopting low-carbon fuel standards
- Implementing a state car allowance rebate system called "Cash for Clunkers"
- Closing emissions inspection loopholes for vehicles with classic cars license plates

2.3.5 Freight Planning in Metropolitan Areas

The four urbanized areas in Nevada have Metropolitan Planning Organizations that partner with NDOT and address regional freight movement.

[4] https://climateaction.nv.gov/our-strategy/

2.3.5.1 Carson Area Metropolitan Planning Organization (CAMPO)

The 2050 Regional Transportation Plan outlines the freight needs for the Carson City metropolitan region. The plan identifies the NDOT Priority Freight Projects for the CAMPO area: US 50 operational and capacity improvements, I-580/US 395 interchange improvements phase 2B-4, and the US 395 operational and capacity improvements from Johnson Lane to the US 50/I-580 Junction. Freight traffic is highlighted as being a major source of economic activity in the region. US 395 and US 50 east corridors are identified as major areas for congestion during peak hours with travel demand models forecasting higher congestion in the future. The three previously mentioned projects are all focused on the impact that increased congestion will have on freight traffic in these bottleneck areas. The Douglas County Transportation Plan is mentioned as adding to the improvements along US 395 to reduce congestion. NDOT has developed an operational study along US 50 East between Dayton and Stagecoach in Lyon County.

2.3.5.2 Regional Transportation Commission (RTC) of Southern Nevada

RTC of Southern Nevada addresses freight needs in the Access 2050: Regional Transportation Plan and is in the process of developing a separate regional freight plan. The majority of freight traffic in the area is carried on I-15, followed by I-515/US93, CC-215/I-215 and US 95. The Union Pacific Railroad is another major freight corridor in Southern Nevada.

RTC recently completed the Southern Nevada Freight Plan Update Final Report in 2022 that highlights future demand and freight-related performances. The goals for this plan update are to enhance safety, preserve infrastructure, optimize mobility, transform economies, foster sustainability and connect communities. Freight-specific studies have been completed in the City of North Las Vegas and the City of Henderson. RTC highlights that peak hour travel congestion is expected to worsen in the future and the increasing demand on the freight network could create bottlenecks in the system. Shipping imbalance and lack of a trained workforce have been identified as a weakness and limited land and water sources and industrial land use encroachment have been identified as threats to the freight system.

2.3.5.3 Regional Transportation Commission of Washoe County

The 2050 Regional Transportation Plan for Washoe County includes an assessment of freight needs for the Reno-Sparks metropolitan region. The following freight priorities have been identified for the area: economic competitiveness, mobility and reliability, safety, infrastructure preservation, advanced innovative technology, environmental sustainability and livability, sustainable funding and collaboration, and land-use and community values.

The plan identifies areas in the region that have significant impact in the local freight operations: Sparks industrial area and Sparks rail yard, North Valleys area with the Reno-Stead airport and U.S. 395 corridor, South Meadows industrial area, Pyramid Highway industrial area, and the Reno-Tahoe International Airport.

RTC lists the following projects that are focused on improving freight and goods movement through Northern Nevada: system-wide ITS improvements on I-80 and US 395/I-580, Pyramid Highway/US 395 Connector and the Spaghetti Bowl Project and the US 395 Widening. RTC highlights truck parking shortages as a concern that needs to be addressed as Washoe County has a deficit of truck parking spaces.

2.3.5.4 Tahoe Regional Planning Agency (TRPA)

TRPA outlines their freight concerns in the 2020 Regional Transportation Plan. TRPA highlights that freight movement into the Tahoe area is done by trucking, as the closest freight rail is in Truckee. There are no planned projects specifically focused to address freight and goods movement, but it is noted that projects that improve roadway access and mobility will be beneficial. The plan recommends using the complete streets approach to address these needs. TRPA is monitoring the need to convert freight fleets into zero emission vehicles.

2.3.6 Support Multi-State Planning

NDOT has established two coalitions for the two major transcontinental interstate corridors of I-15 and I-80 that connect the major seaports in California to the rest of the nation. These coalitions collaborate with State DOTs, safety and technology experts, communications specialists, and trucking industry representatives to develop strategies that will improve the safety, mobility, consistency of travel and the movement of freight along the I-15 and I-80 corridors.

2.3.6.1 I-15 Mobility Alliance

The I-15 Mobility Alliance is a regional partnership between government and private interests in Nevada, California, Arizona, and Utah. Initiated in 2007, the alliance developed the first I-15 Corridor System Master Plan (CSMP) in 2012, which defines a multi-decade, multimodal transportation system vision and implementation strategy. The CSMP was updated in 2017. The alliance is currently updating and identifying Immediate Projects of Interregional Significance – projects that are beneficial for regional movement along I-15 and its systematic connectors – for funding priority.

2.3.6.2 I-80 Multi-state Corridor Operations and Management Program

The I-80 Winter Operations Coalition is a multi-state partnership led by the NDOT and includes California, Utah, Wyoming, and Nebraska. The coalition was initiated in 2010 to bring state departments of transportation together to collaborate on strategies to improve I-80 corridor's safety, mobility, consistency of travel and the movement of freight along I-80 during the winter months. The I-80 Winter Operations Coalition successfully secured a federal grant through the Multistate Corridor Operations and Management (MCOM) program, which is funding the current program initiatives.

2.4 Truck Parking

Truck parking is a significant concern in Nevada, as identified by the Freight Advisory Committee (see chapter 10 about the Freight Advisory Committee) and the Nevada Truck Parking Implementation Plan. The statewide shortage of truck parking impacts Northern Nevada, particularly during winter storm events when I-80 is closed in the Sierras. In Southern Nevada, the increasing development of warehouse and industrial land uses near residential areas has exacerbated the need for more designated truck parking areas.

The Nevada Truck Parking Implementation Plan was completed in August of 2019. This plan provides a comprehensive overview of issues related to statewide truck parking, urban truck parking, technology and data, and special cases. The plan then concludes with an overview of the options available to fund or finance plan recommendations. FHWA supported the development of the plan by facilitating truck parking workshops for local agencies and other stakeholders in both Northern and Southern Nevada.

The Nevada Department of Transportation conducted this study to develop a plan for expanding, improving, and integrating freight truck parking and truck parking communications systems in response to rising demand, changing hours of service requirements, and safety standards. The Plan identified the locations where there are no truck parking facilities with amenities within a 2-hour drive, including US 93 between Las Vegas and Ely, US 95 between Tonopah and Fernley, and US 95 between Winnemucca, Nevada and Marsing, Idaho. Other needs/gaps mentioned in the 2019 truck parking report include:

- Clark County had a deficit of more than 550 truck parking spaces
- Washoe County, Reno and Sparks area lacked about 250 spaces
- I-15 is a route with significant truck parking needs
- Other gaps:
  - Churchill County and near Carlin on I-80
  - US 6 near California border
  - US 95 near Indian Springs
  - US 93 near US 93/93A split
- There is a technology and information gap to help drivers finding parking
- Stakeholders identified Donner Pass on I-80 as lacking emergency parking especially during winter weather closures

Statewide Truck Parking

Existing truck parking locations throughout the state are shown in Figure 2-2.

The following recommendations were made for long-haul (statewide) truck parking needs:

- Expand and/or enhance existing public truck parking facilities at several rest stops and turnout areas
- Add truck parking at new weigh stations
- Allow parking at chain-up/brake check/inspection site areas during off season
- Convert closed NDOT or NHP facilities to truck parking
- Add truck parking during highway improvements
- Improve multi-state coordination
- Develop a P3 model and a competitive grant or loan program

Urban Truck Parking

Additional detail about truck parking facilities in and around the urbanized areas of Northern Nevada and Southern Nevada are provided in Figure 2-3 and Figure 2-4 below.

The following recommendations were made for urban truck parking needs. These recommendations focus on how NDOT can assist with education and support local efforts.

- Support efforts to change zoning
- Develop a P3 model and a competitive grant or loan program

- Evaluate available land for truck parking

Technology and Data

Plan recommendations centered around two main recommendations related to technology and data. These include:

- Deploying a statewide truck parking availability system (TPAS)
- Enhancing truck stop electrification (TSE) levels

Special Cases

The plan also made recommendations related to several special cases, including:

- Emergency parking
- The Convention Marshalling Yard

The Funding and Financing Options section of the plan described various funding sources available to implement proposed recommendations, including federal funding and grants, state and local funding, direct user fees, public-private-partnerships, design-build-finance-operate-maintain structures, sponsorships, and tax incentives.

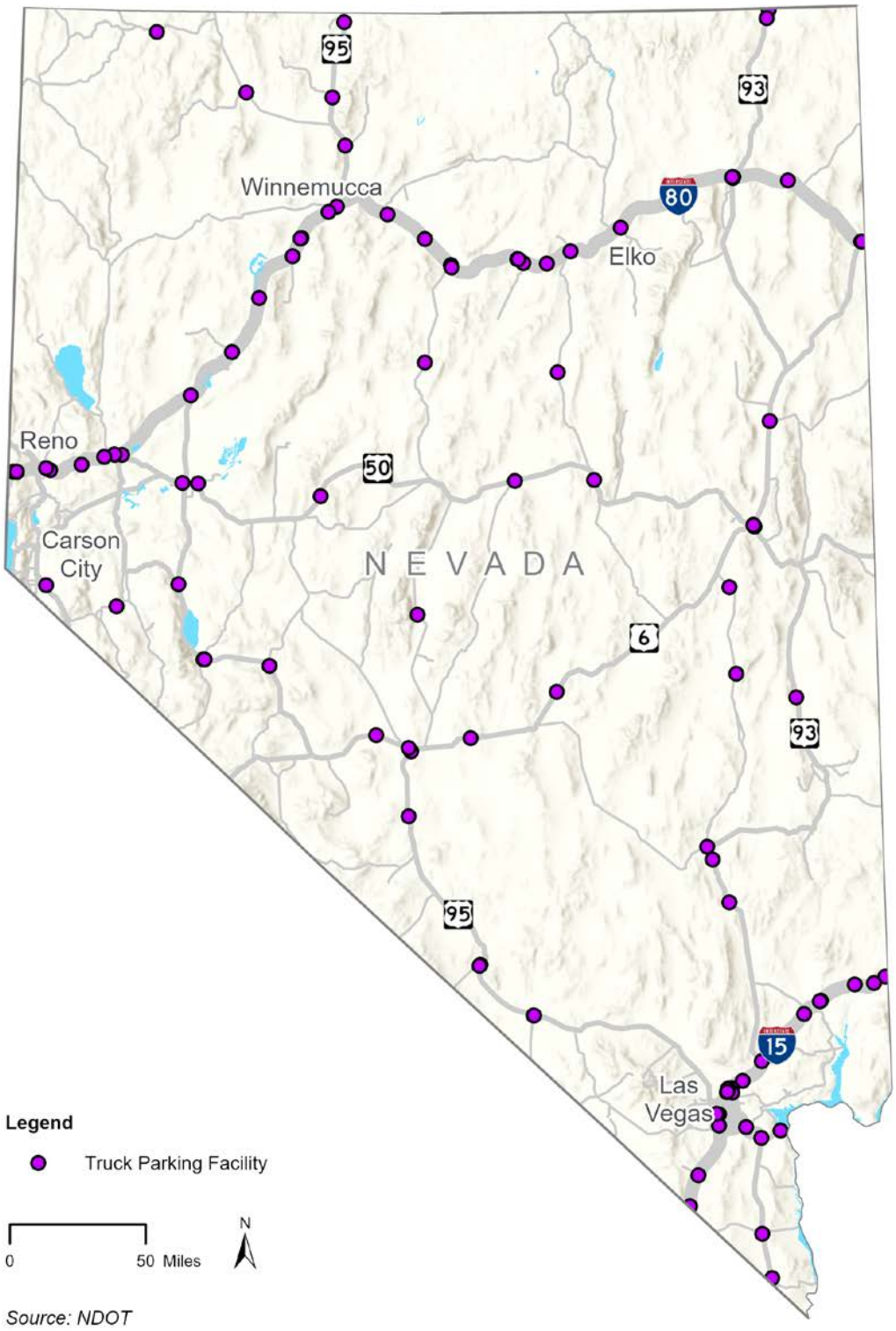


Figure 2-2. Existing Truck Parking Facilities

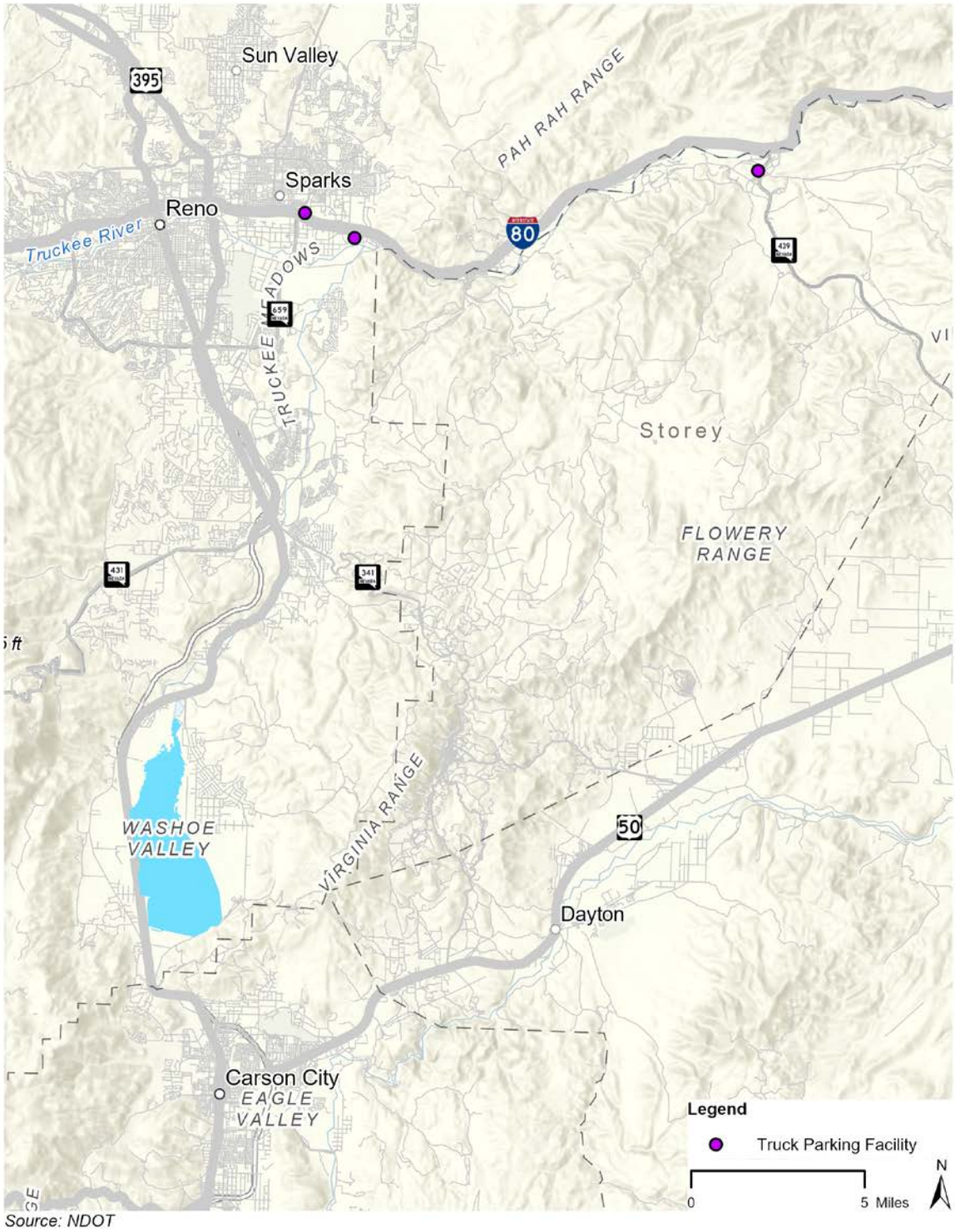
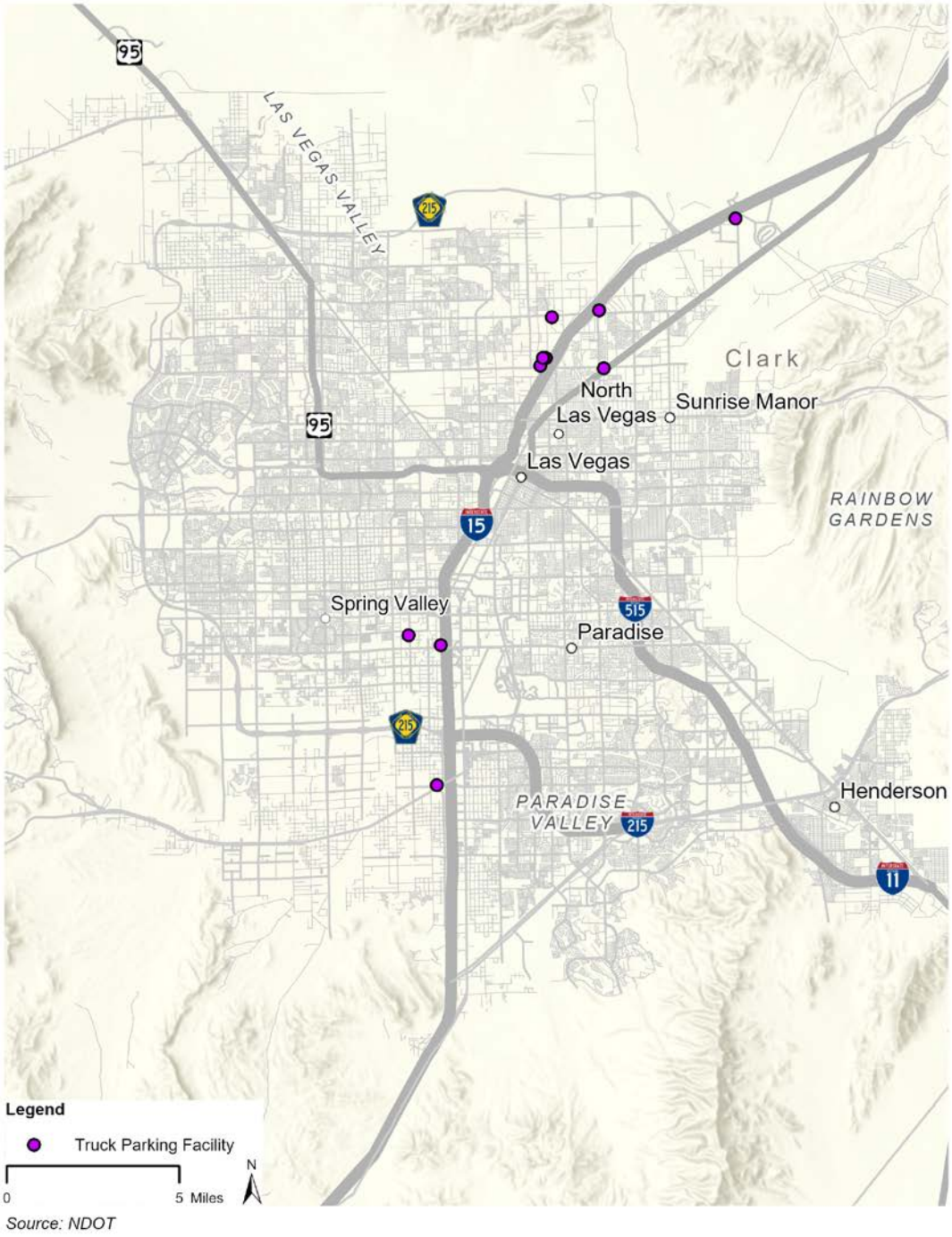


Figure 2-3. Existing Truck Parking Facilities in Northern Nevada



Source: NDOT

Figure 2-4. Existing Truck Parking Facilities in Southern Nevada

2.5 Freight Program Implementation Support Services

NDOT completed the Nevada State Freight Plan (NSFP) in 2016, which provides a framework to improve freight mobility to foster continued growth and economic diversification in Nevada. The NSFP proposed eighteen strategies for addressing the freight plan's goals supported by a series of implementation actions. These actions include broad-based policies and initiatives, as well as projects and further investigation that helped Nevada advance the state's freight system to capture future economic opportunities and facilitate appropriate flow of goods.

The Freight Program Implementation Support Services Project was the next step after the Freight Plan to start implementing the recommended actions to accomplish each of the 18 strategies. NDOT staff worked closely with a consultant team on the full implementation of each action.

The overall vision is to show the Department proof that there is a need to expand the Freight Program, including the addition of staff within NDOT to manage the Department's overall freight planning effort. Ideally, the Freight division would work closely with other divisions (i.e. roadway design, scoping) to create projects. The project helped to define the freight program and develop a process manual that allows someone who would step into the Freight Program Manager role to effectively and immediately be able to manage the freight program at NDOT.

3. Critical Freight Corridors and Facilities

Multimodal critical rural freight facilities and corridors designated within the State under section 70103 of title 49 (National Multimodal Freight Network) and critical rural and urban freight corridors designated within the State under section 167 of title 23 (National Highway Freight Program) are required elements of a state freight plan. NDOT has chosen to include multimodal freight facilities in both rural and urban environments.

3.1 Multimodal Freight Facilities

While the required elements for state freight plans include the listing of multimodal critical rural freight facilities and corridors, this chapter provides lists for both rural and urban multimodal critical freight facilities and corridors.

The metropolitan areas of Las Vegas and Reno-Sparks-Carson City are the primary freight hubs within the state, and I-80 and I-15 are the primary freight corridors connecting these hubs with centers outside of Nevada. Currently, the Nevada metropolitan area hubs are connected to each other by US 95, but not by interstate highway or rail. While rail, pipeline, and air transport do not carry the volume in Nevada that trucks do, these modes still play very important roles in carrying unique items to, from, and within Nevada. The relationship between these modes, hubs, and corridors is an important aspect of a freight network and distribution.

Nevada has six rail-truck facilities and three air-truck multimodal facilities. Details on these facilities are provided in Table 3-1. Understanding the location and function of the multimodal facilities is important to both identifying the amount and types of freight processed in the region and maintaining efficiency on connecting freight corridors.

The Las Vegas region includes four multimodal facilities: Union Pacific Railroad Las Vegas Intermodal Facility, Union Pacific Railroad Moapa Transload Facility, Pan Western Transload Facility, and Marnell Air Cargo Center. In total, the Las Vegas region includes approximately 140 acres of multimodal facilities. The Reno-Sparks metropolitan area includes three multimodal facilities: the Sparks and Parr intermodal yards, and the Reno-Tahoe International Airport (RNO) Air Cargo Center. The Sparks Intermodal Yard is home to a host of manufacturing, trucking, warehousing, and construction companies, as well as the petroleum products tank farm. With its close proximity to RNO, it is a great example of a truly multimodal facility that combines rail, truck, air, and pipeline in a single location.

One of the proposed strategies from the *Southern Nevada Regional Goods Movement Master Plan* (RTCSNV, 2015) is to improve multimodal connectivity through development of an integrated logistics center, or Freight Village, in the Las Vegas region. This industrial park or mixed-use development would be constructed specifically around high-performance freight servicing facilities, with access to major highways and railroads, and (where possible) pipelines and airports. It should range in size from 300 to 500 acres (CH2M, 2015).

Table 3-1. Multimodal Facilities

Facility	Type	Function	Location
Union Pacific Railroad Las Vegas Intermodal Facility	Rail-Truck	Intermodal container-on-flatcar and auto carload facility. Typically handles paper products, autos, and building materials. Storage capacity of 80 trailers and containers. Includes two tracks for auto loading and unloading and two for intermodal. A 98-acre facility.	Las Vegas Metro Area
Moapa Transload Facility[1]	Rail-Truck	Includes two rail sidings and two conveyor belts to transfer freight.	Las Vegas Metro Area
Pan Western Transload Facility	Rail-Truck	Transloading services are provided for box, flat, center beam, gondola, hopper, and liquid railcars. Onsite services include forklifts, straddle cranes, conveyors, pumps and compressors. Typically handles aggregates, fuels, liquids, dimensional and over-dimensional freight, as well as hazardous materials. 24,000 feet of rail capacity that can accommodate up to 250 railcars. A 25-acre facility.	Las Vegas Metro Area
Marnell Air Cargo Center	Air-Truck	Freight and distribution facility; designated foreign trade zone. Includes two buildings totaling 200,000 square feet. Typically accommodates airline and mail cargo. A 19-acre facility.	Las Vegas Metro Area
Northeastern Nevada Regional Railport	Rail-Truck	Rail-to-truck and truck-to-rail capabilities, as well as railcar switching, storage, and warehousing. Dry and liquid bulk, hazardous material, and food-grade transloading. Companies at facility include Rudy Pipeline, Pacific Steel, and Liebherr Mining Equipment. Served by Union Pacific and BNSF Railway. A 60-acre facility.	Elko County
Union Pacific Railroad Sparks Intermodal Facility	Rail-Truck	Only intermodal terminal in the state with both container-on-flatcar and trailer-on-flat-car facility. Specializes in longer trains carrying commodities, such as chemicals, coal, minerals, autos and auto parts, agricultural goods, and petroleum. Includes facility that adds and removes helper locomotives to assist train movements over Donner Pass. A 1,442-acre facility.	Reno-Sparks Metro Area
Parr Intermodal Yard[2]	Rail-Truck	Four-track facility, with paved rail serving industrial development and office facilities. Supports general carload business and intermodal and automotive traffic; automotive business consists of outbound shipments of used vehicles. A 9-acre facility.	Reno-Sparks Metro Area
Elko Regional Airport	Air-Truck	Typically accommodates airline and mail cargo.	Elko
Reno-Tahoe International Airport	Air-Truck	Freight and distribution facility and designated foreign trade zone. Typically accommodates airline and mail cargo.	Reno-Sparks Metro Area

Sources: CH2M, 2015; Jacobs, 2012; and Elko Regional Airport, 2015.

[1] Moapa Transload Facility is located west of Hidden Valley Road, east of the Union Pacific rail corridor, between two spur lines. The facility is a small component of the larger parcel.

[2] Parr Intermodal Yard is served by the Union Pacific Reno Branch, but the railroad owns a small section of the overall 205-acre facility, which is comprised of numerous privately owned parcels.

3.2 Critical Freight Corridors

An important component of the plan and precursor to aligning prioritized projects with available funding sources is defining Nevada's Highway Freight Network, which is a combination of the National Highway Freight Network, and additional corridors that are also important for Nevada. Together, there are six components of Nevada's Highway Freight Network, defined by USDOT and state agencies, as indicated in Table 3-2.

Table 3-2. Components of Nevada's Highway Freight Network

National/State Network	Component	Defined by	Mileage Cap
National Highway Freight Network	Primary Highway Freight Network	USDOT	None
	Critical Rural Freight Corridors	NDOT	300
	Critical Urban Freight Corridors	NDOT and MPOs	150
	Other Interstates not on the Primary Highway Freight System	USDOT	None
Additional corridors important to Nevada	Critical Multi-state Freight Corridors	NDOT	None
	Other Nevada Freight Corridors	NDOT and MPOs	None

Note: The Bipartisan Infrastructure Bill allows for the increase in mileage limits and will be revised in a future freight plan update.

State transportation agencies are responsible for defining the Critical Rural Freight Corridors (CRFCs) and Critical Urban Freight Corridors (CUFCs), and Other Nevada Freight Corridors. Having a defined network is required to apply for certain federal funding opportunities. For instance, only projects on the National Highway Freight Network are eligible for funding from the National Highway Freight Program (NHFP). However, each state has a mileage cap on the length of corridors that can be defined under these categories. Nevada's cap is 300 miles for CRFCs and 150 miles for CUFCs.

Because the mileage cap for the nationally defined system is disproportionately low within large states like Nevada, two additional corridor categories important to Nevada were added to the state freight plan to help prioritize local/state funding for projects not on the National Highway Freight Network.

- Critical Multi-state Freight Corridors are major US highways that traverse the state of Nevada and our neighboring states--helping to fill the large expanses where no interstate freeways exist and provide critical long-distance connectivity.
- Other Nevada Freight Corridors are additional highways that serve regional and local freight mobility.

A key element of the freight plan is a list of prioritized improvement projects that will form a direct input into the STIP and Regional Transportation Plans (RTPs) developed by the metropolitan planning organizations (MPOs). To continue to advance transportation and freight mobility in the state, follow-through of these concepts to implementation is required.

Selection of Nevada's Highway Freight Network is a multi-tiered process beginning with the utilization of a multi-objective decision analysis (MODA) tool. This automated tool allows the user to compare and prioritize multiple projects based on a set of criteria established by the user. Each criterion can be measured according to different parameters including using a subjective ranges or scales (i.e., favorability on a scale from 1 to 10) and objective data points (i.e., population, traffic volumes). The

user-established criteria and associated values for each alternative are entered into an excel spreadsheet, and the tool calculates a score based on the criteria values and weighting parameters. With a methodology in place, updating this project list on an established interval can be completed in a consistent manner, allowing defensible comparisons of new projects. The project list was separated into four broad regions across the state—Las Vegas, Reno-Sparks, Carson City, and rural areas—and the projects sorted by MODA value within each region. The prioritized list was further refined based on input received from the Freight Advisory Committee, NDOT, public agency partners, and key industry stakeholders and separated into three categories: critical, very important, and important.

An initial high-level screening defined key state freight corridors as:

- Corridors designated as part of the National Highway Freight Network
- Rural state highways with an average annual daily truck traffic (AADTT) greater than 50 trucks per day
- State highways and local arterials within urban areas with the greatest AADTT and/or
  - Provide key linkages within the local urban network
  - Serve key economic development areas
  - Provide vital parallel alternate routes to the National Highway Freight Network

Some smaller segments along the same corridor were combined if truck volumes were similar, creating a total of 141 segments. Those rural and urban corridors not already identified as part of the National Highway Freight Network were then further evaluated using additional quantitative and qualitative criteria. This additional evaluation was used to develop recommendations for corridors to be designated as Critical Rural Freight Corridors and Critical Urban Freight Corridors as defined by the Fixing America's Surface Transportation Act (FAST Act).

Criteria used for defining the components of Nevada's Highway Freight Network were selected from a combination of criteria below. The criteria are weighted equally.

- 2014 AADTT
- Access to multimodal facilities
- Access to freight-dependent employment centers
- Potential role in advancing the development of the I-11 corridor

The corridor segments were then separated into rural and urban as defined by the 2014 census designated urbanized area boundary. Each list was then sorted by the MODA score to identify the most critical rural and urban freight network. Adopted in the 2017 plan, the critical rural freight corridors and critical urban freight corridors are listed in Tables 3-3 and 3-4 and illustrated on Figures 3-1 to 3-3.

Table 3-3. Critical Rural Freight Corridors

Corridor Number	Corridor Name and Extents	Corridor Length
86	US95 (SR157/Kyle Canyon Road to McFarland Avenue)	27.0
29	SR439/USA Parkway (I-80 to Storey/Lyon County line)	10.6
89	US95 (SR160 to SR374)	46.0
87	US95 (McFarland Avenue to Clark/Nye County line)	12.7
88	US95 (Clark/Nye County line to SR160)	13.8
90	US95 (SR374 to 7.5 miles south of Nye/Esmeralda County line)	39.9

Table 3-4. Critical Urban Freight Corridors

Corridor Number	Corridor Name and Extents	Corridor Length
Southern Nevada Total		40.3
16	CC215 (US95 to I-15N)	12.9
85	US95 (CC215 to SR157/Kyle Canyon Road)	4.3
141	CC215 (I-215 to Rainbow Boulevard)	3.0
134	SR573/Craig (Losee Road to Las Vegas Boulevard)	3.5
33	Koval Lane (E Reno Avenue to Sands Avenue)	1.8
36	SR612/Nellis Boulevard (Washington to Las Vegas Boulevard)	3.8
19	SR593/Tropicana Avenue (I-15 to I-515)	5.7
48	SR610/Lamb Boulevard (Las Vegas Boulevard to I-15)	2.3
20	SR562/Sunset Road (SR604/Las Vegas Boulevard to Eastern Avenue)	3.0
Washoe Total		28.5
38	US395 (I-80 to Lemmon Drive)	6.4
39	US395 (Lemmon Drive to Red Rock Road)	3.6
45	Greg Street (I-80 to Mill Street)	4.5
43	SR468/Glendale Avenue (Kietzke Lane to S McCarran Boulevard)	2.7
41	SR445/Pyramid Highway (N McCarran Boulevard to Sparks Boulevard)	3.8
n/a	SR659/McCarran Boulevard (I-580 to Greg Street)	5.3
59	Terminal Way (Mill to Vassar)	0.3
n/a	Vista Boulevard (I-80 to Prater Way)	1.0
n/a	Sparks Boulevard (I-80 to Prater Way)	0.9
Carson Total		6.2
101	US50 (I-580 Carson City to SR341)	6.2

Note: The CRFCs and the CUFCs will be amended in a future freight plan update to allow for the increase of CRFC miles from 150 to 300 miles per the Bipartisan Infrastructure Law (BIL) and the redesignation of both the CRFCs and CUFCs.

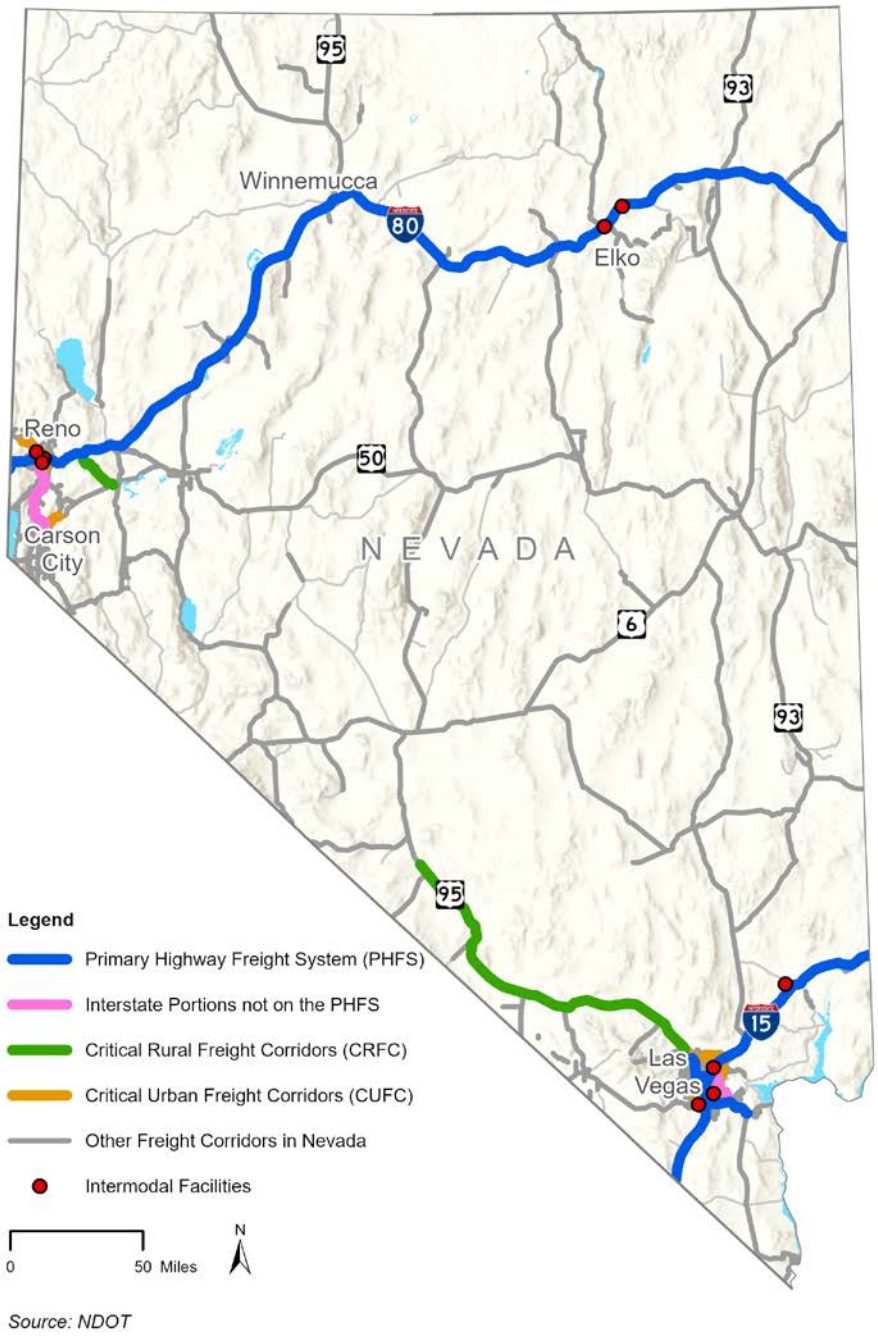


Figure 3-1. Nevada's Highway Freight Network: Statewide

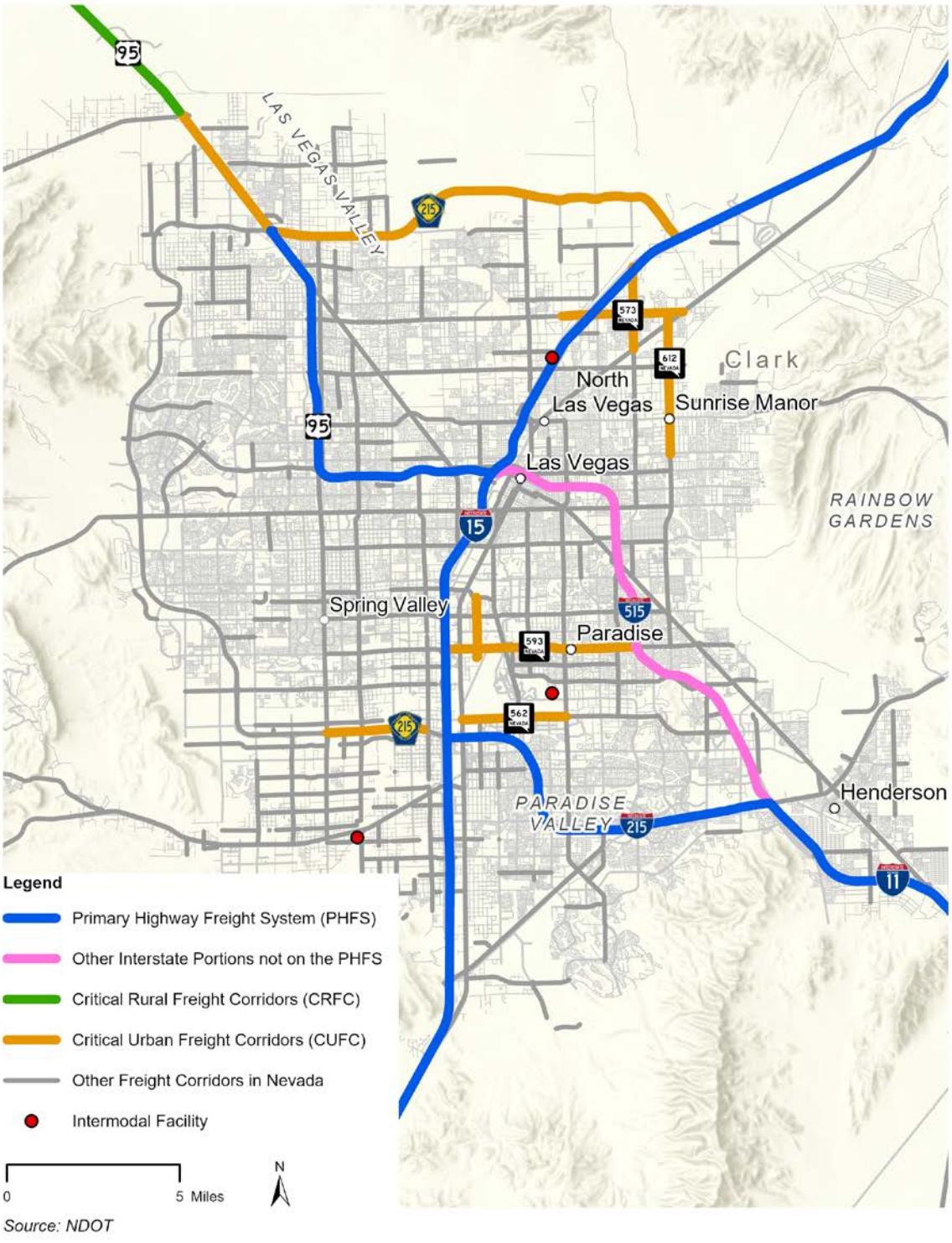
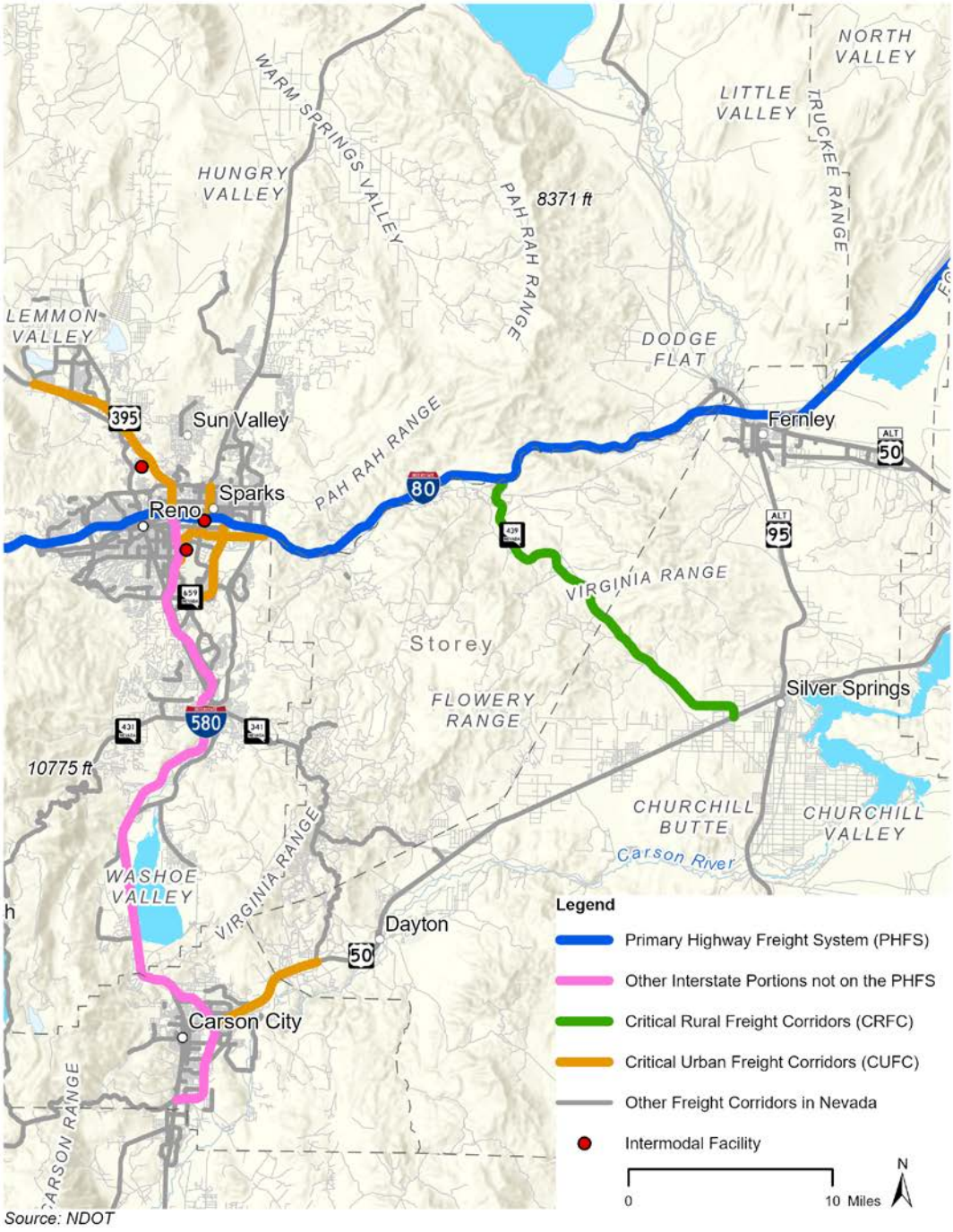


Figure 3-2. Nevada's Highway Freight Network: Las Vegas Area



Source: NDOT

Figure 3-3. Nevada's Highway Freight Network: Reno-Sparks Area

4. Meeting National Multimodal Freight Policy Goals

This chapter lists polices that are designed to enhance and improve the goals of the National Multi-modal and National Highway Freight Network. The strategies are intended to support and achieve the goals outlined by the National Highway Freight Program and improve safety, security, reliability and resiliency of the freight transportation system.

4.1 Strengthen Economic Competitiveness

4.1.1 Overview

Freight-reliant industries generate the goods that make the rest of the economy hum. The overall economic competitiveness of Nevada depends on the success of these industries. According to the Nevada Governor's Office of Economic Development (GOED), several factors make the state a competitive location for freight-reliant industries:

- Nevada is a one-day's drive to about 60 million customers and multiple major US ports on the Pacific Coast
- Nevada boasts two important airports: Harry Reid International and Reno-Tahoe International

Nevada has a growing advanced manufacturing industry

Nevada contains a wealth of mineral resources

- Nevada houses a large quantity of commercial real estate

This section examines indicators of the competitiveness of Nevada's key industries including employment and freight demand. All of these key industries rely on the freight system, and many are freight-dependent. However, before delving into a discussion about the key industries and their reliance on the freight system, it is useful to gain a high-level understanding of Nevada's economy overall by examining population and Gross Regional Product (GRP).

4.1.2 Population

Examining population changes provides an indication of how dynamic a region's economy is. Fast population growth suggests that the state is in high demand. Businesses are moving to the state, driving a demand for workers and new residents. And vice versa: new residents drive demand for new businesses. As Table 4-1 shows, Nevada's population grew 15 percent between 2010 and 2020, more than double the national rate of 7.4 percent and the fifth fastest rate of any state.[5]

[5] https://www2.census.gov/programs-surveys/decennial/2020/data/apportionment/apportionment-2020-map03.pdf

Table 4-1. Nevada Statewide Population Trends

2010	2020	Change
2,700,551	3,104,614	+15.0%

Source: CPCS analysis of Census data. https://www.census.gov/library/stories/state-by-state/nevada-population-change-between-census-decade.html

Table 4-2 shows population by Nevada county in 2020. The vast majority of Nevada's population, almost 89 percent, lives in Clark or Washoe Counties. With nearly 9 of 10 Nevadans living and working in these two counties, much of the state's freight activity related to consumer demand happens in these counties. However, as we will see later on, many counties that make up decimal percentages of Nevada's population are in fact important centers of a freight-dependent industry and have outsized influence on freight demand statewide.

Table 4-2. Population by County, 2020

County	Population, 2020	Percent of State Total
Clark	2,265,461	72.97%
Washoe	486,492	15.67%
Lyon	59,235	1.91%
Carson City	58,639	1.89%
Elko	53,702	1.73%
Nye	51,591	1.66%
Douglas	49,488	1.59%
Churchill	25,516	0.82%
Humboldt	17,285	0.56%
White Pine	9,080	0.29%
Pershing	6,650	0.21%
Lander	5,734	0.18%
Mineral	4,554	0.15%
Lincoln	4,499	0.14%
Storey	4,104	0.13%
Eureka	1,855	0.06%
Esmeralda	729	0.02%

Source: CPCS analysis of U.S. Census Bureau data. https://www.census.gov/library/stories/state-by-state/nevada-population-change-between-census-decade.html

4.1.3 Gross Regional Product

Gross Regional Product (GRP) measures the value of final goods and services produced in a particular region. This indicator provides an idea of the overall size of an economy. Table 4-3 presents Nevada's

real GDP in 2011 and 2021. The state saw a growth in real GDP of nearly 19 percent over this decade. While this is impressive, it is slightly below the national average of 22.25 percent.[6]

Table 4-3. Nevada Real GDP (millions of 2012 $)

2011	2021	Change
130,697.85	155,509.6	+18.98%

Source: CPCS analysis of BEA data.

COVID-19 Impacts on GDP

The shock of the COVID-19 pandemic and the ensuing lockdowns had immediate impacts on economic activity, and hence GDP. Nevada's real GDP dropped almost 18 percent between Q1 2020 and Q2 2020. The state's real GDP only recovered to its 2019 average in Q4 2021. In comparison, the national real GDP dropped just under 9 percent between Q1 2020 and Q2 2020 and it exceeded the 2019 average real GDP in Q1 2021. The above-average impacts of COVID-19 on Nevada's economy are likely due to the state economy's reliance on the service and entertainment industry (think Las Vegas), a sector which was hit particularly hard by the global health crisis. It was freight-dependent industries that sustained the economy throughout the pandemic, completing e-commerce orders and delivering critical medical products.

Table 4-4 lists the GRP of each county in Nevada as well as its share of the state's total. This provides information about the geography of Nevada's economy. Unsurprisingly, the size of each county's GRP closely matches the county's population. Clark and Washoe Counties together make up over 85 percent of Nevada's GDP.

Table 4-4. GRP by County

Counties	GRP (millions of $)	Percent of State Total
Clark	124,640	68.5%
Washoe	31,010	17.0%
Storey	4,290	2.4%
Carson City	4,110	2.3%
Elko	3,270	1.8%
Douglas	3,050	1.7%
Nye	1,930	1.1%
Eureka	1,890	1.0%
Lyon	1,780	1.0%
Humboldt	1,610	0.9%
Churchill	1,390	0.8%
White Pine	1,030	0.6%
Lander	1,030	0.6%

[6] https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1&acrdn=1

Counties	GRP (millions of $)	Percent of State Total
Pershing	469	0.3%
Mineral	249	0.1%
Lincoln	182	0.1%
Esmeralda	55	0.0%
Nevada	181,980	100%

Source: GOED, 2021. Note that the Nevada figure differs from the number presented above. This is because the county-level data here comes from the GOED, not the BEA, and is given in nominal not real terms.

4.1.4 Key Industries

GOED identifies 9 key industries in the state.[7] These industries are presented in Table 4-5 and are discussed further in the following sub-sections.

Table 4-5. Key Industries in Nevada

Key Industry	Description	Example Commodities	Main Freight Mode(s)
Aerospace & Defense	National security, military operations	Transportation equipment, Machinery, Electronics	Truck
Health	Healthcare, pharmaceuticals	Pharmaceuticals	Truck, air cargo
Information Technology	Advanced technology, data centers	Electronics	Truck
Manufacturing	Production of goods	Wood products, Paper products, Textiles, Base metals	Truck, rail
Logistics	Distribution operations	Precision instruments, Electronics	Truck, rail,
Mining	Extraction of primary metals, minerals, and other raw materials	Nonmetal mineral products, Metallic ores, Gravel, Building stone	Rail
Natural Resource Technologies	Technology and equipment that support agriculture and the cultivation of natural resources	Machinery, Electronics	Truck
Agriculture	Crop farms, livestock ranches	Cereal grains, Meat/seafood, Animal feed	Rail, truck
Tourism & Gaming	Hospitality, food production, casinos	Alcoholic beverages, Tobacco products	Truck

Source: CPCS analysis of GOED data

[7] The GOED aggregates to industries into a broader parent industry. For example, Manufacturing and Logistics are combined into a single Manufacturing & Logistics industry. Similarly, Natural Resource Technologies and Agriculture are combined into a single Natural Resource Technologies industry. For the purpose of providing a more detailed analysis, we have chosen to examine the sub-industries and not the aggregated parent industry.

The rest of this section examines each of these industries in more detail using employment and location quotient data. First, the relative importance of freight for the industry is discussed, followed by an examination of employment in the industry by county. Lastly, an analysis of location quotients for each industry by county is conducted. The tourism and gaming, health, and logistics industries see the largest employment in the state. Based on the number of counties with location quotients (LQ) above 1, Nevada is particularly specialized in mining, natural resource technology, and agriculture industries.

Employment

For freight-dependent industries, the number of employees is a good indicator of the amount of freight coming or going from a particular employment center. Locations with a large number of employees generate a large number of freight shipments, whereas a lower number of employees are likely not handling as many freight shipments.

Location Quotients (LQs)

LQs compare employment concentrations for a particular industry within a region to the national average. This provides another idea of the relative importance of the industry to the region's economy. A value above 1 suggests that relative employment in the industry is above average. A value below 1 suggests that relative employment in the industry is below average.

4.1.4.1 Aerospace and Defense

The aerospace and defense industry supports national security and military operations. While it is not the most freight-dependent industry, it does rely on the freight system to transport military equipment such as transportation equipment (e.g., aircraft and tanks), fabricated metals (e.g., ammunition), chemicals (e.g., hazardous materials and explosives), among others. The US designates a Strategic Highway Network (STRAHNET) and a Strategic Rail Corridor Network (STRACNET) for the movement of military equipment and troops. We discuss this further in section 4.13.

Table 4-6 presents employment in the aerospace and defense industry. It makes up just over 1 percent of the state's employment and has employment centers in Clark, Washoe, and Nye Counties. Thus, it is reasonable to suppose that most of the freight moving to and from Aerospace & Defense industries in Nevada have their origins or destinations in these counties.

Table 4-6. Aerospace & Defense Employment

Employment	Percent of State Total	Top Five Counties
18,021	1.3%	1. Clark 2. Washoe 3. Nye 4. Carson City 5. Churchill

Source: CPCS analysis of GOED data.

Table 4-7 presents the three counties in Nevada with location quotients above 1 in the aerospace and defense industry. Recall that a LQ above 1 indicates that the county's relative employment in the industry is above the national average. Thus, although Clark and Washoe County have higher nominal employment in the aerospace and defense industry, Nye County has an employment concentration in

this industry that is over five times the national average. Churchill and Carson City Counties also have an above-average employment in this industry relative to their population. This suggests that, for their size, these three counties see a relatively high concentration of aerospace and defense industries and their freight systems likely support an above-average share of military freight.

Table 4-7. Aerospace & Defense Location Quotients

Counties with LQ >1
Nye (5.61)
Churchill (4.3)
Carson City (1.58)

Source: CPCS analysis of GOED data.

4.1.4.2 Health

The health industry supports medical care in the state. While it is not the most freight-dependent industry, it does rely on the freight system to transport medical goods such as chemicals (e.g., pharmaceuticals) and precision instruments (e.g., surgical and medical instruments), which are often time sensitive and high value.

Table 4-8 presents employment in the health industry. It makes up just over 9 percent of the state's employment and has employment centers in Clark, Washoe, and Carson City Counties. Thus, it is reasonable to suppose that most of the freight moving to and from Health-related industries in Nevada have their origins or destinations in these counties.

Table 4-8. Health Industry Employment

Employment	Percent of State Total	Top 5 Counties
131,247	9.2%	1. Clark 2. Washoe 3. Carson City 4. Elko 5. Douglas

Source: CPCS analysis of GOED data.

Table 4-9 presents the only county in Nevada with a location quotient above 1 in the health industry. Although Clark and Washoe County have higher nominal employment in the health industry, Carson City County has an employment concentration in this industry that is above the national average. This suggests that, for its size, Carson City County sees a relatively high concentration of Health industries, and its freight system likely supports an above-average share of medical freight.

Table 4-9. Health Location Quotients

Counties with LQ >1
Carson City (1.16)

Source: CPCS analysis of GOED data.

4.1.4.3 Information Technology

The information technology industry refers to high-tech businesses like Apple, Tesla, and Google, all of which have a presence in Nevada.[8] While it is not the most freight-dependent industry, it does rely on the freight system to transport products such as electronic equipment (e.g., semiconductors and circuit boards) and computer equipment (e.g., electronic computers and communications equipment).

Table 4-10 presents employment in the information technology industry. It makes up just over 5 percent of the state's employment and has employment centers in Clark, Washoe, and Carson City Counties. Thus, it is reasonable to suppose that most of the freight moving to and from Information Technology-related industries in Nevada have their origins or destinations in these counties.

Table 4-10. Information Technology Employment

Employment	Percent of State Total	Top 5 Counties
74,584	5.2%	1. Clark 2. Washoe 3. Carson City 4. Douglas 5. Nye

Source: CPCS analysis of GOED data.

4.1.4.4 Manufacturing

The manufacturing industry refers to businesses that produce manufactured goods. Because it relies on the receipt of physical inputs and the delivery of manufactured outputs, the Manufacturing industry is highly freight-dependent. The freight system is critical to transport products such as wood products, metal products, stone, clay, glass, and concrete products, textiles, paper products, and more. Nevada's GOED touts that, because the state is located within a single day's drive to over 40 million consumers and five West Coast ports, its manufacturing industry has a competitive edge.[9]

Table 4-11 presents employment in the manufacturing industry. It makes up just over 4 percent of the state's employment and has employment centers in Clark, Washoe, and Storey Counties. Other than Clark County, the other four top counties for manufacturing employment are found in Western Nevada in the Reno and Carson City region.

Table 4-11. Manufacturing Employment

Employment	Percent of State Total	Top 5 Counties
60,079	4.2%	1. Clark 2. Washoe 3. Storey 4. Carson City 5. Lyon

Source: CPCS analysis of GOED data.

[8] https://goed.nv.gov/key-industries/information-technology/

[9] https://goed.nv.gov/key-industries/manufacturing-logistics/

Table 4-12 presents the four counties in Nevada with a location quotient above 1 in the manufacturing industry. Three of these four counties (Storey, Lyon, and Carson City) also appear in the top 5 counties for manufacturing employment. This indicates that these three counties are among the most important for manufacturing, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of manufactured goods in Nevada. Storey County is noteworthy for having a location quotient above 8, indicating that relative employment in the manufacturing industry in this county is eight times the national average.

Table 4-12. Manufacturing Location Quotients

Counties with LQ >1
Storey (8.06)
Lyon (1.82)
Douglas (1.23)
Carson City (1.01)

Source: CPCS analysis of GOED data.

Technology and Manufacturing in Northern Nevada

Of the 29 companies that relocated their corporate headquarters to Northern Nevada in 2020 and 2021, over 60% were in Technology and Manufacturing. These relocations, particularly impressive given the economic challenges of the COVID-19 pandemic, are driving significant job growth, income gains, and drops in unemployment. This indicates that Northern Nevada is highly competitive in the Technology and Manufacturing industry and is poised for continued growth overall.

Source: https://www.edawn.org/home-page-feature/northern-nevada-economy-fueled-by-growth-in-tech-and-manufacturing-59-companies-29-headquarters-and-5600-jobs-reach-unexpected-milestones-during-the-pandemic/

4.1.4.5 Logistics

The logistics industry refers to businesses that support distribution operations. Because it supports the efficient movement of goods in Nevada, the logistics industry is a freight-supporting industry. In some sense, then, the logistics industry is indirectly freight-dependent in that it derives its demand from the freight system. While the logistics industry is not a traditionally a freight-dependent industry, it does rely on the freight system to transport certain products such as precision instruments and electronics.

Table 4-13 presents employment in the logistics industry. It makes up 7 percent of the state's employment and has employment centers in Clark, Washoe, and Storey Counties. Thus, it is reasonable to suppose that much of the freight moving to and from Logistics-related industries in Nevada have their origins or destinations in these regions.

Table 4-13. Logistics Employment

Employment	Percent of State Total	Top 5 Counties
100,400	7.0%	1. Clark 2. Washoe 3. Storey 4. Elko 5. Lyon

Source: CPCS analysis of GOED data.

Table 4-14 presents the four counties in Nevada with a location quotient above 1 in the logistics industry. All four of these counties also appear in the top 5 counties for logistics employment. This indicates that these four counties are among the most important for logistics in the state, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of Logistics-related goods in Nevada.

Table 4-14. Logistics Location Quotients

Counties with LQ >1	
Storey (3.52)	Elko (1.09)
Washoe (1.41)	Lyon (1.03)

Source: CPCS analysis of GOED data.

4.1.4.6 Mining

The mining industry refers to businesses that produce raw metals and minerals. Because it relies on the delivery of these mined goods to market, the mining industry is highly freight-dependent. The freight system is critical to transport products such as primary metal and stone, clay, glass, and concrete products. Mining is a critical industry in Nevada. The GOED touts that, while Nevada is well-known for its gold, silver, and copper deposits, the state also mines lithium, iron, gypsum, limestone, sand, and gravel.[10]

Table 4-15 presents employment in the mining industry. It makes up just over 1 percent of the state's employment and has employment centers in Eureka, Elko, and Lander Counties. All five counties are found in the northern portion of the state. Thus, it is reasonable to suppose that much of the freight moving to and from mines in Nevada have their origins or destinations in this region of the state.

Table 4-15. Mining Employment

Employment	Percent of State Total	Top 5 Counties
15,024	1.1%	1. Eureka 2. Elko 3. Lander 4. Lyon 5. White Pine

Source: CPCS analysis of GOED data.

Table 4-16 presents the 13 counties in Nevada with a location quotient above 1 in the mining industry. (All but four counties in Nevada appear on this list.) Five of these counties (Eureka, Elko, Lander, Lyon, and White Pine) also appear in the top 5 counties for mining employment. This indicates that these five counties are among the most important for mining, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of mined goods in Nevada. Many of the

[10] https://goed.nv.gov/key-industries/mining/

counties in Table 4-16 are noteworthy for having extremely high location quotients. Eureka County, in particular, has a LQ above 269 and ranks first in the state for employment in the Mining industry despite having the second smallest county population in Nevada.

Table 4-16. Mining Location Quotients

Counties with LQ >1	
Eureka (269.22)	Elko (30.39)
Lander (164.07)	Nye (24.33)
Pershing (117.23)	Lyon (7.76)
White Pine (91.54)	Lincoln (4.64)
Humboldt (71.66)	Churchill (1.46)
Esmeralda (63.21)	Storey (1.01)
Mineral (34.31)	

Source: CPCS analysis of GOED data.

4.1.4.7 Natural Resource Technologies

The natural resource technologies industry refers to businesses that produce technology and equipment that support agriculture and the cultivation of other natural resources. While it is not the most freight-dependent industry, it does rely on the freight system to transport equipment such as machinery (e.g., farm equipment and woodworking machinery) and electronics.

Table 4-17 presents employment in the natural resource technology industry. It makes up over 5 percent of the state's employment and has employment centers in Clark, Washoe, and Storey Counties. Thus, it is reasonable to suppose that much of the freight moving to and from industries related to Natural Resource Technologies in Nevada have their origins or destinations in these counties.

Table 4-17. Natural Resource Technology Employment

Employment	Percent of State Total	Top 5 Counties
77,247	5.4%	1. Clark 2. Washoe 3. Storey 4. Nye 5. Douglas

Source: CPCS analysis of GOED data.

Table 4-18 presents the 10 counties in Nevada with a location quotient above 1 in the natural resource technologies industry. Two of these counties (Storey and Nye) also appear in the top 5 counties for employment. This indicates that these two counties are among the most important for the natural resource technologies industry, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of related freight in Nevada.

Table 4-18. Natural Resource Technologies Location Quotients

Counties with LQ >1	
Mineral (9.01)	Humboldt (1.74)
Pershing (2.64)	Esmeralda (1.56)
Storey (2.29)	Lyon (1.51)
Lincoln (2.06)	Clark (1.2)
Nye (1.78)	Churchill (1.1)

Source: CPCS analysis of GOED data.

4.1.4.8 Agriculture

The agriculture industry refers to businesses that produce crops or raise livestock. Because it relies on the receipt of physical inputs and the delivery of agricultural products, the agriculture industry is highly freight-dependent. Indeed, the freight system is critical to transport products such as poultry, grain products, animal feed, etc. Nevada's GOED notes that the state's agriculture industry primarily produces livestock. Nevada's ranches rank third nationally in average size. The state also produces dairy and crops including alfalfa hay and seed, potatoes, wheat, corn, and oats.[11]

Table 4-19 presents employment in the agriculture industry. It makes up just under 1 percent of the state's employment and has employment centers in Clark, Washoe, and Lyon Counties. Thus, it is reasonable to suppose that much of the freight moving to and from farms and ranches in Nevada have their origins or destinations in these counties.

Table 4-19. Agriculture Employment

Employment	Percent of State Total	Top 5 Counties
13,008	0.9%	1. Clark 2. Washoe 3. Lyon 4. Churchill 5. Douglas

Source: CPCS analysis of GOED data.

Table 4-20 presents the 11 counties in Nevada with a location quotient above 1 in the agriculture industry. Three of these counties (Lyon, Churchill, and Douglas) also appear in the top 5 counties for agriculture employment. This indicates that these three counties are among the most important for agriculture, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of agriculture products in Nevada. Esmeralda County is noteworthy for having a location quotient above 4, indicating that relative employment in the agriculture industry in this county is four times higher than the national average, despite having the smallest population of any county in Nevada.

[11] https://goed.nv.gov/key-industries/natural-resource-technologies/

Table 4-20. Agriculture Location Quotients

Counties with LQ >1	
Esmeralda (4.17)	Nye (1.53)
Lyon (3.01)	White Pine (1.41)
Pershing (2.89)	Eureka (1.37)
Churchill (2.75)	Lander (1.04)
Humboldt (2.44)	Douglas (1.01)
Lincoln (2.43)	

Source: CPCS analysis of GOED data.

4.1.4.9 Tourism and Gaming

The tourism and gaming industry refers to businesses including hospitality, food production, and casinos. The tourism and gaming industry is primarily a service industry and is thus arguably the least freight-dependent industry among the GOED's Key Industries. Nevertheless, the tourism and gaming still relies to some extent on the freight system to receive certain goods such as food products (e.g., food preparation, liquor, and coffee) and tobacco products.

Table 4-21 presents employment in the tourism and gaming industry. Unsurprisingly given Nevada's reputation as a tourism and gaming destination, the tourism and gaming industry makes up over 22 percent of the state's employment. Clark, Washoe, and Storey Counties see the largest employment in this sector. Thus, it is reasonable to suppose that much of the freight moving to tourism and gaming-related businesses in Nevada have their destinations in these counties.

Table 4-21. Tourism and Gaming Employment

Employment	Percent of State Total	Top 5 Counties
318,850	22.3%	1. Clark 2. Washoe 3. Douglas 4. Churchill 5. Carson City

Source: CPCS analysis of GOED data.

Table 4-22 presents the nine counties in Nevada with a location quotient above 1 in the tourism and gaming industry. Four of these counties (Clark, Washoe, Douglas, and Carson City) also appear in the top 5 counties for Tourism & Gaming employment. This indicates that these four counties are among the most important for tourism and gaming in the state, in both nominal and relative terms. The freight system in these counties is thus critical to the movement of goods that support Tourism & Gaming businesses.

Table 4-22. Tourism & Gaming Location Quotients

Counties with LQ >1
Clark (2.32)
Douglas (2.32)
Elko (2.1)
Washoe (1.46)
Nye (1.41)
Humboldt (1.18)
White Pine (1.05)
Carson City (1.04)
Lyon (1.01)

Source: CPCS analysis of GOED data.

4.1.5 Freight System Flows

The previous section examined each of the GOED's nine Key Industries. All of these industries are dependent in some capacity on the freight system, highlighting how critical efficient and resilient freight infrastructure is to the strength and competitiveness of Nevada's economy.

The manufacturing, mining, and agriculture industries make up Nevada's most freight-dependent industries. These three key Industries directly employ 88,111 individuals, which make 6.2 percent of the state's employment. They also indirectly bolster other facets of the economy, including the logistics and natural resource technologies industries. Diving deeper into the demands placed on Nevada's freight system by these freight-dependent industries is critical to understand how to improve infrastructure and strengthen Nevada's economy.

The Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF5) was used to analyze how the three freight-dependent Key Industries use the freight system in Nevada. This analysis will reveal the most important freight modes, trade flow types (domestic, imports, exports), and trading partners for Nevada's freight-dependent industries. This will provide insight into where infrastructure investments might have the greatest impacts on Nevada's economic strength.

Freight Analysis Framework

The Freight Analysis Framework (FAF5) offers a comprehensive picture of freight movements between states and major metropolitan areas by all modes of transportation. The FAF5 constitutes the best publicly available multimodal commodity flow data available in the US. Using the 2017 Commodity Flow Survey, the FAF5 was last updated in 2021, marking its fifth iteration (hence, the term FAF5). FAF5 data is critical to freight planning because it identifies the volume and value of goods moving on the freight system, which helps planners analyze and illustrate the relationship between the material economy and the freight transportation system.

4.1.5.1 Overview

Before we examine the manufacturing, mining, and agriculture industries in detail, we will present an overview of freight flows in the state overall.

Modal Split

Table 4-23 shows that truck is the dominant mode by tonnage in Nevada, followed by tonnage. Rail, air, multiple modes, and all others move less than 6 percent of the state's total freight tonnage. By value, truck still reigns supreme, but is followed by multiple modes and mail. The remaining modes move under 15 percent of freight by value.

This data can also provide general information about the average value of goods moving on each commodity. For example, the air mode moves 0.1 percent of freight by tonnage but 7.7 percent by value, indicating that this mode tends to move high value goods. On the other hand, the pipeline mode moves 32.4 percent of freight in Nevada by tonnage but just 6.2 percent by value, which suggests that pipelines are moving relatively less valuable commodities.

Table 4-23. Modal Split for all Commodities in Nevada

	Volume		Value	
Mode	Thousands of tons	Share	Millions of dollars	Share
Truck	91,408.4	62.4%	111,793.4	66.8%
Rail	4,380.2	3.0%	958.6	0.6%
Air	81.4	0.1%	12,856.2	7.7%
Multiple modes and mail	3,155.4	2.2%	30,802.5	18.4%
Pipeline	47,432.0	32.4%	10,446.8	6.2%
Other/Unknown	114.3	0.1%	459.2	0.3%
Total	**146,571.7**	**100%**	**167,316.7**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-24 shows that the vast majority of freight travelling through Nevada moves domestically, both by tonnage and by value. Nevada sees slightly more exports than imports by tonnage and value. However, commodities moving internationally through Nevada (imports and exports) tend to be of higher value.

Table 4-24. Flow Type for all Commodities in Nevada

	Volume		Value	
Mode	Thousands of Tons	Share	Millions of dollars	Share
Domestic	143,324	97.8%	142,211.8	85.0%
Import	1,549.1	1.1%	12,177.9	7.3%
Export	1,698.7	1.2%	12,926.9	7.7%
Total	**146,571.8**	**100%**	**167,316.6**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-25 reveals that Nevada's top trading partner by tonnage is Canada. The state's top trading partner by value is Eastern Asia. The data reveals that, for Nevada, freight traded with Canada is of lower value than freight traded with Eastern Asia or Europe.

Table 4-25. Top Trading Partners for all Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Canada (48.7%)	Eastern Asia (32.2%)
Eastern Asia (23.6%)	Europe (29.3%)
Europe (9.2%)	Canada (11.7%)
Mexico (7.2%)	Southwest and Central Asia (10.9%)
Southeast Asia and Oceania (6.9%)	Southeast Asia and Oceania (8.7%)
Southwest and Central Asia (2.2%)	Mexico (4.7%)
Rest of Americas (1.3%)	Rest of Americas (2.0%)
Africa (0.9%)	Africa (0.5%)

Source: CPCS analysis of FAF5 data.

4.1.5.2 Manufacturing

Manufacturing is a very large industry, so we have chosen to break it down by manufacturing commodity types included in FAF5 into four sub-industries, as shown in Table 4-26. In this section, we examine the commodity flows of each manufacturing sub-industry individually.

Table 4-26. Manufacturing Sub-Industries and Commodity Types

Sub-industry	Industrial Manufacturing	High-tech Manufacturing	Food Manufacturing	Miscellaneous Manufacturing
Commodities	20-Basic chemicals 22-Fertilizers 23-Chemical products 24-Plastics/rubber 31-Nonmetal mineral products 32-Base metals 33-Articles-base metal 36-Motorized vehicles 37-Transport equipment	21-Pharmaceuticals 34-Machinery 35-Electronics 38-Precision instruments	06-Milled grain products 07-Other food stuffs 08-Alcoholic beverages 09-Tobacco products	39-Furniture 40-Miscellaneous manufacturing products

Source: CPCS analysis of FAF5 data.

Industrial Manufacturing

Industrial manufacturing makes up about 18.6 percent of Nevada's freight movements by tonnage and 20.7 percent by value. This suggests that these commodities tend to be higher value than average.

Modal Split

Table 4-27 reveals that the majority of industrial manufacturing commodities by tonnage and value move by truck in Nevada. However, trucks tend to move commodities of lower value than the multiple modes and mail category.

Table 4-27. Modal Split for Industrial Manufacturing Commodities in Nevada

	Volume		Value	
Mode	**Thousands of tons**	**Share**	**Millions of dollars**	**Share**
Truck	25,081.2	92.3%	23,601.4	68.1%
Rail	1,084.6	4.0%	399.3	1.2%
Air	14.5	0.1%	3,319.0	9.6%
Multiple modes and mail	920.4	3.4%	7,248.1	20.9%
Pipeline	88.0	0.3%	4.0	0.0%
Other/Unknown	0.7	0.0%	71.6	0.2%
Total	**27,189.5**	**100%**	**34,643.4**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flows – Domestic and International

Table 4-28 reveals that the vast majority of industrial manufacturing commodities move domestically. However, commodities moving internationally through Nevada (imports and exports) tend to be of relatively higher value.

Table 4-28. Flow Type for Industrial Manufacturing Commodities in Nevada

	Volume		Value	
Mode	Thousands of Tons	Share	Millions of dollars	Share
Domestic	26,370.9	97.0%	31,684.5	91.5%
Import	609.2	2.2%	2,177.4	6.3%
Export	209.4	0.8%	781.5	2.3%
Total	**27,189.5**	**100%**	**34,643.4**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-29 shows that Nevada's top trading partner by both industrial manufacturing tonnage and value is Canada.

Table 4-29. Top Trading Partners for Industrial Manufacturing Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Canada (39.9%)	Canada (36.9%)
Eastern Asia (19.9%)	Eastern Asia (27.3%)
Southeast Asia and Oceania (13.3%)	Europe (17.1%)
Europe (11.0%)	Southeast Asia and Oceania (9.0%)
Mexico (9.3%)	Mexico (5.5%)
Southwest and Central Asia (2.5%)	Southwest and Central Asia (2.3%)
Africa (2.4%)	Rest of Americas (1.3%)
Rest of Americas (1.8%)	Africa (0.5%)

Source: CPCS analysis of FAF5 data.

High-Tech Manufacturing

High-tech manufacturing makes up about 1.5 percent of Nevada's freight movements by tonnage and 25.9 percent by value. This suggests that these commodities tend to be very high value.

Modal Split

Table 4-30 reveals that the majority of high-tech manufacturing commodities by tonnage and value move by truck in Nevada. However, trucks tend to move commodities of lower value than the multiple modes and mail category.

Table 4-30. Modal Split for High-Tech Manufacturing Commodities in Nevada

	Volume		Value	
Mode	Thousands of tons	Share	Millions of dollars	Share
Truck	1,939.7	88.7%	25,992.2	60.0%
Rail	8.1	0.4%	60.4	0.1%
Air	32.9	1.5%	4,079.9	9.4%
Multiple modes and mail	197.0	9.0%	13,047.2	30.1%
Pipeline	0.0	0.0%	0.0	0.0%
Other/Unknown	9.3	0.4%	135.6	0.3%
Total	**2,187.1**	**100%**	**43,315.3**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-31 shows that the majority of high-tech manufacturing commodities travelling through Nevada move domestically. However, commodities moving through Nevada and travelling internationally (imports and exports) tend to be higher value.

Table 4-31. Flow Type for High-Tech Manufacturing Commodities in Nevada

	Volume		Value	
Mode	Thousands of Tons	Share	Millions of dollars	Share
Domestic	1,926.4	88.1%	33,949.9	78.4%
Import	210.0	9.6%	6,327.3	14.6%
Export	50.7	2.3%	3,038.1	7.0%
Total	**2,187.1**	**100%**	**43,315.3**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-32 shows that Nevada's top trading partner for high-tech manufacturing commodities by both tonnage and value is Eastern Asia.

Table 4-32. Top Trading Partners for High-Tech Manufacturing Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Eastern Asia (56.3%)	Eastern Asia (56.9%)
Canada (13.4%)	Southeast Asia and Oceania (13.5%)
Southeast Asia and Oceania (12.7%)	Europe (10.5%)
Europe (8.5%)	Canada (9.2%)
Mexico (6.7%)	Mexico (5.5%)
Southwest and Central Asia (1.1%)	Rest of Americas (2.3%)
Rest of Americas (1.1%)	Southwest and Central Asia (1.9%)
Africa (0.2%)	Africa (0.2%)

Source: CPCS analysis of FAF5 data.

Food Manufacturing

Food manufacturing makes up about 4.8 percent of Nevada's freight movements by tonnage and 7.4 percent by value. This suggests that these commodities tend to be slightly higher value than average.

Modal Split

Table 4-33 shows that almost all food manufacturing commodities by tonnage and value move by truck in Nevada.

Table 4-33. Modal Split for Food Manufacturing Commodities in Nevada

	Volume		Value	
Mode	Thousands of tons	Share	Millions of dollars	Share
Truck	6,882.4	97.8%	11,838.9	95.0%
Rail	19.9	0.3%	18.3	0.1%
Air	2.3	0.0%	29.4	0.2%
Multiple modes and mail	128.6	1.8%	565.9	4.5%
Pipeline	0.0	0.0%	0.0	0.0%
Other/Unknown	5.6	0.1%	6.0	0.0%
Total	**7,038.8**	**100%**	**12,458.5**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-34 reveals that most of the food manufacturing commodities moving through Nevada travel domestically. However, commodities travelling through Nevada and moving internationally (imports and exports) tend to be slightly higher value.

Table 4-34. Flow Type for Food Manufacturing Commodities in Nevada

	Volume		Value	
Mode	Thousands of Tons	Share	Millions of dollars	Share
Domestic	6,777.4	96.3%	11,763.3	94.4%
Import	158.0	2.2%	418.2	3.4%
Export	103.2	1.5%	277.1	2.2%
Total	**7,038.6**	**100%**	**12,458.6**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-35 shows that Nevada's top trading partner for food manufacturing commodities by both tonnage and value is Mexico.

Table 4-35. Top Trading Partners for Food Manufacturing Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Mexico (33.2%)	Mexico (31.0%)
Canada (24.6%)	Eastern Asia (22.2%)
Eastern Asia (11.8%)	Canada (15.3%)
Southeast Asia and Oceania (11.7%)	Europe (14.7%)
Europe (11.2%)	Southeast Asia and Oceania (9.9%)
Southwest and Central Asia (4.1%)	Southwest and Central Asia (3.9%)
Rest of Americas (3.0%)	Rest of Americas (2.4%)
Africa (0.4%)	Africa (0.6%)

Source: CPCS analysis of FAF5 data.

Miscellaneous Manufacturing

Miscellaneous manufacturing makes up about 1.5 percent of Nevada's freight movements by tonnage and 14.6 percent by value. This suggests that these commodities tend to be of high value.

Modal Split

Table 4-36 reveals that most of the miscellaneous manufacturing commodities moving through Nevada by tonnage and value move by truck. However, trucks tend to move commodities of lower value than the air and multiple modes and mail categories.

Table 4-36. Modal Split for Miscellaneous Manufacturing Commodities in Nevada

Mode	Volume		Value	
	Thousands of tons	Share	Millions of dollars	Share
Truck	2,076.6	93.3%	15,723.3	64.5%
Rail	3.7	0.2%	21.7	0.1%
Air	7.7	0.3%	5,020.4	20.6%
Multiple modes and mail	136.6	6.1%	3,598.8	14.8%
Pipeline	0.0	0.0%	0.0	0.0%
Other/Unknown	0.8	0.0%	16.6	0.1%
Total	**2,225.4**	**100%**	**24,380.8**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-37 shows that the majority of miscellaneous manufacturing commodities travelling through Nevada move domestically. However, miscellaneous manufacturing goods travelling through Nevada and to an international location (exports) make up nearly one-third of movements by value. Indeed, miscellaneous commodities moving international through Nevada (imports and exports) tend to be of higher value.

Table 4-37. Trade Flow Type for Miscellaneous Manufacturing Commodities in Nevada

Mode	Volume		Value	
	Thousands of Tons	Share	Millions of dollars	Share
Domestic	2,053.3	92.3%	14,509.9	59.5%
Import	120.5	5.4%	1,928.5	7.9%
Export	51.7	2.3%	7,942.5	32.6%
Total	**2,225.5**	**100%**	**24,380.9**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-38 shows that Nevada's top trading partner for miscellaneous manufacturing commodities is Eastern Asia by tonnage and Europe by value.

Table 4-38. Top Trading Partners for Miscellaneous Manufacturing Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Eastern Asia (50.4%)	Europe (55.6%)
Canada (23.8%)	Southwest and Central Asia (22.4%)
Mexico (8.4%)	Eastern Asia (10.2%)
Southeast Asia and Oceania (7.7%)	Canada (5.0%)
Europe (6.3%)	Southeast Asia and Oceania (2.6%)
Rest of Americas (1.6%)	Rest of Americas (1.8%)
Southwest and Central Asia (0.9%)	Mexico (1.7%)
Africa (0.9%)	Africa (0.8%)

Source: CPCS analysis of FAF5 data.

4.1.5.3 Mining

In this section, we examine the commodity flows for the mining industry in Nevada. Table 4-39 shows the mining commodity types included in FAF5 that make up this analysis.

Table 4-39. Mining Commodity Types

Mining Commodities
10-Building stone
11-Natural sands
12-Gravel
13-Nonmetallic minerals
14-Metallic ores

Source: CPCS analysis of FAF5 data.

Mining makes up about 21.8 percent of Nevada's freight movements by tonnage and 2.1 percent by value. This suggests that, on average, these commodities tend to be lower value.

Modal Split

Table 4-40 shows that most of the mining commodities travelling through Nevada by both tonnage and value move by truck.

Table 4-40. Modal Split for Mining Commodities in Nevada

	Volume		Value	
Mode	Thousands of tons	Share	Millions of dollars	Share
Truck	30,229.6	94.5%	3,074.6	86.8%
Rail	1,285.0	4.0%	222.8	6.3%
Air	0.0	0.0%	0.1	0.0%
Multiple modes and mail	479.2	1.5%	245.3	6.9%
Pipeline	0.0	0.0%	0.0	0.0%
Other/Unknown	1.5	0.0%	0.3	0.0%
Total	**31,995.3**	**100%**	**3,543.1**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-41 reveals that the vast majority of mining commodities travelling through Nevada move domestically. However, commodities travelling through Nevada and moving internationally (imports and exports) tend to be of higher value.

Table 4-41. Flow Type for Mining Commodities in Nevada

Mode	Volume		Value	
	Thousands of Tons	Share	Millions of dollars	Share
Domestic	30,847.9	96.4%	3,112.8	87.9%
Import	104.2	0.3%	25.1	0.7%
Export	1,043.4	3.3%	405.2	11.4%
Total	**31,995.5**	**100%**	**3,543.1**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-42 shows that Nevada's top trading partner for mining commodities is Canada by tonnage and Eastern Asia by value.

Table 4-42. Top Trading Partners for Mining Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Canada (75.7%)	Eastern Asia (59.8%)
Eastern Asia (20.6%)	Canada (32.2%)
Europe (1.9%)	Europe (2.9%)
Rest of Americas (0.6%)	Rest of Americas (2.7%)
Africa (0.4%)	Mexico (1.3%)
Mexico (0.3%)	Africa (0.4%)
Southeast Asia and Oceania (0.2%)	Southeast Asia and Oceania (0.4%)
Southwest and Central Asia (0.2%)	Southwest and Central Asia (0.2%)

Source: CPCS analysis of FAF5 data.

4.1.5.4 Agriculture

In this section, we examine the commodity flows for the agriculture industry in Nevada. Table 4-43 shows the agriculture commodity types included in FAF5 that make up this analysis.

Table 4-43. Agriculture Commodity Types

Agriculture Commodities
01-Live animals/fish
02-Cereal grains
03-Other agricultural products
04-Animal feed
05-Meat/seafood

Source: CPCS analysis of FAF5 data.

Agriculture commodities make up about 2.7 percent of Nevada's freight movements by tonnage and 3.9 percent by value.

Modal Split

Table 4-44 reveals that most of the agriculture commodities travelling through Nevada by tonnage and value move by truck.

Table 4-44. Modal Split for Agriculture Commodities in Nevada

	Volume		Value	
Mode	Thousands of tons	Share	Millions of dollars	Share
Truck	3,911.3	97.4%	6,225.4	96.6%
Rail	9.3	0.2%	2.4	0.0%
Air	2.6	0.1%	52.4	0.8%
Multiple modes and mail	77.1	1.9%	144.0	2.2%
Pipeline	0.0	0.0%	0.0	0.0%
Other/Unknown	16.0	0.4%	17.5	0.3%
Total	**4,016.3**	**100%**	**6,441.7**	**100%**

Source: CPCS analysis of FAF5 data. For international flows, only modes for domestic segments are examined here.

Trade Flow Type

Table 4-45 shows that the vast majority of agriculture commodities travelling through Nevada move domestically.

Table 4-45. Flow Type for Agriculture Commodities in Nevada

	Volume		Value	
Mode	Thousands of Tons	Share	Millions of dollars	Share
Domestic	3,922.4	97.7%	6,322.1	98.1%
Import	24.9	0.6%	57.8	0.9%
Export	69.0	1.7%	61.7	1.0%
Total	**4,016.3**	**100%**	**6,441.6**	**100%**

Source: CPCS analysis of FAF5 data.

Trading Partners

Table 4-46 reveals that Nevada's top trading partner for agriculture commodities is Canada by both tonnage and value.

Table 4-46. Top Trading Partners for Agriculture Commodities in Nevada

Top Trading Partners by Volume	Top Trading Partners by Value
Canada (39.4%)	Canada (40.0%)
Eastern Asia (37.8%)	Mexico (19.9%)
Mexico (12.2%)	Eastern Asia (15.4%)
Southwest and Central Asia (5.0%)	Southeast Asia and Oceania (8.9%)
Southeast Asia and Oceania (2.2%)	Europe (7.5%)
Europe (2.1%)	Southwest and Central Asia (5.4%)
Rest of Americas (1.0%)	Africa (1.6%)
Africa (0.3%)	Rest of Americas (1.3%)

Source: CPCS analysis of FAF5 data.

4.1.6 Conclusion

This analysis demonstrates that for Nevada's key freight-dependent industries, freight is generally travelling through the state by truck and tends to have domestic origins and destinations. This highlights the need to maintain an efficient and resilient road system in Nevada to support the state's economy.

However, modes other than truck are also important in Nevada. Rail moves a significant share of freight and the air and multiple modes and mail categories support higher value goods. Thus, it is also important to invest in the state's rail network, intermodal facilities, and air cargo facilities.

While domestic movements make up the majority of the freight flows travelling through Nevada, the state does still have significant trade relationships with international regions, including Canada, Eastern Asia, Mexico, and Europe.

Moreover, this FAF analysis only considers freight movements with origins or destinations in Nevada and does not consider through movements. It is important to remember that Nevada also plays a critical role in supporting this pass-through travel, which benefits the national economy.

4.2 Safety

4.2.1 Improve Safety, Security, and Resiliency

Ensuring the safe movement of people and goods throughout the state is a top priority for NDOT. Even minor traffic incidents can have far-reaching and significant economic impacts beyond property damage or the medical costs of those involved. Additional impacts that are not always easily quantifiable include emergency response and clean-up costs, travel time delays, damage to infrastructure, and lost productivity.

Given the unique and enormous consequences of traffic fatalities, NDOT launched in 2010 the statewide "Zero Fatalities, Drive Safe Nevada" initiative, which was consistent with the national Toward Zero Deaths strategy sponsored by the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the American Association of State Highway and Transportation Officials (AASHTO), and the Governors Highway Safety Association (GHSA). The "Zero Fatalities" initiative addresses highway safety through the development of engineering solutions where appropriate, increased traffic enforcement, and a robust multimedia public education and outreach campaign to raise driver awareness of the behaviors.

In the 2010 Nevada Strategic Highway Safety Plan (SHSP), NDOT, in coordination with the Nevada Department of Public Safety, set an interim goal to reduce fatalities by 2030 to half of the 2018 fatalities. Continuing the legacy of the previous SHSP, the 2021-2025 SHSP adopts four guiding principles, including incorporate equity, prioritize safe speed, double down on what works, and accelerate advanced technology to provide a roadmap to eliminate preventable roadway tragedies.[12]

This section uses SHSP's data-driven and evidence-based approach to investigate truck-involved crashes and identify trends.

[12] 2021-2025 Nevada Strategic Highway Safety Plan.
https://www.dot.nv.gov/home/showpublisheddocument/19409/637540797684530000

4.2.1.1 Primary Measure - Truck-Involved Motor Vehicle Crashes

The total number of truck crashes trended downwards in 2018 after fluctuating between 2014 and 2017.

10,396	95	19	
Truck Crashes (2014-2018)	Fatal Truck Crashes (2014-2018)	Average Fatal Truck Crashes (2014-2018)	Fail to meet the performance target (<10 Average Annual Fatality)

Method/Data Source

Information related to motor vehicle crashes originated from NDOT's crash data. The data detailed records of statewide crashes over a rolling time period. This information includes locations, timing, vehicle types, weather, situational conditions, and many factors. Truck crashes are defined as crashes that involved at least one truck.

Analysis

Roadway safety matters to both truck drivers hauling freight and to other drives who use the same roadways to travel. There were a total of 95 fatalities related to motor vehicle crashes involving at least one truck between 2014 and 2018. As shown in Table 4-47, the overall number of truck-involved motor vehicle crashes increased from 2014 and 2017 before a slight decrease between 2017 and 2018. During the period of five years between 2014 and 2018, 27.2 percent of truck crashes caused casualties, 3.3 percent of which resulted in fatalities. Figure 4-1 describes the trend of fatalities between 2009 and 2018. After a steady increase since 2013, the number of fatalities decreased by 51.7 percent between 2017 and 2018.

Table 4-47. Truck-Involved Motor Vehicle Crashes by Severity

Year	Fatal Crash	Injury Crash	Property Damage Only	Annual Total
2014	13	410	1,084	1507
2015	21	456	1,226	1703
2016	18	612	1,580	2210
2017	29	660	1,857	2546
2018	14	593	1,823	2430
Total by Severity	95	2,731	7,570	10,396

Source: NDOT Vehicle Crash Data 2014-2018

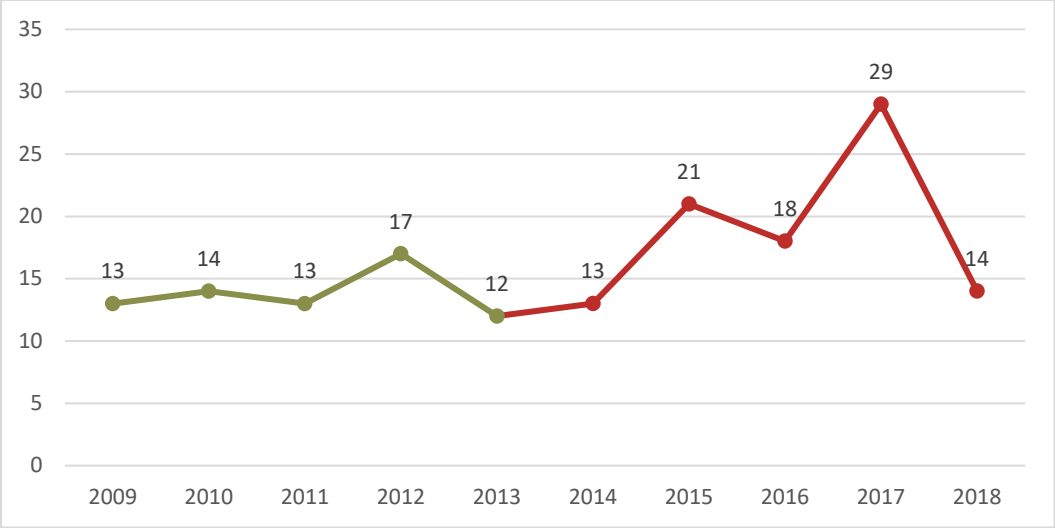


Figure 4-1. Truck-Involved Motor Vehicle Crash Fatalities

Source: NDOT Vehicle Crash Data 2014-2018

Table 4-48 demonstrates the top ten roadways with the highest number of truck-involved fatalities between 2014 and 2018. US-95 Northbound and US-93 Northbound have the most fatalities caused by truck-involved motor vehicle crashes. Two major interstates, I-15 and I-80, also have multiple fatalities in both directions. As shown in Table 4-49, the majority of the fatalities occurred in the Las Vegas Metropolitan Area in Clark County.

Comparing the locations of truck crashes between 2009-2013 and 2014-2018, eight counties experienced increase in the number of fatal truck crashes (Table 4-49). The fatal truck crash counts only decreased in Elko and Lyon Counties by 30 percent and 50 percent, respectively. The only county that did not have any fatal crashes involving trucks was Storey County, which is the smallest county in Nevada and has no interstates and only one State Route, SR 439, traversing through it.

Table 4-48. Top 10 Roadways with the Highest Truck Crash Fatalities (2014-2018)

Primary Road	Fatalities
US-95 Northbound	11
US-93 Northbound	11
I-15 Southbound	7
I-80 Westbound	7
I-80 Eastbound	6
I-15 Northbound	4
US-6	3
US-50	3
SR318	3
SR612	2
Other Routes	38
Total	**95**

Source: NDOT Vehicle Crash Data 2014-2018

Table 4-49. Truck Crash Fatalities by County (2009-2013 vs. 2014-2018)

County	2009-2013	2014-2018	Trend
Clark	35	47	
Elko	10	7	
Churchill	1	6	
Washoe	2	6	
Esmeralda	1	4	
Humboldt	4	4	
Nye	4	4	
Douglas	1	3	
White Pine	0	3	
Eureka	2	2	
Lander	1	2	
Lincoln	2	2	
Lyon	4	2	
Mineral	2	2	
Pershing	0	1	
Total	**69**	**95**	

Legend:

Data showing an increasing trend

Data showing a flat trend line

Data showing a negative trend

Getting better

Stable

Getting worse

Note: No fatal truck crashes occurred in Carson City or in Storey County during this reporting period.

The dominant type of fatal truck crashes during 2014-2018 was angle crashes, leading to nearly 30 percent of the total truck crash fatalities, followed by non-collision crashes at over 26 percent. Figure 4-2 provides a breakdown of the fatalities per crash type. Weather does not appear to be a significant contributing factor as the vast majority (95.9 percent) of the truck-involved motor vehicle crash fatalities analyzed occurred during clear or cloudy conditions. Figure 4-3 shows the locations of truck-involved fatal crashes statewide while Figure 4-4 and Figure 4-5 show the locations in the Las Vegas and Reno metropolitan areas.

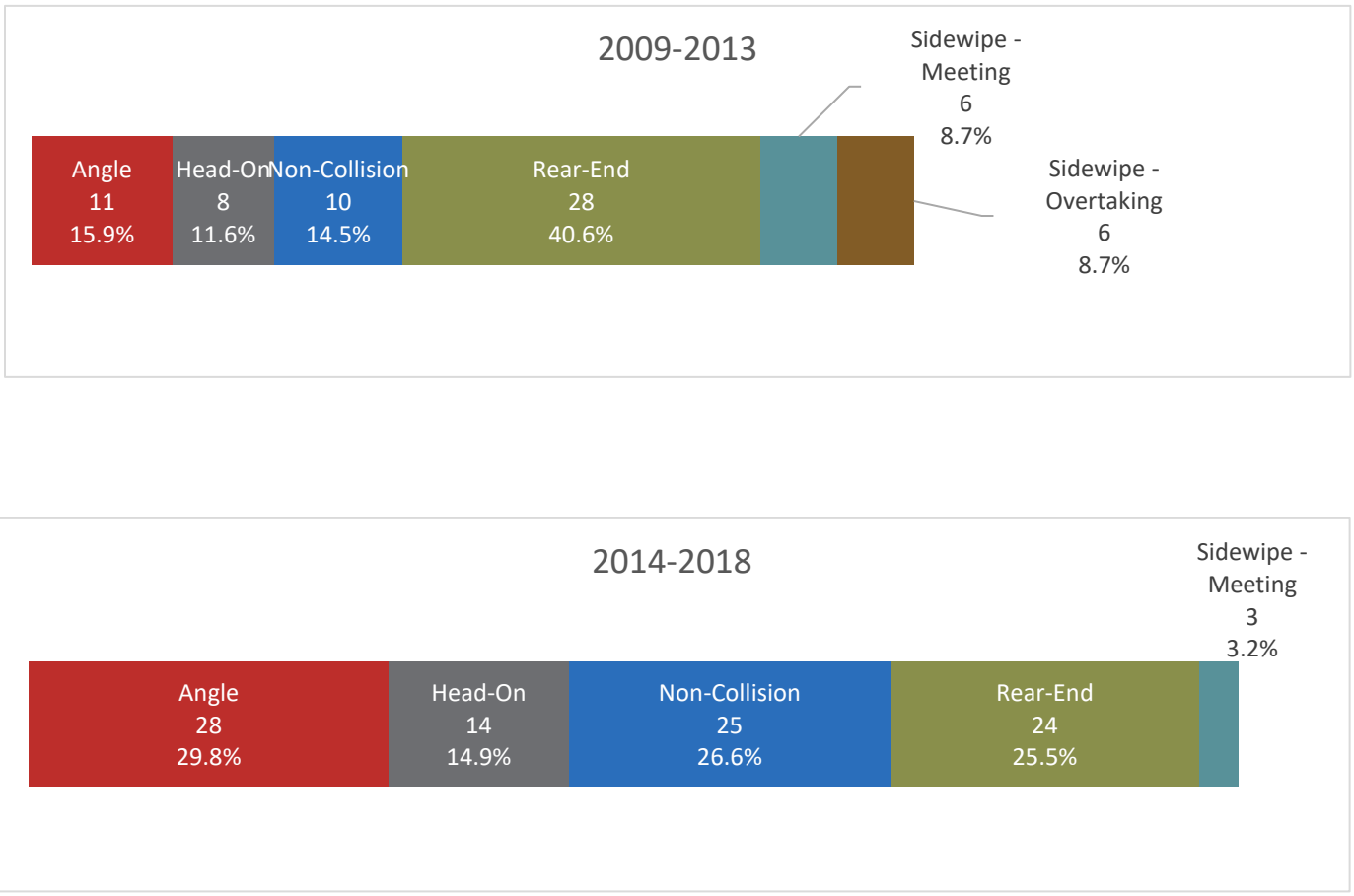


Figure 4-2. Truck Crash Fatalities by Crash Type (2009-2013 vs. 2014-2018)

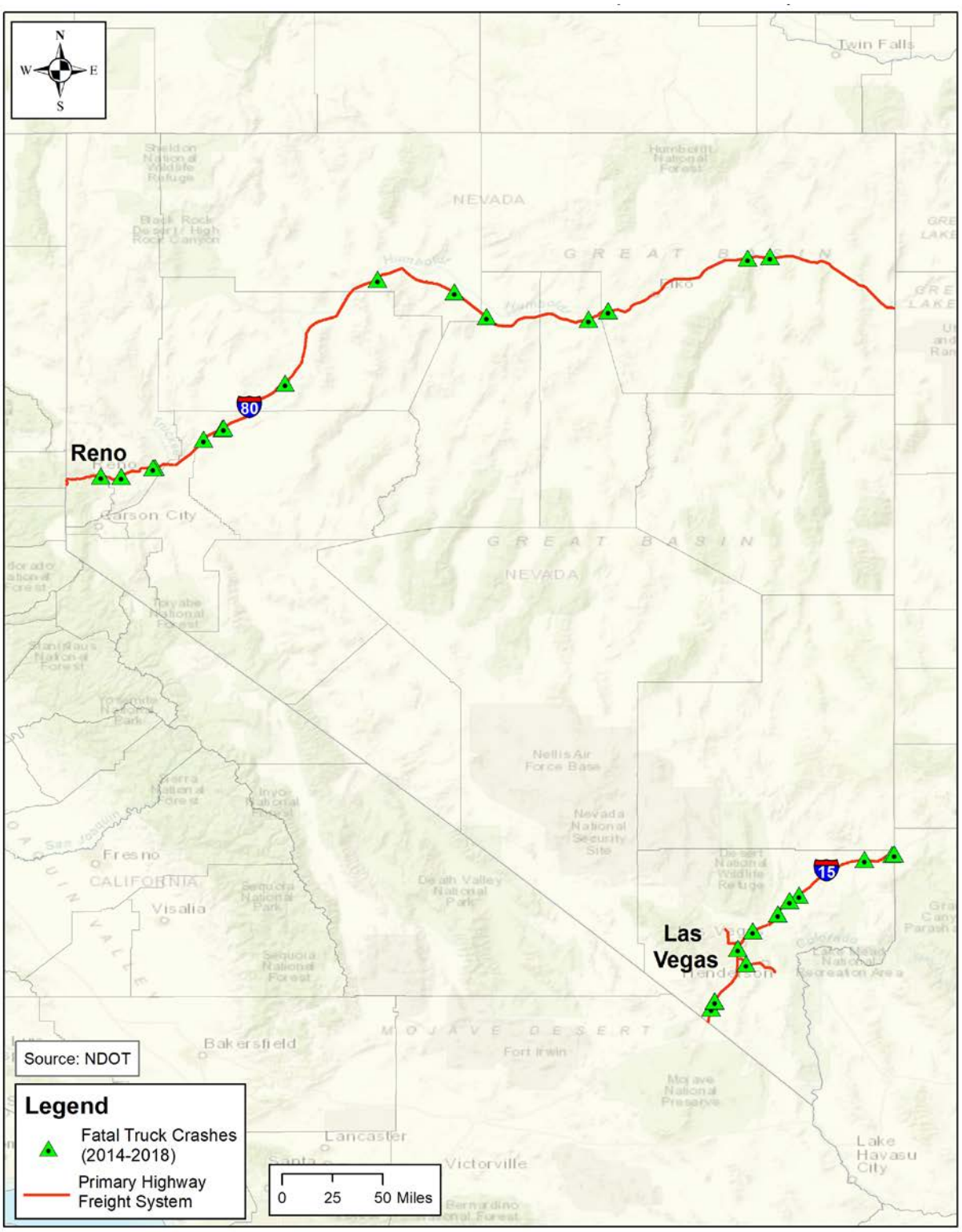


Figure 4-3. Truck-Involved Fatal Crash Locations, Statewide (2014-2018)

Figure 4-4. Truck-Involved Fatal Crash Locations, Las Vegas Metropolitan Area (2014-2018)

Figure 4-5. Truck-Involved Fatal Crash Locations, Reno-Sparks-Carson City (2014-2018)

4.2.2 Secondary Measure - Truck-Involved Railroad Crossing Fatalities

Between 2011 and 2021, five out of 22 railroad crossing crashes involved trucks, one of which was fatal.

22	5	1	
Railroad Crossing Crashes (2011-2021)	Truck-Involved Railroad Crossing Crashes (2011-2021)	Fatal Truck-Involved Railroad Crossing Crashes (2011-2021)	Fail to meet the performance target (Eliminate Truck Fatalities at Railroad Crossings)

Eliminating railroad crossing fatalities, particularly those involving a truck, is an important step in ensuring the safe movement of people and goods throughout the state. This section overviews the safety at highway-rail crossing by investigating the truck-involved railroad crossing crashes in Nevada.

4.2.2.1 Method/Data Source

The FRA's Office of Safety Analysis maintains a database that tracks incidents at railroad crossings.[13]

The number of truck-involved rail crossing crashes decreased slightly, while the fatalities caused by those crashes increased between 2011 and 2021.

According to data obtained from the Federal Railroad Administration (FRA), between 2011 and 2021, there were 22 at-grade crossing crashes in Nevada, five of which involved trucks (22.7 percent). One fatal truck-involved railroad crossing accident occurred between 2011 and 2021, resulting in six fatalities.

As shown in Table 4-50, while the number of at-grade rail crossing crashes and truck-involved crossing crashes are lower between 2011-2021 than 2000-2010, the number of fatalities increased. Figure 4-6 illustrates that the majority of the at-grade crossing incidents happened in Washoe and Clark Counties.

Table 4-50. Highway-Rail Grade Crashes (2000-2010 vs. 2011-2021)

	2000-2010	2011-2021	Trend
Total at-grade rail crossing crashes	30	22	↓
Total truck-involved at-grade rail crossing crashes	6	5	↓
Total at-grade rail crossing fatalities	3	9	↑
Truck-involved at-grade rail crossing fatalities	0	6	↑

Source: FRA Highway-Rail Crossing Crashes

Legend:

Data showing an increasing trend	Data showing a flat trend line	Data showing a negative trend
Getting better	Stable	Getting worse

[13] Highway Rail Accidents (6180.57). Accident Data as Reported by Railroads. https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/on_the_fly_download.aspx

Figure 4-6. At-Grade Railroad Crossing Fatality Locations, Statewide (2011-2021)

4.3 State of Good Repair

As Nevada continues to grow and diversify its economy, the state's freight transportation infrastructure will continue to become increasingly vital to the state's economic future.

NDOT maintains over 5,000 centerline miles of roadway and 1,100 bridges. While state-maintained roadways only account for 20 percent of Nevada's total roadway network they provide vital inter- and intrastate connectivity and carry over half of automobile traffic and 82 percent of heavy truck traffic within the state.

In addition to the state's roadway network, Nevada's freight infrastructure network includes airports; 1,085 miles of railroad mainline track; 309 miles of short and branch line track; two freight intermodal facilities; three classification yards and numerous industrial lead facilities. While these additional freight network assets are owned, operated, and maintained by other public and private entities, NDOT works closely with each to ensure there is adequate connectivity between the various modes to effectively serve the freight needs of Nevada businesses.

A safe, efficient, and reliable roadway network is essential to Nevada's continued economic vitality and contributes to the overall quality-of-life of the state's 3 million residents.

Preserving the state's existing roadway network is key to maintaining intermodal connectivity necessary for the efficient functioning of the state's freight network as a whole and ensuring Nevada has ready access to statewide, national, and global markets.

NDOT's established pavement condition goals target resources to the most heavily utilized facilities.

Table 4-51 below show the current pavement and bridge performance targets by facility type, as established in NDOT's 2021 Performance Management Report.

Table 4-51. Pavement and Bridge Performance Targets by Facility Type

State Highway Pavement Management Standards Overview	
Performance Target by Facility Type	**2021 Status**
Category 1 (controlled access roads): 95%	96.4%
Category 2 (ADT above 10,000): 90%	88.3%
Category 3 (ADT between 1,600 and 10,000): 85%	93.0%
Category 4 (ADT between 400 and 1,600): 75%	72.1%
Category 5 (ADT less under 400): 50%	45.0%
Maintain State Bridges - Targets to maintain in good / poor condition by facility type	**2021 Status**
Bridges on NHS in good condition: 5% or greater	46.2%
Bridges on NHS in poor condition: 7% or less	0.9%
Bridges on non-NHS in good condition: 35% or greater	48.2%
Bridges on non-NHS in poor condition: 7% or less	2.0%

Source: 2021 Performance Management Report, NDOT

NDOT employs an array of maintenance and rehabilitation repair methods to improve the condition of pavements while in fair or better condition to minimize the need and frequency of more costly and disruptive major roadway pavement section reconstruction. Maintenance repair methods employed include chip seals, filling potholes, and patching. When pavement conditions warrant intervention

beyond minor spot maintenance repairs, rehabilitation repair methods such as asphalt overlays and recycling methods are employed to restore pavements to acceptable standards and prolong the useful life of the roadway. Proactive maintenance and rehabilitation of roadways results in significant cost savings compared to major reconstruction of very poor or failed pavement sections. Major reconstruction can cost as much as six times more than timely, proactive pavement rehabilitation repairs. Additionally, proactive maintenance and rehabilitation repairs are typically less disruptive to traffic, often requiring fewer lane closures and detours and taking less time to construct.

With the exception of bridges located on federal lands, NDOT is responsible for inspecting and providing condition reports for all of the public bridges located in Nevada. National Bridge Inventory (NBI) data, including sufficiency and load ratings, together with other factors, allow NDOT to identify and prioritize preservation work to maximize bridge performance, minimize costs, and gauge the overall effectiveness of the state's efforts in maintaining the condition of its bridges.

Research, development and implementation of innovative transportation technologies is central to NDOT's ability to improve the state's transportation system for all users and is key to realizing its vision for leading the nation in delivering transportation solutions and improving Nevada's quality of life. NDOT's managing directors, division chiefs, and senior technologists are committed to staying informed on emerging trends that may affect the operational demands on the state's roadway network and continuously research new and evolving technologies to determine how they might be adapted and implemented to meet the unique needs of Nevada's transportation system.

4.4 Truck Travel Time Reliability

Improving the reliability of freight transportation on the Interstate Highway System is a required performance measure by FHWA. The Truck Travel Time Reliability (TTTR) Index is measures travel time reliability on the Interstate Highway System.

4.4.1 Truck Travel Time Reliability Index (TTTR)

1.28	1.27	
2019 Truck Travel Time Reliability	**2021 Truck Travel Time Reliability**	**Fail to meet the performance target (1.26 by 2021)**

TTTR measures the severity of unexpected delay. According to FHWA, the formal definition of TTTR is "the consistency or dependability in travel times, as measured from day-to-day and/or across different

Objective: Provide an efficient and reliable multimodal freight transportation system for shippers and receivers across the State.

Goal:

1. Reduce the number of locations where the average truck speed is below 40 mph.
2. Meet the NDOT TTTR Target (1.26)

Measure:

1. Truck Travel Time Reliability (TTTR)
2. Truck speeds on I-15, 1-80, US 395, US 93, US 95, I-215/CC-215

Target: TTTR <=1.26 by 2021

Current Condition: TTTR = 1.27 (2021)

Analysis:

In terms of travel speeds, except for I-15 and US-93, the other major truck corridors all experienced decrease in end-to-end average travel times between July 2017 and July 2021.

The TTTR decreased slightly (0.01) between 2019 and 2021. However, the 2021 TTTR doesn't meet the target of 1.26.

times of the day."[14] For the purpose of updating the NSFP, the TTTR is calculated by using the truck speed during the five time periods of the day and the formula shown in Equation 1:

1. Morning peak (6-10 AM);
2. Mid-day (10 AM – 4 PM);
3. Afternoon peak (4 PM – 8 PM);
4. Weekends (6 AM – 8 PM);
5. Overnights for all days (8 PM – 6 AM)

$$(Eq.\,1)\ \text{Travel Time Reliability Ratio} = \frac{\text{95th Percentile Travel Time}}{\text{50th Percentile Travel Time}}$$

The maximum TTTR of these five periods is reported as the final TTTR for each road segment.

The truck speeds on major truck routes in Nevada were from the National Performance Management Research Data Set (NPMRDS).

The TTTR on Nevada's Interstate system was 1.27 in 2021, decreasing by 0.01 since 2019. However, the 2021 TTTR is 0.01 higher than the 1.26 target set by NDOT.

4.4.2 Choke Points on Major Truck Routes

Travel time data collected from vehicle probes on the National Highway System is distributed by the Federal Highway Administration (FHWA) to states and Metropolitan Planning Organizations (MPOs). This information can be used to track travel time and travel speeds between select segments.

Travel time and travel speeds on major truck routes in Nevada were calculated using the NPMRDS. FHWA acquired a national data set of average travel times for use in performance measurement and has made it available to state departments of transportation and metropolitan planning organizations.

Travel speeds during afternoon peak periods (4:00 – 6:00 pm) on five key corridors – I-80, US-395, I-15, 215 Beltway, US-93, and US-95 - are listed in Table 4-52. Except for US-93, the other major truck corridors all experienced increased average travel speeds between July 2017 and July 2021.

[14] Travel Time Reliability: Making it There on Time, All the Time. FHWA. https://ops.fhwa.dot.gov/publications/tt_reliability/ttr_report.htm

Table 4-52. Average Travel Speeds on Major Truck Corridors

Corridor (Date)	Direction	Travel Time (Miles per Hour)	% Change
I-80 (July 2017)	Eastbound	63.4	4.0%
I-80 (July 2021)		65.9	
I-80 (July 2017)	Westbound	58.7	5.2%
I-80 (July 2021)		55.6	
US 395 (July 2017)	Eastbound	52.2	0.6%
US 395 (July 2021)		52.5	
US 395 (July 2017)	Westbound	55.1	4.3%
US 395 (July 2021)		57.4	
I-15 (July 2017)	Northbound	58.0	3.0%
I-15 (July 2021)		59.8	
I-15 (July 2017)	Southbound	57.5	3.8%
I-15 (July 2021)		59.7	
215 Beltway (July 2017)	Eastbound	54.5	9.3%
215 Beltway (July 2021)		59.5	
215 Beltway (July 2017)	Westbound	52.9	6.4%
215 Beltway (July 2021)		56.3	
US-93 (July 2017)*	Northbound	NA	NA
US-93 (July 2021)		53.5	
US-93 (July 2017)*	Southbound	NA	NA
US-93 (July 2021)		55.8	
US-95 (July 2017)	Northbound	54.3	6.4%
US-95 (July 2021)		57.8	
US-95 (July 2017)	Southbound	54.0	4.9%
US-95 (July 2021)		56.7	

Source: NPMRDS, 2017, 2021

Note: The 2017 US-93 data is incomplete.

Figure 4-7 through Figure 4-9 show the locations where the average truck speed, during the afternoon peak period in July 2021, dropped below 40 miles per hour. These graphs help to identify the chokepoints on major truck corridors. As shown in the figures, the majority of the chokepoints occur in the Reno-Sparks-Carson City region and the Las Vegas Metropolitan Area. Some other chokepoints are on I-80 in Fernley, Winnemucca, Primeaux, Elko, Wells, and Jackpot, US-95 in Hawthorne, Tonopah, and McDermitt, and US-93 in Crystal Springs, Caliente, and Beaverdam. Compared to the chokepoints identified by the previous freight plan, the locations of the chokepoints remain mostly the same, with a few more bottlenecks identified close to the borders with Oregon, Idaho, California, and Arizona.

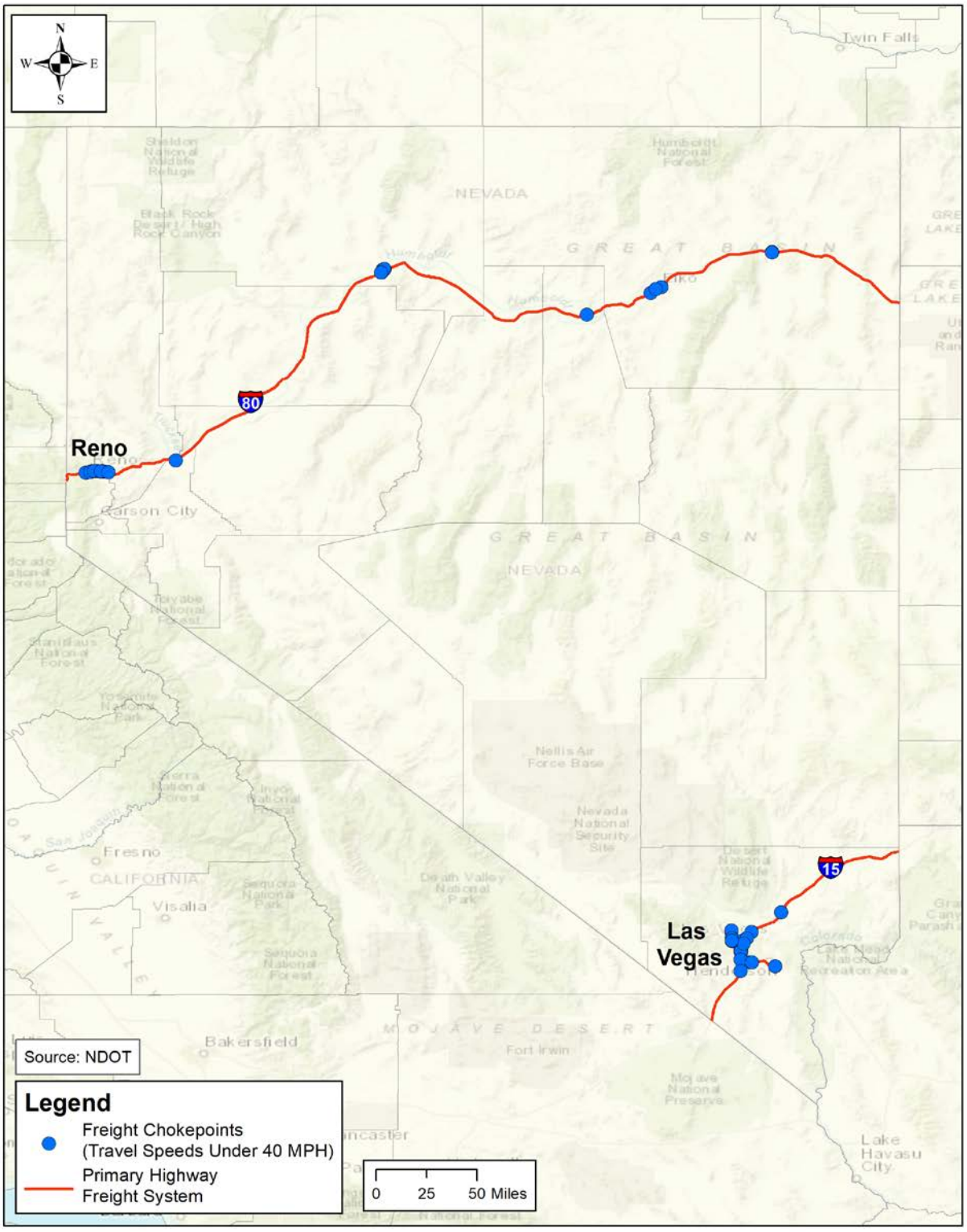


Figure 4-7. Average Truck Speeds below 40 MPH: Statewide

Figure 4-8. Average Truck Speeds below 40 MPH: Reno-Sparks-Carson City CSA

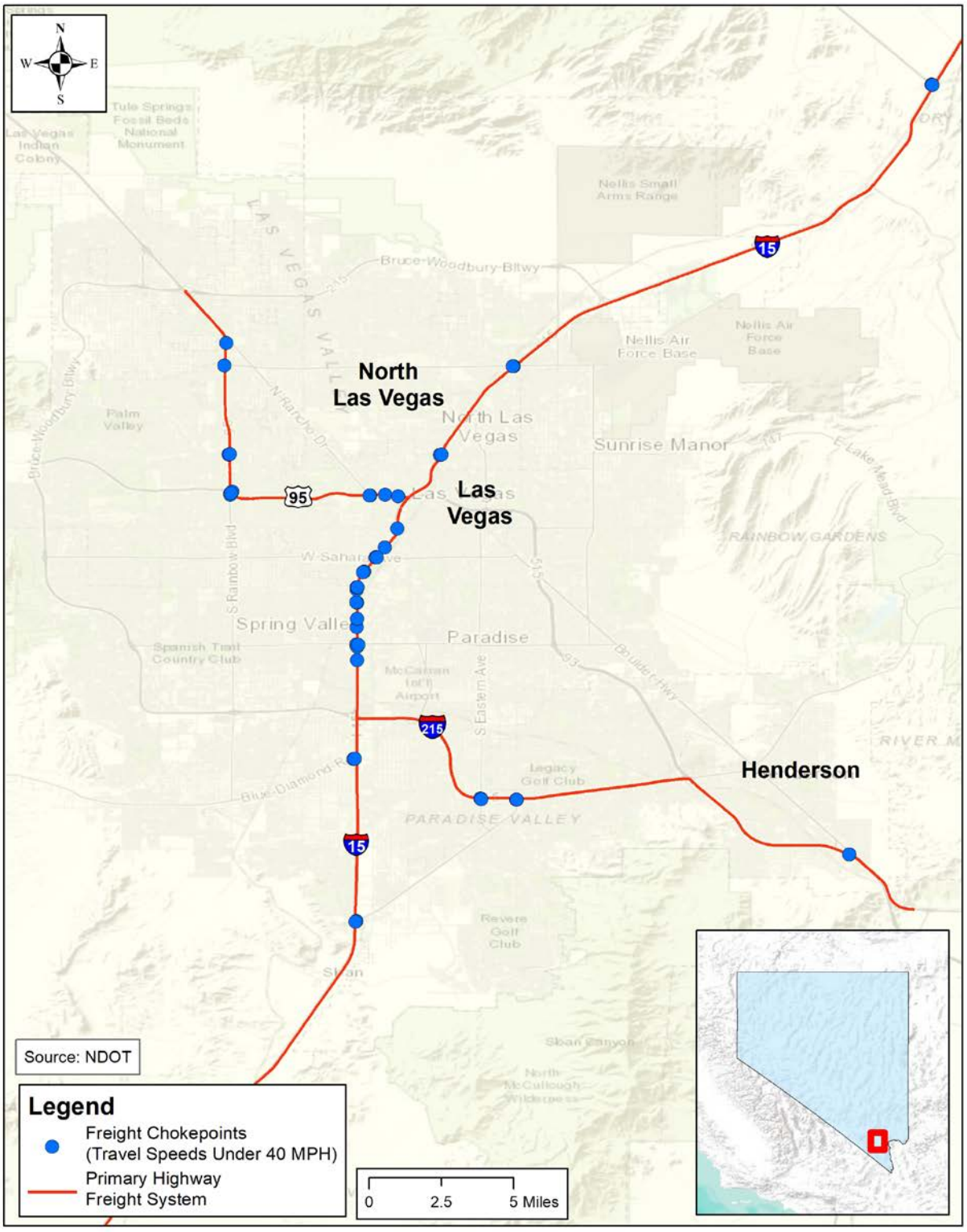


Figure 4-9. Average Truck Speeds below 40 MPH: Las Vegas Metropolitan Area

4.5 E-Commerce

The rapid growth of e-commerce produces an increasing number of light commercial vehicles that rely on an efficient freight transportation system.

E-commerce sales have been growing steadily since 2011, increasing 184.3 percent between Q4 2011 and Q4 2019 nationwide. The COVID pandemic further stimulated this growth and increased the share of e-commerce sales compared to total retail sales to an all-time high (15.7 percent in Q2 2020, a 4.3 percent increase from Q1 2020) (Figure 4-10). E-commerce sales growth has slowed since the start of COVID, decreasing 0.7 percent between Q1 2021 and Q4 2021. In Q4 2021, e-commerce sales as percent of total retail sales were 1.5 percent higher than pre-COVID data (11.4 percent in Q1 2020).

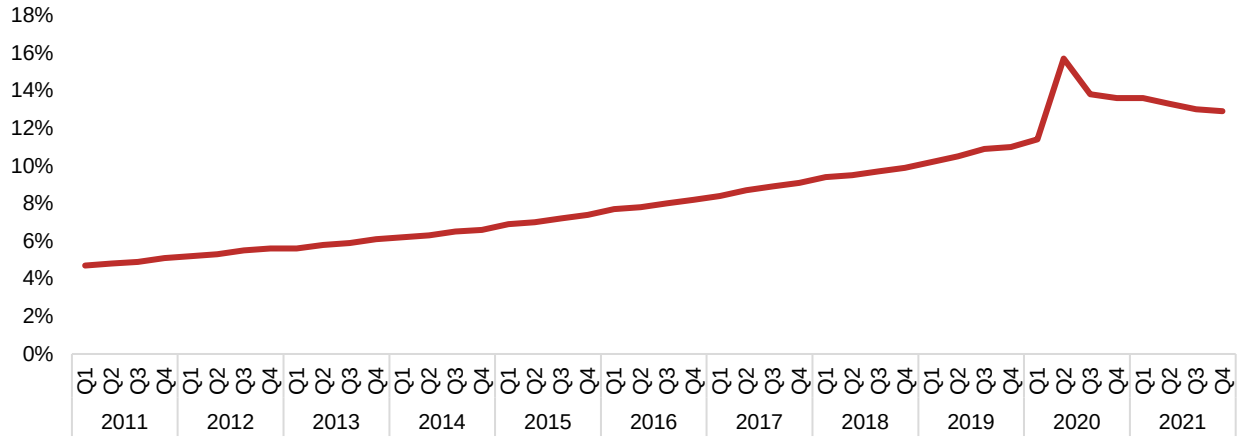


Figure 4-10. U.S. Quarterly E-Commerce Sales as Percent of Total Retail Sales

Source: Federal Reserve Bank of St. Louis

Unlike traditional truck freight, the freight flows generated by e-commerce usually consists of the following characteristics:

- High percentage of light commercial vehicles travelling on local roads to carry out last-/first-mile deliveries, adding freight traffic to residential neighborhoods, and
- E-commerce requires a denser network of warehousing and storage space in close proximity to population centers.

How can NDOT plan for the growing e-commerce demands?

NDOT should study the e-commerce-induced freight trip patterns and the industrial land use demands closely and work with regional and local transportation agencies and other related stakeholders to ensure that this new freight demand is routed to the most efficient set of roadways for handling truck traffic, and that roads are improved as needed to handle the increased weights, lower speeds, and navigational requirements of the urban and suburban system where new warehousing and distribution facilities are located.

Figure 4-11 shows the flow of goods for a typical e-commerce distribution channel within a broader retail supply chain. The addition of e-commerce generates truck trips directly between the consumer and the supplier (typically a retailer). It also generates trips between the consumer and a warehouse location. E-commerce activity can also generate truck trips between the warehouse and the supplier to balance out inventory levels. The addition of all these movements can impact further upstream movements such as trips between the port, warehouse, distribution center, and domestic manufacturers. E-commerce increases supply chain complexity and the reliance of freight on an efficient freight transportation system to deliver goods.

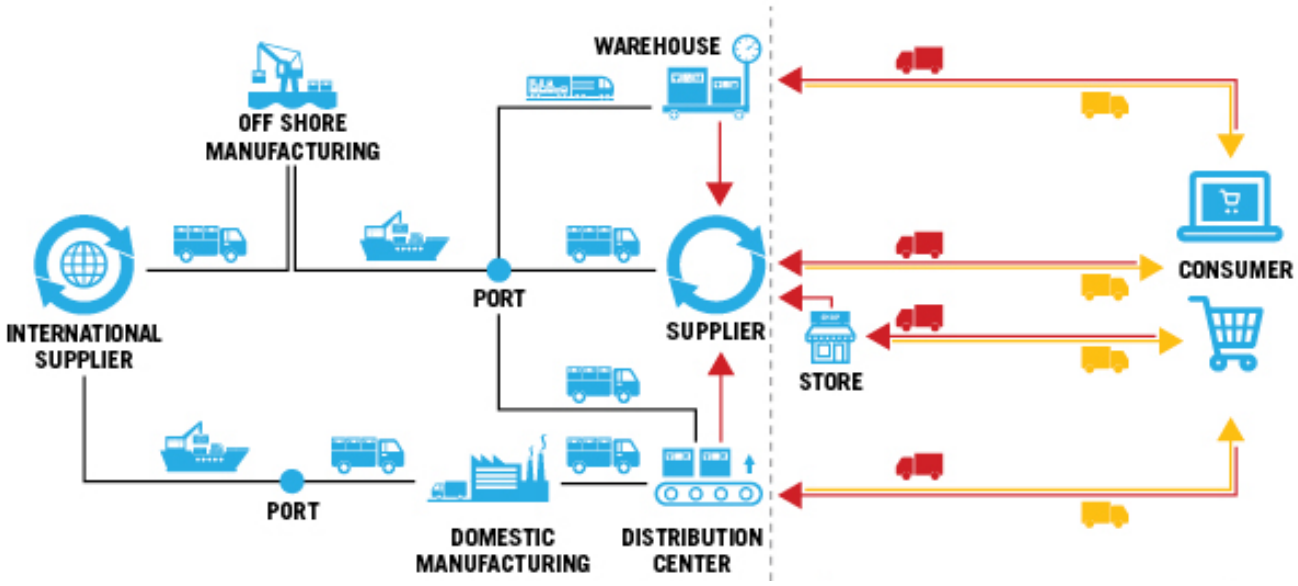


Figure 4-11. E-Commerce Logistics & Supply Chain Schematic

Source: Omni-Channel Retail: Roadmap to Profit, Inbound Logistics, January 17, 2017

4.5.1 Industrial Real Estate Demand

The rapid increase in e-commerce is changing land development patterns and accelerating the need for warehouse and distribution centers; this will impact the volumes and access points for trucks on local roads on major freight corridors throughout Nevada.

In Las Vegas and Reno, industrial real estate vacancy rates decreased in 2021 (Figure 4-12 and Figure 4-13), indicating the continuous demand in space in Nevada's two key markets. The trend of vacancy rates has been downward in Reno since 2019 Q3 (before the start of COVID), suggesting the demand for warehouses and distribution centers was on the rise before further incentivized by the pandemic.

Similar to vacancy rates, net absorption is another indicator that measures the saturation of markets by subtracting the total space that becomes physically vacant from the total space that becomes physically occupied during a specific period time. Las Vegas and Reno both experienced growing net absorption in Q4 2020 and the first two quarters in 2021. The net absorption reached the 4.5 million square feet, the highest point since 2018 Q4, in Las Vegas.

The low vacancy rates and high net absorption led developers to replenish the industrial real estate market to meet Nevada's demand for urban fulfillment centers. Another 10 million and 6 million square feet of warehouse space were in the pipeline for completion in 2022 in Las Vegas and Reno, respectively. The majority of the scheduled projects were located in North Las Vegas (Las Vegas), Southwest (Las Vegas), North Valleys (Reno), and the I-80 East Corridor (Reno) submarkets, indicating a potential for increased truck traffic as those warehouses open for lease.[15]

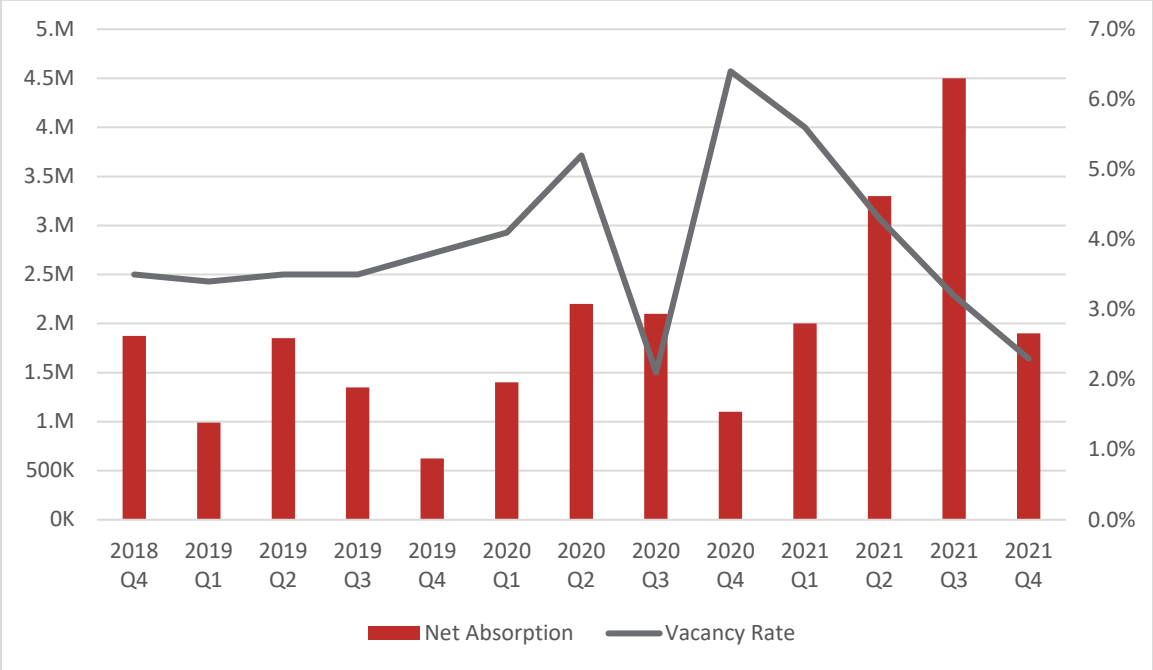


Figure 4-12. Quarterly Net Absorption and Vacancy Rate for Industrial Real Estate in Las Vegas Market

Source: Colliers International Industrial Las Vegas Report

[15] 2021 Q4 Industrial Market Research Report – Las Vegas. Colliers International. https://www.colliers.com/en/research/las-vegas/2021-q4-las-vegas-industrial-market-research-report

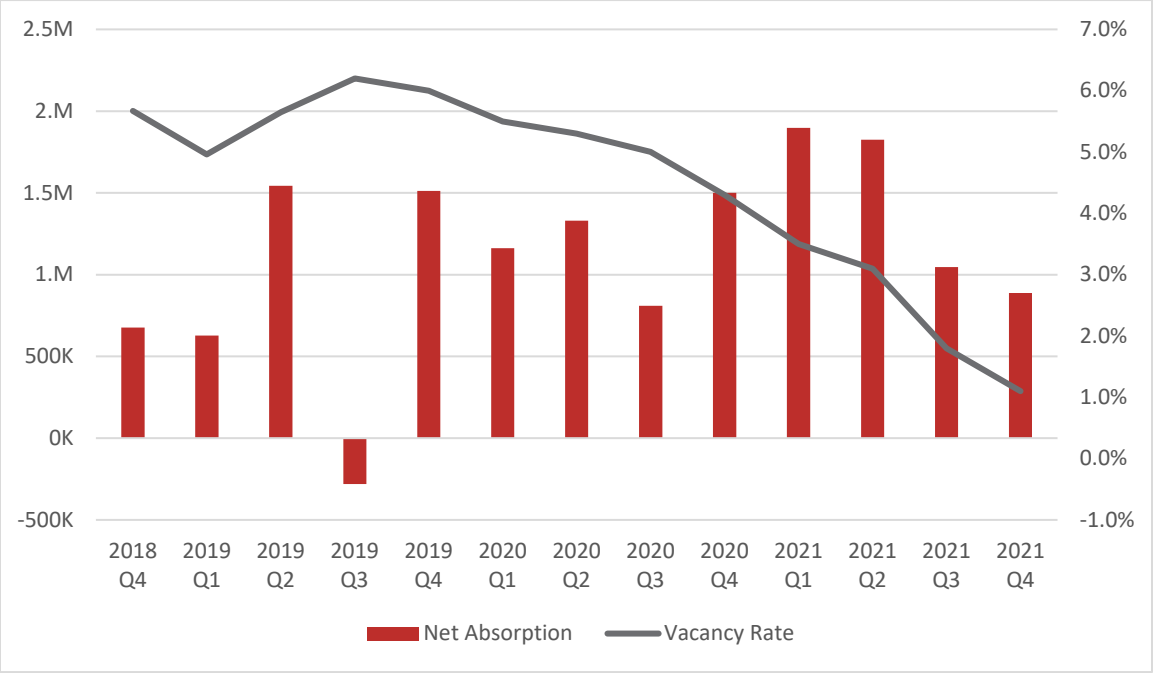


Figure 4-13. Quarterly Net Absorption and Vacancy Rate for Industrial Real Estate in Reno Market

Source: Colliers International Industrial Reno Report

4.5.2 Key Locations – Warehouses and Distribution Centers

The increased use of e-commerce has made the location and size of industrial real estate even more important in terms of the generation of freight traffic and the logistics of freight-dependent industries. This section details the industrial real estate growth in the Las Vegas and Reno submarkets, providing insights into potential areas of focus for improving the freight system in Nevada.

4.5.2.1 Las Vegas Submarket

There are over 100 million square feet of industrial real estate in the Las Vegas metropolitan region, with over 90 percent of this space being warehouses and distribution centers and just 10 percent used for manufacturing[16]. As shown in Table 4-53, approximately 38 percent of this warehouse space is in the North Las Vegas submarket, with another 22 percent in the Southwest Las Vegas submarket. Another roughly 30 percent is split between the Southeast Las Vegas (SE LV)/Henderson, Speedway, and Airport/East. Las Vegas submarkets with 12 percent, 10 percent, and 9 percent of the total current square footage, respectively. A map of the submarkets is provided in Figure 4-14.

[16] Jones Lang LaSalle, Las Vegas Industrial Insight Q42021.

The North Las Vegas submarket appears poised to continue its leadership in attracting warehouse development with over 1.2 million square feet of new projects developed in 2021 (including the recently opened Amazon facility on E. Owens Avenue) and roughly 1.8 million square feet under construction at the end of 2021. The SE LV/Henderson submarket is the second leading market in terms of recent growth, with 601,808 square feet developed in 2021 and another 1.4 million square feet under construction at the end of 2021. Major interstates, such as I-15, I-215, and I-515, and other local roads that lead into, out of, and adjacent to these facilities are critical in terms of the distribution of goods around the Las Vegas metropolitan region, particularly those related to e-commerce.

Table 4-53. Existing and Planned Warehousing and Distribution Center (DC) Facilities by Las Vegas Submarket

Submarket	Warehousing & DC Existing Inventory (sq. ft.)	2021 Completed Projects (sq. ft.)	Under construction as of end of 2021 (sq. ft.)
North Las Vegas	34,984,855	1,206,462	1,778,913
SW Las Vegas	20,011,899	314,357	764,649
SE LV/Henderson	11,272,049	601,808	1,424,596
Speedway	9,194,463	337,666	649,136
Airport/E. Las Vegas	7,873,684	0	230,400
Southwest Las Vegas	4,321,425	0	0
Central Las Vegas	3,280,032	0	0
Northwest Las Vegas	249,039	0	0
Total	**91,187,446**	**3,739,466**	**4,847,694**

Source: Jones Lang LaSalle, Las Vegas Industrial Insight Q4 2021

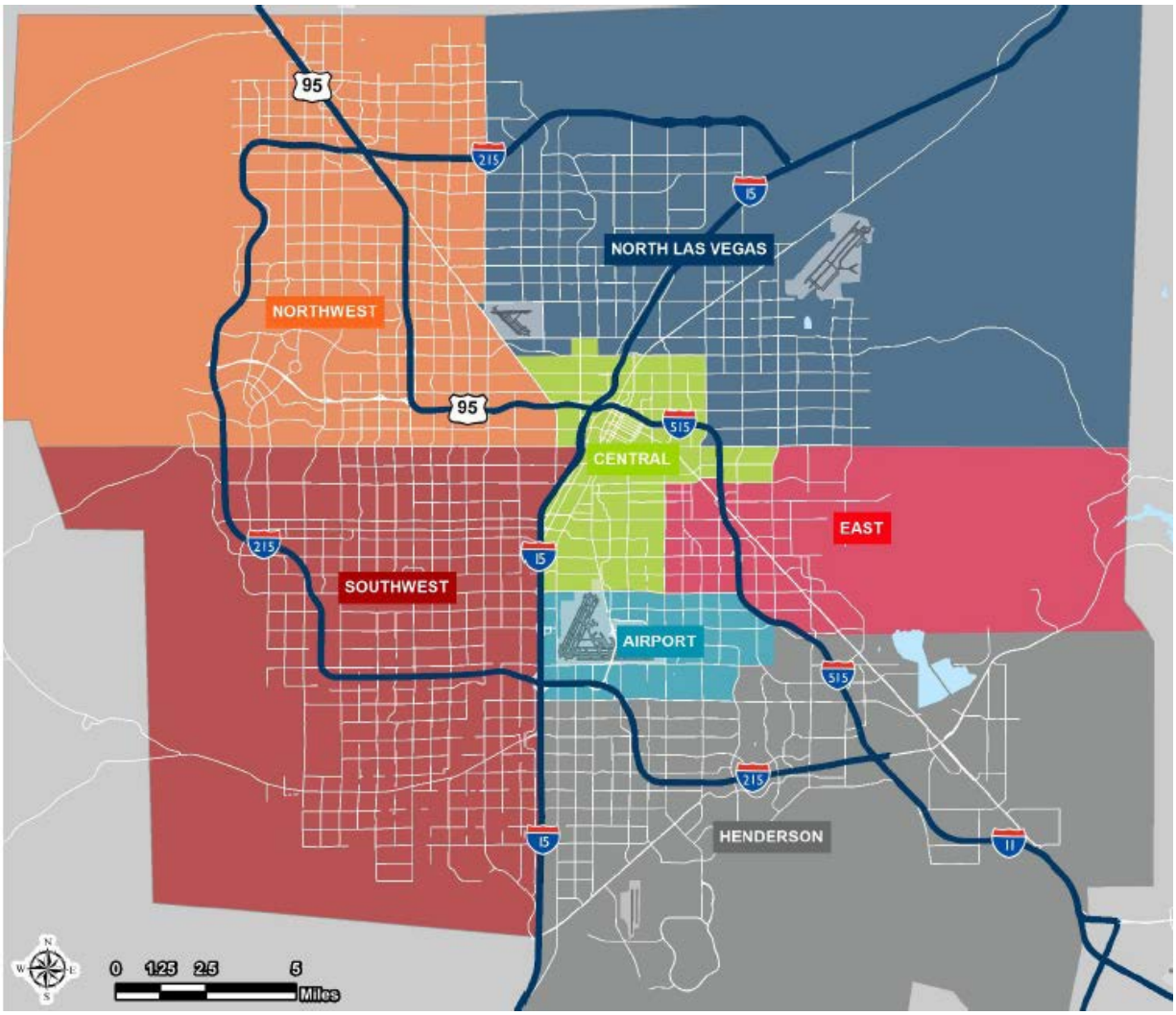


Figure 4-14. Boundary Map of Las Vegas Industrial Real Estate Submarkets

Source: Cushman & Wakefield, Marketbeat, Las Vegas Industrial Q4 2021 Report

4.5.2.2 Reno Submarket

The Reno metropolitan region and Northwestern Nevada have about 15 percent less industrial warehouse space than Las Vegas at just under 79 million square feet of industrial space. Northwestern Nevada has another 18 million square feet of manufacturing and 7 million square feet of flex space that can be used for multiple purposes[17].

The distribution of this square footage is shown in Table 4-54. The vast majority of the industrial properties in the Reno/Northwestern Nevada area are in three submarkets – Sparks, North Valleys, and Storey County. Combined they make up about 70 percent of the industrial market. These three locations were also among the leaders for industrial growth in 2021 with relatively high levels of net absorption (additional square footage rented) at the end of the year compared to the beginning of the year and

[17] Cushman Wakefield Marketbeat, Reno Industrial Q4 2021.

high levels of buildings under construction at the end of 2021. However, South Reno did have over 1.6 million square footage of net absorption in 2021 and Fernley had 800,000 square footage of industrial property under development at the end of 2021. Similar to the Las Vegas region, major highways, such as I-80 and US-395 and other local roads, leading into, out of, and adjacent to these facilities are crucial to truck mobility in Northwestern Nevada.

Table 4-54. Existing and Planned Industrial, Warehousing and Distribution Center (DC) Facilities by Reno/Northwestern Nevada Submarket

Submarket	Warehousing and DC Existing Inventory (sq. ft.)	2021 Construction Completions (sq. ft.)	Under construction as of end of 2021 (sq. ft.)
Sparks	28,612,228	592,720	66,560
North Valleys	23,613,230	1,060,129	2,055,137
Storey County	20,165,515	663,600	596,400
South Reno	9,732,905	23,751	111,200
Airport	8,954,354	0	0
Douglas County/ Carson City	5,371,686	0	0
Fernley	4,843,427	0	815,800
Central	1,949,854	0	0
West Reno	954,168	0	0
Total	**104,197,367**	**2,340,200**	**3,645,097**

Source: Cushman Wakefield Marketbeat, Reno Industrial Q4 2021

4.6 Considerations of Military Freight

Nevada plays a major role in national security, with Nevada businesses having a long history of researching, designing, developing, and applying a variety of technologies for defense applications dating back to World War II[18]. The state continues to see growth in the aerospace and defense industry, with employment growing at more than three times the national rate between 2011 and 2021. The state is home to several military facilities, including Nellis Air Force Base, Creech Air Force Base, Naval Air Station Fallon, and the Hawthorne Army Depot. Nevada's freight system is key to supporting military operations that support the national defense.

4.6.1 Strategic Highway and Rail Network

The Strategic Highway Network, or STRAHNET, is a network of highways that provide interconnected routes for the movement of military equipment and troops.[19] It is a crucial component of the nation's strategic defense. Additionally, the STRAHNET in Nevada provides linkages to Aerospace and Defense

[18] Nevada Governor's Office of Economic Development Aerospace & Defense Industry and Workforce Overview, 2021

[19] https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/STRAHNET/Nevada.pdf

sector facilities that are located outside of the state. Nevada's STRAHNET consists of three Interstates, I-80, I-15, and I-11, two non-Interstates, US 95 and US 93, and two connectors, E Craig Road to I-15 and Union Lane to US 95.

Similar to the STRAHNET, the Strategic Rail Corridor Network, or STRACNET, is a network of over 36,000 miles of rail lines that support the movement of military equipment.[20] In Nevada, the STRACNET routes include the Union Pacific South Central Route that connects Las Vegas to Caliente in Southern Nevada and the Union Pacific Overland Route that connects Reno, Winnemucca, and Cobre in Northern Nevada. The network also includes two connectors: the Union Pacific Feather River Corridor and the Union Pacific Hawthorne Branch.

4.6.2 Military Bases and Their Connections

Nevada is home to two U.S. Air Force bases, one U.S. Army base, and one U.S. Navy base (See Figure 4-17). The local road network and state highways provide critical support to the activities conducted at those military bases. Table 4-55 summarizes the key corridors associated with military bases in Nevada. Figure 4-16 and Figure 4-17 show the location of these bases and the nearest STRAHNET and STRACNET corridors.

Table 4-55. Nevada Military Base Inventory

Name	Department	Location	STRAHNET	STRACNET
Nellis Air Force Base	US Air Force	Clark County	I-15 and E Craig Road connector	Union Pacific South Central Route
Creech Air Force Base	US Air Force	Indian Springs	U.S. 95	N/A
Hawthorne Army Depot Base	US Army	Hawthorne	U.S. 95	Union Pacific Hawthorne Branch
Naval Air Station Fallon Base	US Navy	Fallon	U.S. 95 and Union Lane connector	N/A

Source: Nevada Department of Transportation; Hawthorne Army Depot Hazardous Waste Management.

[20] https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/Pages/RailroadsNationalDefense.aspx

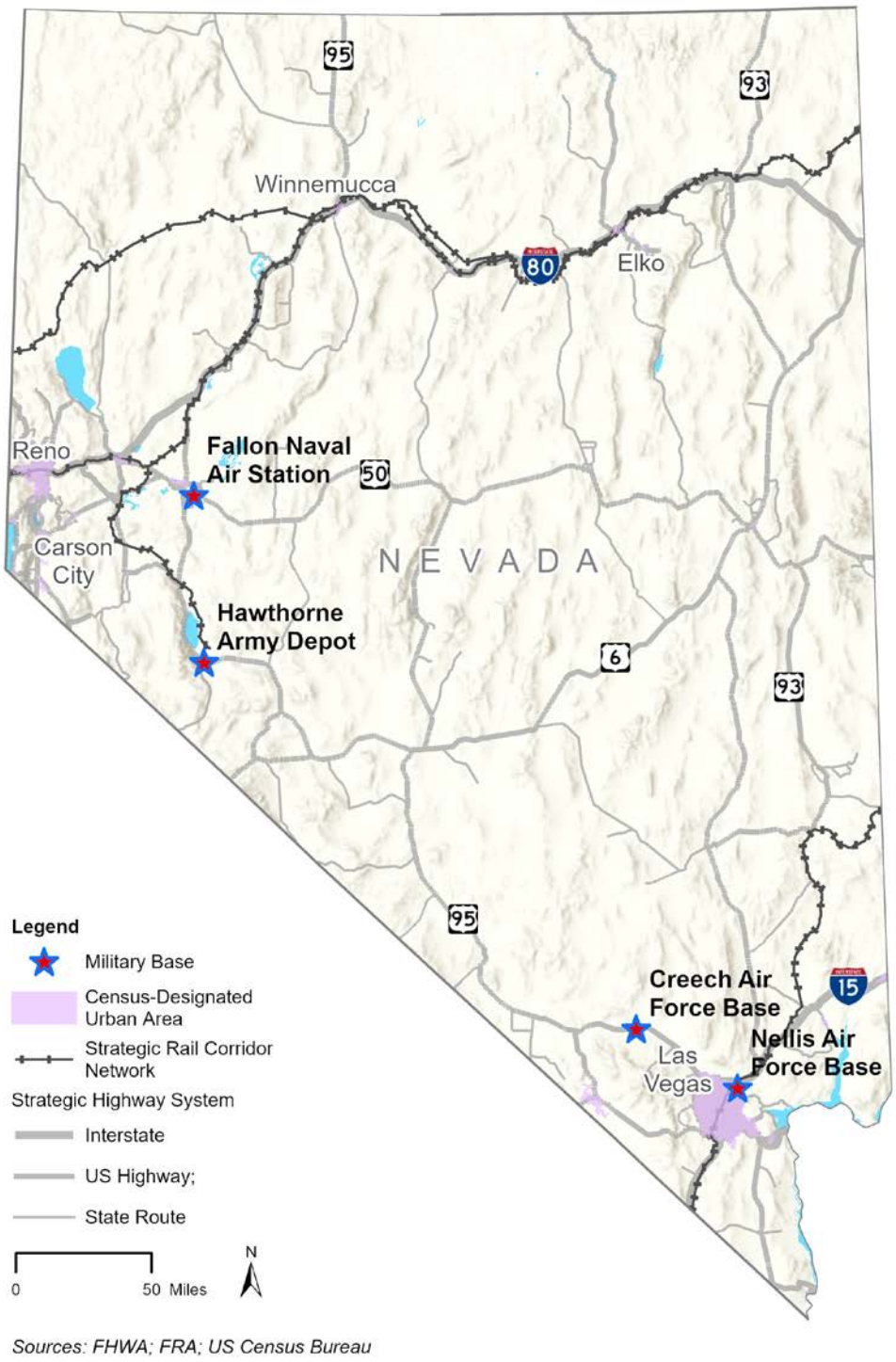


Figure 4-15. Military Bases, Statewide

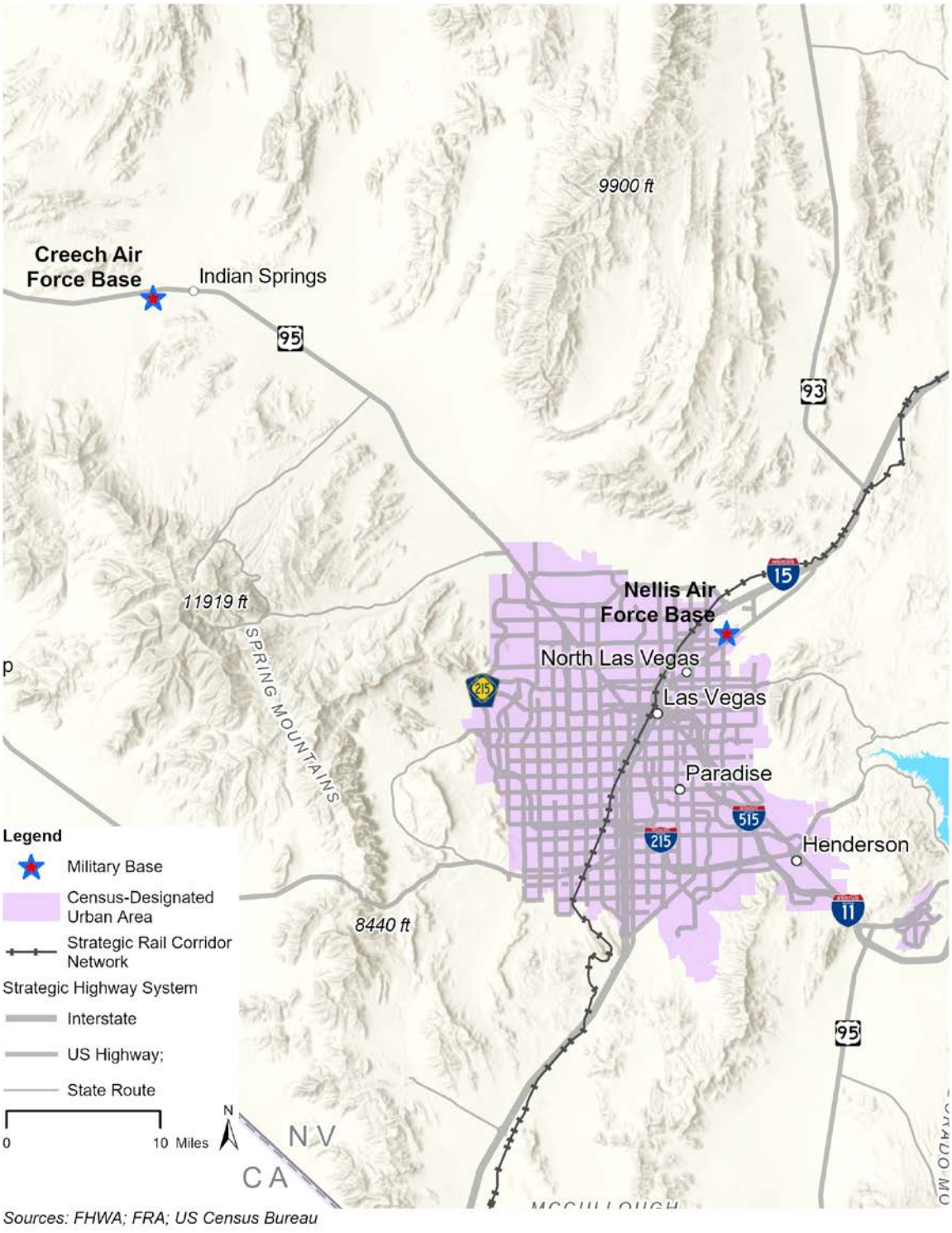


Figure 4-16. Nellis and Creech Air Force Bases and Connecting Roadways

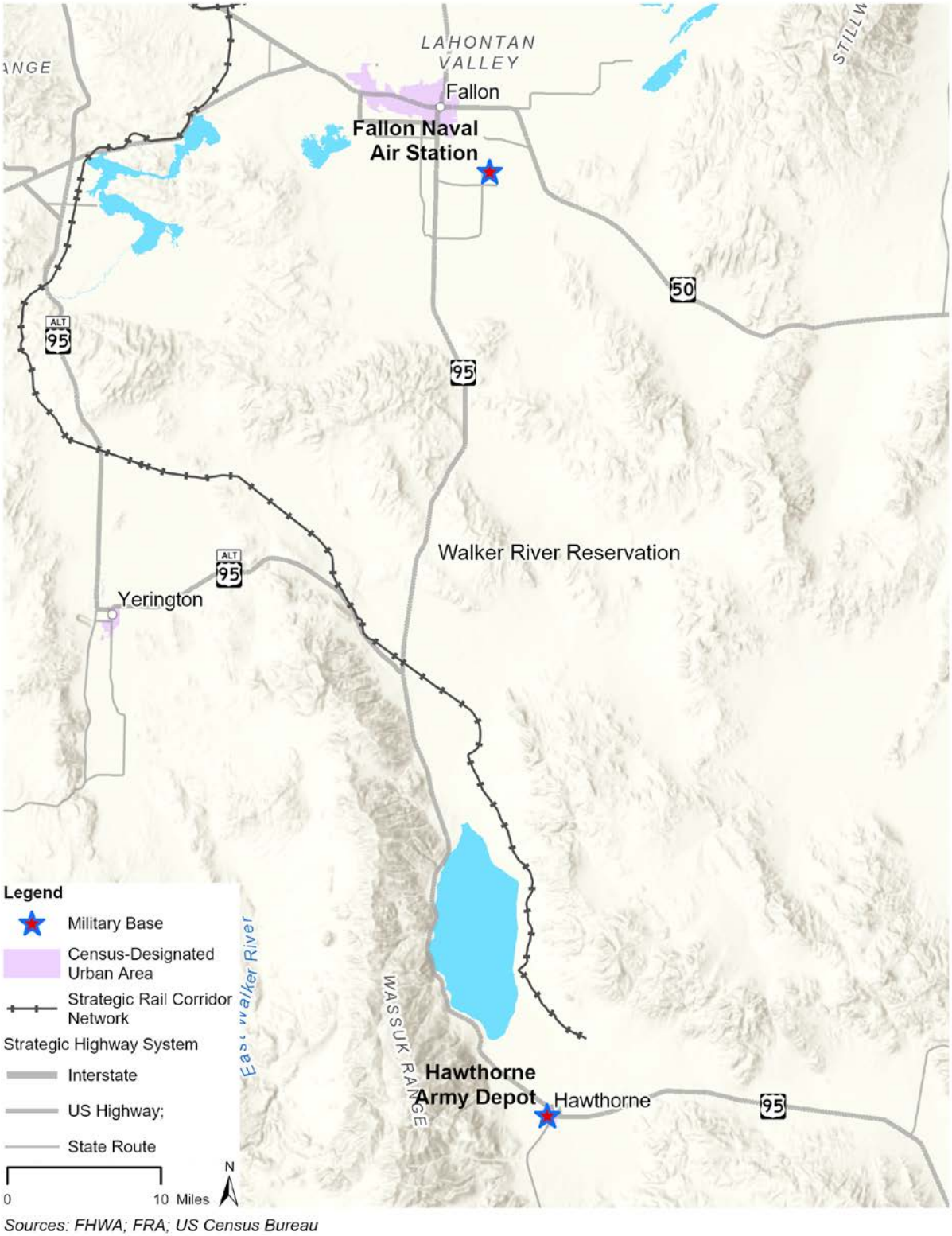


Figure 4-17. Naval Air Station Fallon and Hawthorne Army Depot and Connecting Roadways

Nellis Air Force Base is the location of the largest flying wing in the U.S. Air Force and it is estimated to have more than 12,000 military and civilian personnel, making it one of the largest employers in Southern Nevada. Creech Air Force Base has six operational squadrons, one maintenance squadron, and unmanned aerial vehicles. Naval Air Station Fallon is the U.S. Navy's premier air-to-air and air-to-ground training facility. Each of these facilities require the delivery of vehicles, vehicle parts, and ground system components that are part of the aerospace and defense sector supply chain. Notably, Nevada was the first state to issue licenses to test driverless cars and trucks. This has the potential to play a key role in the development of a new generation of unmanned military vehicles.

4.6.3 Aerospace and Defense Supply Chain

The Aerospace and Defense sector is generally structured through a series of tiered suppliers that provide incrementally complex and integrated products such as parts, components, and systems to large aerospace companies in the development, maintenance, and repair of aerospace vehicles.

In 2020, there were nearly 18,000 jobs in the Aerospace and Defense sector, with the majority in the Las Vegas region (Figure 4-18). Employment in this sector is forecast to grow through 2031 at a much faster pace than this sector's growth for the entire U.S. Major aerospace companies in Nevada include L3 Harris Technologies in the Las Vegas metropolitan region, Dassault Aviation in the Reno area, and Precision Castparts, which has locations in both the Las Vegas and Reno regions.

Based on the employment location data described above, it is likely that the vast majority of the flows that are generated or attracted occur within or around the Las Vegas and Reno metropolitan regions. These flows connect with other locations throughout the western U.S. which have large aerospace industries (such as Southern California).

	Region	2010 Jobs	2020 Jobs	Change	% Change
●	Nevada	13,769	17,990	4,221	30.7%
●	Las Vegas-Henderson-Paradise, NV	8,444	11,268	2,824	33.4%
●	Reno, NV	2,146	3,531	1,385	64.6%
●	United States	2,169,789	2,417,315	247,525	11.4%

Figure 4-18. Nevada Aerospace and Defense Sector Employment by Region

Source: Nevada Governor's Office of Economic Development: Aerospace Industry and Workforce Overview, 2021

4.7 Reducing Environmental Impacts through Sustainable Freight Transportation

Sustainable freight transportation includes the ability of the Nevada transportation system to accommodate growing freight demand, while mitigating the impacts on the environment. Additionally, sustainability involves preparing for a wide range of system risks, including climate change.

In 2021, the Nevada Legislature passed Assembly Bill 413, which requires NDOT to convene an Advisory Working Group to research the needs of the state transportation system and recommend sustainable funding options. This working group focuses on topics such as the reduction of greenhouse gas (GHG) emissions, transportation emission reduction strategies, and system efficiency optimization.[21] The Bill emphasizes the importance of planning for sustainable freight transportation in Nevada. The state of Nevada also established a State Climate Initiative to work towards the development of a climate-resilient future and climate-ready transportation system in Nevada. To align with these ongoing efforts, the Nevada State Freight Plan update identified measures to track the freight system's performance on sustainability and livability. This section consists of two parts:

1. **Needs and Opportunities**: this subsection dives into the needs and opportunities of the Nevada's freight system in terms of sustainability, exploring the impacts of GHG emissions, climate change, and fuel tax revenue on the freight system.
2. **Strategies**: this subsection recommends strategies to reduce the freight system's environmental impacts and ensure a sustainable funding stream.

4.7.1 Needs and Opportunities

4.7.1.1 GHG Reduction

The transportation sector is and will likely remain the largest contributor of GHG in Nevada.

The *Nevada Statewide Greenhouse Gas Emissions Inventory and Projection 1990-2041*[22]undertaken in 2021 contains GHG data through 2019 and estimated that Nevada's transportation sector comprises the largest portion of net GHG emissions by sector at 34 percent. The transportation sector surpassed the electricity generation sector in 2015, and when considering existing policies, the transportation sector will remain the largest contributor of GHG through the projection period to 2041 (Figure 4-19).

Transportation sector emissions peaked in 2007 at 18.343 MMTCO2e, fell to 13.480 millions of tons of carbon (MMTCO2e) in 2011, and increased 18 percent to 15.943 MMTCO2e in 2019 (Figure 4-20). The increase is attributed to aircraft and highway vehicles. Increasingly stringent federal highway vehicle fuel economy standards in the 2010s were credited with depressing the increase in emissions. From 2009 to 2019, VMT were estimated to increase by 34.5 percent while emissions increased by 33.8 percent.

In 2019, Nevada adopted aggressive GHG emissions reduction targets of 28 percent by 2025, 45 percent by 2030 and net-zero by 2050 (SB 254). The projections in the 2021 report found that Nevada is on track

[21] Nevada Legislature Assembly Bill 413. https://www.leg.state.nv.us/App/NELIS/REL/81st2021/Bill/8039/Text

[22] https://ndep.nv.gov/uploads/air-pollutants-docs/ghg_report_2019.pdf

to reduce GHG emissions, but not at a fast-enough rate to meet its SB 254 targets. It projected that Nevada would reduce GHG emissions 23 percent by 2025 (5 percent under the 28 percent goal) and 24 percent by 2030 (21 percent under the 45 percent goal). Therefore, it is pertinent that new policies and strategies are adopted if the path towards 2050 net-zero emissions is to be achieved.

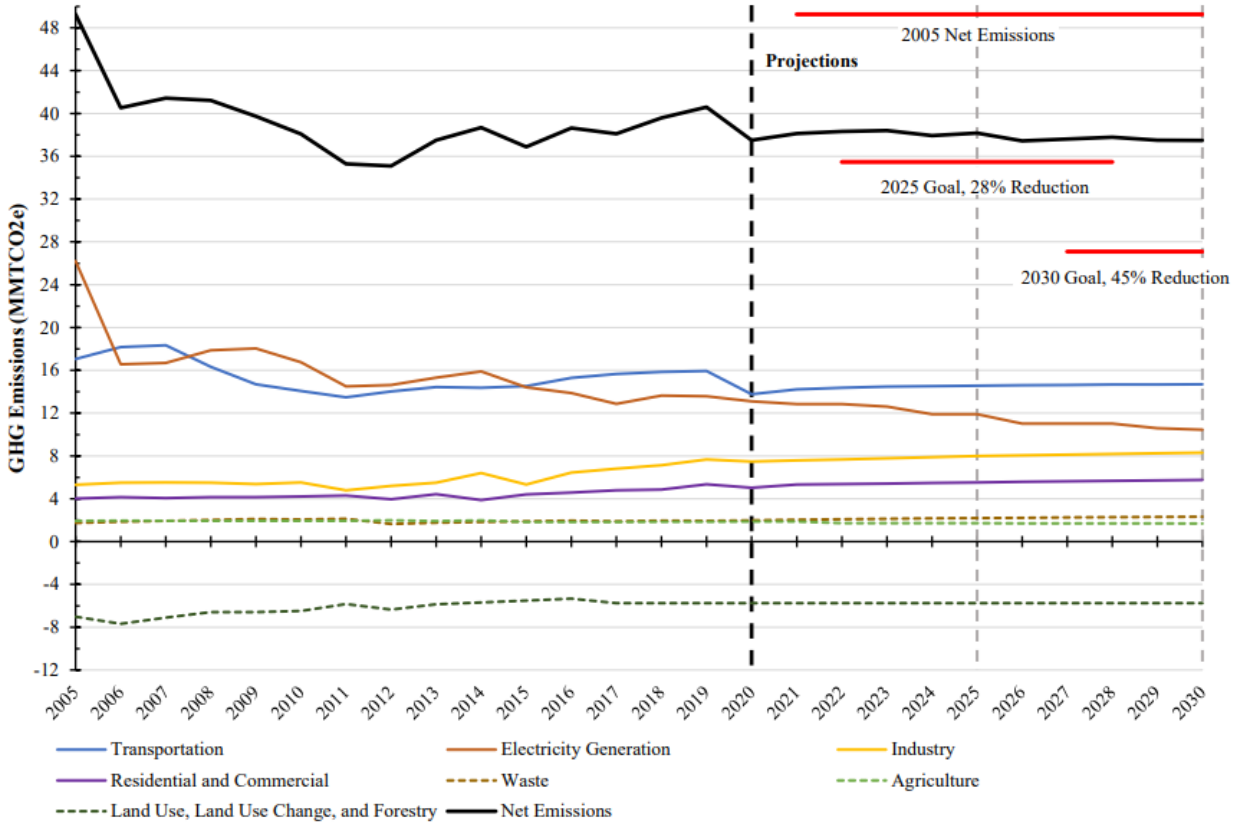


Figure 4-19. Nevada Historical and Projected Net GHG Emissions by Sector, 2005-2039

Source: extracted from the Nevada Statewide Greenhouse Gas Emissions Inventory and Projection 1990-2041 https://ndep.nv.gov/uploads/air-pollutants-docs/ghg_report_2021.pdf

Note: Assumes policies and regulations as of September 2020 and that these policies remain unchanged. Transportation projections assume Tier 3 passenger car and light duty truck fuel economy standards Phase 2 greenhouse gas emissions standards for medium- and heavy-duty vehicles. The adoption of Clean Cars Nevada is considered in the projections but the November 2021 decision by the U.S. Court of Appeals for the District of Columbia vacating all parts of the Phase 2 GHG standards as they relate to trailers is not considered.

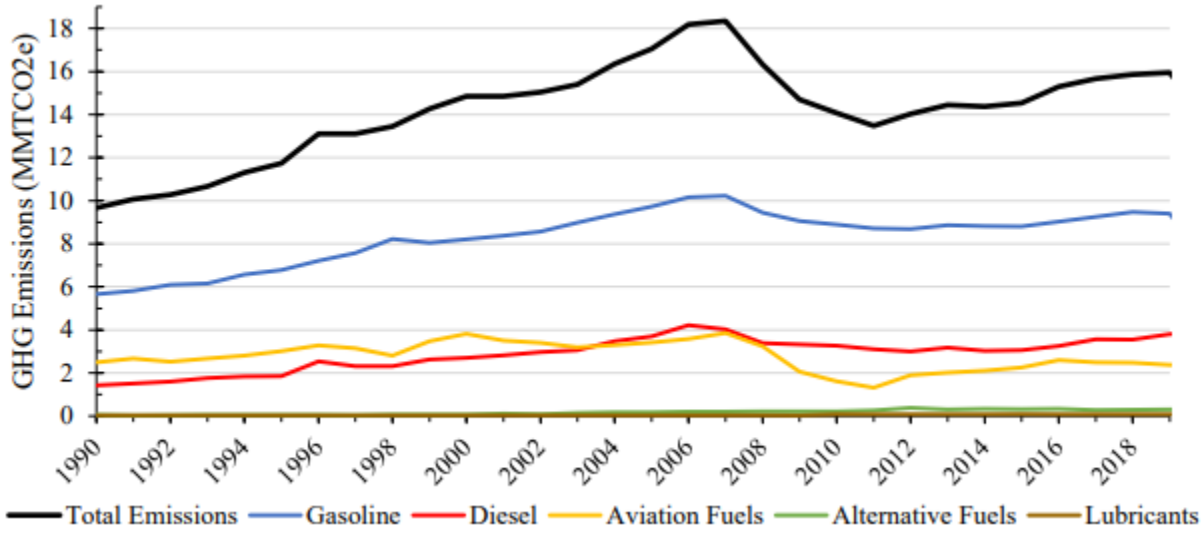


Figure 4-20. Nevada Transportation Sector GHG Emissions by Fuel Type, 1990-2019

Source: extracted from the *Nevada Statewide Greenhouse Gas Emissions Inventory and Projection 1990-2041* https://ndep.nv.gov/uploads/air-pollutants-docs/ghg_report_2021.pdf

4.7.1.2 Climate Change Impacts

Climate change or major weather volatility has entered the consciousness of freight planners in recent years and can have significant impacts on supply chain planning. Nevada's response requires resiliency and emergency preparedness elements, including plans that outline transportation alternatives for the supply of critical goods when normal supply chains are disrupted as a result of extreme weather condition. In addition to increasing average temperature, climate change manifests itself by causing extreme droughts, major wildfires, decreasing soil quality, rising sea level, and many other natural disasters that are detrimental to the economy and the built environment.

The two main categories of climate change risks are:[23]

- Chronic stresses: slowly occurring hazards due to long-term changes in climate conditions i.e., erosion
- Acute shocks: extreme weather events such as hurricanes, droughts, floods, etc.

This section focuses on four changes in climate that are particularly relevant to Nevada's freight system and discusses how these changes could impact the freight infrastructure and operations.

[23] https://gca.org/wp-content/uploads/2021/08/GCA-Handbook-V2.0-13-September-2021-2.pdf

Extreme Weather Events

I-80 was closed at the California-Nevada state line on Feb. 22, 2022.
Source: Caltrans Traffic Camera

Extreme weather events, such as snowstorms, are one of the main causes of roadway closures during winters. I-80, serving as a critical east-west trading corridor that connects California and Nevada, often faces temporary closures due to inclement weather in the Tahoe-Reno region. Even though the weather forecast and transportation management system (TMS) help DOTs anticipate potential impacts on roads and update truckers with road conditions, the severity of the impacts of snowstorms is still uncertain. Such unpredictable winter weather events can impact the freight system in Nevada in many ways, and the outcomes often create a vicious cycle that imposes continuous, negative impacts on the freight operations and infrastructure.

Winter adverse weather, including snow, ice, and fog, has been estimated to cause 23 percent of non-recurrent delay, which is equivalent to 544 million vehicle-hours of delay per year. Table 4-56 shows snow events' impacts on freeway traffic flow reductions.[5] Extreme winter weather can also cause railroads and airport temporary shutdowns, interrupting freight operations. While heavy snow certainly affects the speed and reduces the capacity on roads, railways, and aviation, the ranges of impacts are wide and further reinforce that snowstorms' impacts on freight movements are unpredictable.

Due to their sizes and weights, trucks are more vulnerable in severe winter weather than smaller personal vehicles. Winter storms can bring whiteout conditions, lowering the visibility and making it hard for drivers to respond to the traffic in a timely manner. In combination with low visibility, black ice can cause trucks to "jackknife," which is when the trailer pushes the towing vehicle to one side. Similarly, ice built up on rail tracks can lengthen the time that trains need to stop. Additionally, high winds that usually accompany winter storms can cause trucks to tip over or move off the roads. Any of these conditions threaten the safety of truckers and can block roadways and cause roadway closure, thus perpetuating the impacts of winter storms on roadway efficiency.

A truck jackknifed on I-80 close to the California-Nevada state line.
Source: mynews4.com

Roadway closures, poor visibility, and dangerous road conditions force trucks to take alternative routes during severe winter storms. This might increase truck traffic volume on auxiliary routes that normally don't experience high truck traffic. Furthermore, sudden increases in truck traffic might face increasing congestion, which diminishes roadway safety.

To mitigate the impact of climate change on safe roadway operations, NDOT spent over $2 million each year on snow and ice control in the past five years (2017-2021).[6] The unpredictable weather conditions also bring uncertainty to DOT budgeting, posing challenges to optimizing funding allocation.

Table 4-56. Freeway Traffic Flow Reductions due to Weather

Weather Conditions	Freeway Traffic Flow Reductions—Average Speed	Freeway Traffic Flow Reductions—Free-Flow Speed	Freeway Traffic Flow Reductions—Volume	Freeway Traffic Flow Reductions—Capacity
Light Rain/Snow	3% - 13%	2% to 13%	5% to 10%	4% to 11%
Heavy Snow	5% to 40%	5% to 64%	30% to 44%	12% to 27%
Low Visibility	10% to 12%	-	-	12%

Source: FHWA

Increasing Temperature and Drought

The number of very warm days (>95°F) between June and August have increased across Nevada, with the largest increase in southern and northwestern Nevada (Figure 4-21). Asphalt and concrete can absorb and retain a significant amount of heat, increasing pavement surface temperatures to between 158 to 176°F.[8] Long sections of scorching roads can lead to trucks having blown tires, which is a serious highway hazard and increases the possibility of travel delay and temporary road closures. Hot weathers also limit air cargo operations. The asphalt and concrete runways and taxiways soften, making it hard for planes to move. In addition, planes sometimes have takeoff weight restrictions during extreme heat since hot temperatures lower the air density and decrease its lifting ability, constraining the cargo capacity at airports in Nevada. High temperatures can also lengthen the rail tracks and increase the chances of track buckling, forcing trains to slow down or causing derailments.

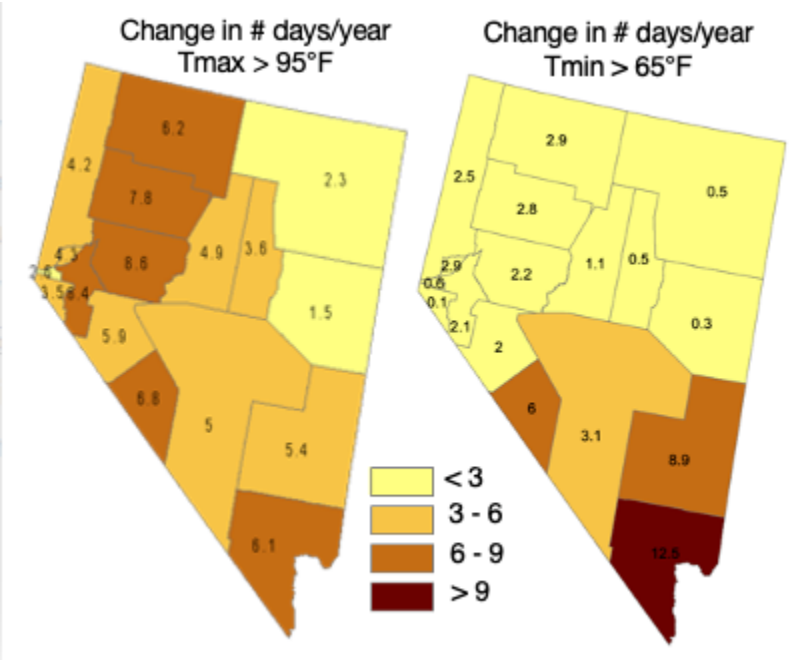


Figure 4-21. Changes in Number of Days/Year with Extreme Heat

Source: Climate Change in Nevada. https://climateaction.nv.gov/policies/climate-nv/

Nevada is located in the middle of the Great Basin, with part of it in the Mojave Desert, making it largely dry and semiarid. On top of that, the Sierra Nevada is a natural barrier that keeps the Pacific Ocean moisture from entering Nevada, while the Rocky Mountain blocks the moist air from the Gulf of Mexico.

The dry wind and the increasing temperatures are causing more areas in Nevada to experience extreme drought. During the two decades between 2000 and 2022, Nevada saw the percentage of extreme drought areas increase from around five percent in 2004 to 40 percent in 2021 (Figure 4-22).

In addition to the detrimental effects of drought and extreme heat on the freight infrastructure, droughts can also threaten Nevada's agricultural and ranching industries, changing the quantity and quality of agricultural production and potentially altering the types of specific crops and livestock that are produced along with where they are produced. Similarly, drought can cause reductions or even interruptions of water supply for water-reliant industries, such as agriculture, manufacturing, and energy, reducing productivity of these industries and threatening competitiveness relative to other producers outside of Nevada. This would result in changes in freight flows and freight operations that adapt to the changes in commodity production and location.

The risk to the state of Nevada is that the freight infrastructure needs will change as a result of drought. More capacity may be needed at some locations, while excess capacity increases in other locations. Close monitoring of these changes will be needed to ensure that changes in demand are understood as far as advance as possible and that new needs are identified through the freight planning process and ultimately fed through the One Nevada Transportation Process that is described in Chapter 3 of this document.

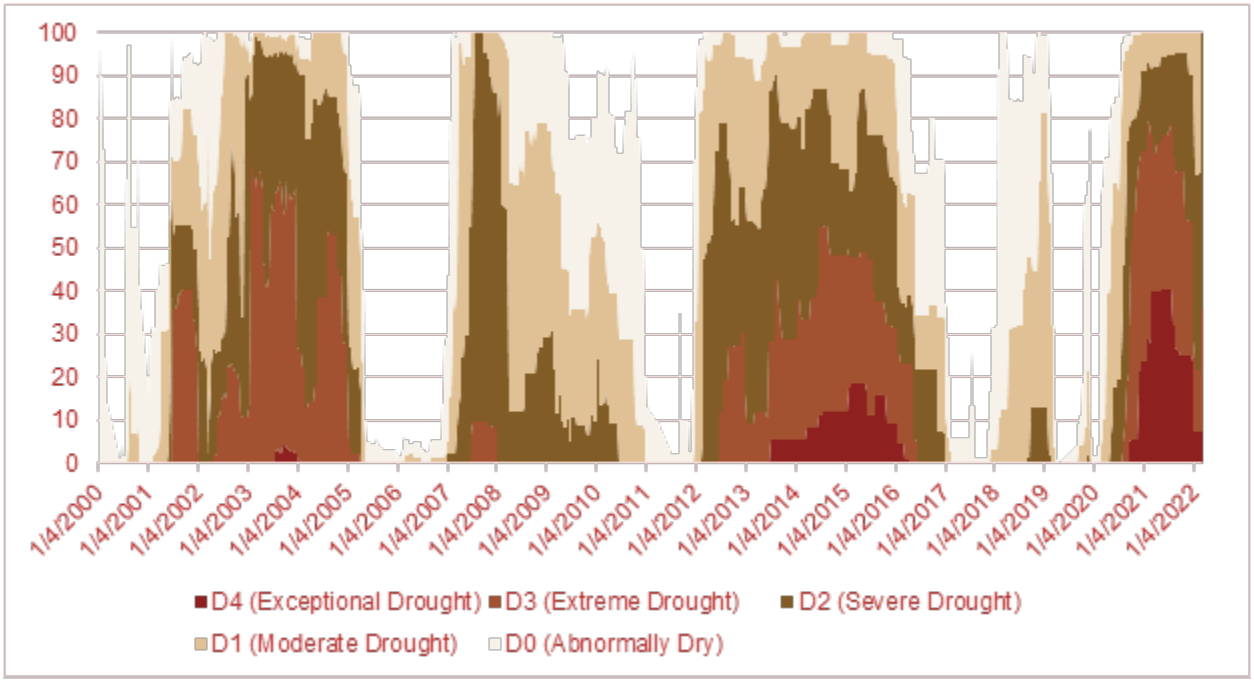


Figure 4-22. Nevada Percent Drought Area in US Drought Monitor Categories

Source: U.S. Drought Monitor. https://droughtmonitor.unl.edu/

Wildfires

A damaged ridge on BNSF railroad in Northern California.
Source: BNSF

According to the National Interagency Fire Center, the total number of wildfires and the extent of areas burnt by wildfires each year have increased since the 1980s, hindering land-based and air-based traffic and harming property, infrastructure, livestock, and human health. Climate change has been proven to lead to longer wildfire seasons, more frequent wildfire incidents, and wider burnt areas.[9] In 2020, over 800 fires occurred throughout Nevada, affecting almost 300,000 acres. The neighboring state, California, witnessed 8,835 fires that blazed through more than 2.5 acres of land.[10] The fires in Northern California and Western Nevada forced major railroads, such as UP and BNSF, to halt their rail operations and reroute affected train flows, while the railroad tracks bore various degrees of track damages.[11] [12] Road closures also often occur during fire seasons in Nevada. For instance, multiple fires that happened in 2021 closed Highway 50, Highway 395, and some other roadways between California and Nevada, of which some were closed for over three months.[13]

The risk to the Nevada freight transportation system is that the impact of the wildfires has the potential to close down key freight routes between Nevada and its largest state-level trading partner, California. These routes being shut down will cause the delivery of goods to be delayed through rerouting of trucks to less efficient routes. This also increases supply chain costs in the freight transportation system. Alternate highways that are used by re-routed trucks may become congested for both truck and passenger traffic having adding time and costs for all roadway users. During extreme fire events, some goods may not be able to be delivered to some locations at all which would have large negative consequences on some residents and businesses.

To mitigate these risks, NDOT could consider a close analysis of alternative freight routing and modal systems. These alternate routes and freight modes should be considered at the system level to understand the cost incurred by re-routed trucks, the impacts on traffic on the alternate route, and the potential for a fire to impact both the main route and the alternate route based on the ongoing increase in frequency and size of fires that is occurring in the western U.S.

Climate Change and Agriculture in Nevada

Agriculture is one of the largest industries in Nevada, contributing $994.2 million to the state economy in 2019.[1] Top commodities include cattle and calves, hay, dairy products, onions, and potatoes. Fresh water, healthy soils, and a thriving ecosystem constitute the foundation of a sustainable agriculture system. The changes in climate will impact the three cornerstones significantly, reducing agricultural productivity and degrading soil and water resources. Additionally, the changes listed below will interact with each other in a way that further exacerbate the impacts on agricultural and ranching business.

High Temperature: Extreme heat negatively impact the health of crops and livestock, as well as farmers and ranchers. Even though warmer weather allows for longer growing seasons, it also provides environments for pests and invasive species to thrive. Longer growing seasons also require additional water usage, further stressing water resources.

Drought: Exacerbated by higher temperatures, droughts can limit water supply and thus reduce crop production and decrease range condition.

Loss of Snowpack: Less precipitation in the form of snow and early snowmelt caused by rising temperatures will likely alter water management in Nevada. Snowpack is the nature's reservoir; losing water storage capacity could further constrain the water supply in Nevada and reduce rangeland production.

Flood: The runoffs from the melting snow and increasing precipitation in the form of rain is projected to increase more than 25% to 50%. Runoffs-induced flooding not only damages crops, but also causes erosion and soil loss.

Wildfires: Drought and extreme heat makes Nevada more vulnerable to wildfires. Fires can directly destruct infrastructure, crops, livestock, and forage. Wildfires also could change vegetation cover and reduce the quality and quantity of forage production. Moreover, the smoke from fires can be extremely harmful and even fatal for livestock.

Source: Climate Change in Nevada. https://climateaction.nv.gov/policies/climate-nv/

Sea Level Rise

The rail system in the Western U.S. includes a large fraction of traffic that transports the goods from the west coast seaports to the rest of the U.S. In particular, the Las Vegas metropolitan region receives goods from the Port of Long Beach and the Port of Los Angeles, while the Reno-Carson City metropolitan region receives goods from the Port of Oakland.

The mean sea levels have been rising in the Los Angeles area for at least four inches during the last century. According to the sea-level rise projections in the Port of Los Angeles Sea Level Rise Adaptation Study, the sea level is forecast to rise between 2-12 inches by 2030, 5-24 inches by 2050, and 17-66 inches by 2100. The wide range of sea-level rise estimates demonstrates that there is a significant amount of uncertainty in the impacts of changes in the sea level.

The risk to the Nevada freight transportation system is that any level of increasing sea level rise has the potential to impact the transport infrastructure at the Ports which in turn could disrupt, delay, or reroute the freight movements from the ports on the west coast to Nevada. This has impacts on both the trucking and rail side. NDOT can mitigate these potential impacts by working with the west coast

ports to understand the likelihood of alternative sea level rise scenarios, the freight network impacts of different scenarios for the port infrastructure, and the potential upstream impacts for Nevada. The State of Nevada working with the private sector freight community could then determine the potential for other ports in the Gulf of Mexico or the East Coast to meet these shipping needs during down periods and how well the state is connected to these alternative ports.

Summary of Impacts

Potential impacts due to extreme short-term weather and climate change are shown below.

Potential Impacts	Extreme Short-Term Weather	Climate Change
Source  Where freight movements in Nevada originated	Severe short-term weather events may not change sourcing. However, sourcing patterns might change if severe weather events become more frequent.	If climate change disrupts source material productions in other regions, Nevada may have to consider different source inputs.
Destination  Where freight movements in Nevada are headed	Severe short-term weather may limit the destinations of products from Nevada. However, long-term and/or permanent changes depend on the frequency of weather events.	The impact of climate change on freight destinations is unclear.
Route  How freight is moving through Nevada	Severe weather events may require more frequent closure of highways, railroads, and airports, disrupting freight flows.	Increasing temperature, wildfires, and other disruptive weather events caused by climate change may require closures of roads and railways due to poor infrastructure conditions. Air cargo may also be disrupted due to safety concerns.
Volume  The quantity of freight moving through Nevada	Volume impacts from short-term weather events are uncertain.	A lengthened growing season may increase demand for agricultural inputs such as fertilizer or pesticides. On the other hand, droughts may require a higher amount of imported water to support agricultural, ranching, and manufacturing activities.
Value  The financial worth of freight moving through Nevada	The value of goods transported depends on the frequency and severity of the weather events.	The value of goods traveling along the system may not change.

4.7.1.3 Wildlife Habitat Impacts

Each year in Nevada, vehicle collisions with wild and domestic/feral animals result in more than 500 reported crashes and kill an estimated 5,032 wild animals. Research estimates that more than 50 percent of such collisions can go unreported to authorities, pointing to a potentially higher number of animal-related incidents. Many of these crashes occur on highways that also serve as freight corridors. As documented by NDOT, U.S. roads impact the natural ecology of at least one-fifth of the country. These roads increase animal deaths, fragment and decrease habitat, prevent wildlife from accessing natural resources and isolate wildlife populations into smaller and more vulnerable subpopulations.

The substantial human, economic and wildlife costs caused by vehicle-animal collisions have led to the development of wildlife crossings. This design tool has been successful at reducing both vehicle-animal collisions and wildlife impacts caused by roads. In a continual effort to provide the safest roadways, the Nevada Department of Transportation and partners such as the Federal Highway Administration, U.S. Fish and Wildlife Service and Nevada Department of Wildlife are installing safety crossings.

Safety crossings are passages above or beneath roadways that are designed to increase road safety and reduce collisions by redirecting wildlife out of the way of oncoming vehicles. From underpasses and overpasses to small-mammal tunnels and other crossings, these structures are designed to provide semi-natural corridors through which animals can safely cross roads without endangering motorists and themselves. Often, safety crossings for larger animals are installed in conjunction with fencing to help direct animals to cross at the desired location, avoiding potential traffic collisions.

4.7.2 Strategies

4.7.2.1 Strengthening Emissions Standards

Trucking Emissions Standards

Growing concern for climate change has affected public policy at the national and especially the state level, with California instituting some of the most restrictive emissions regulations in the United States. This has led to the need for cleaner and more efficient means of moving freight. The first step in this direction is developing stricter vehicle emissions standards. The federal government regulates highway vehicle standards via two agencies:

- The National Highway Traffic Safety Administration (NHTSA) sets safety and fuel economy standards via the Corporate Average Fuel Economy (CAFE) standards which regulate how far vehicles must travel on a gallon of fuel. CAFE standards are set separately for light duty vehicles and medium/heavy duty trucks
- The Environmental Protection Agency (EPA) has the authority to regulate vehicle emissions

In 2016, the EPA and NHTSA finalized the Phase 2 fuel efficiency and GHG emissions standards for medium- & heavy-duty vehicles for MY2018-2027.[24] However, the compliance dates for truck trailers have been stayed as per an order of the United States Court of Appeals for the District of Columbia Circuit issued on September 29, 2020 (case No. 16-1430).

[24] https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf

Generally, states must follow the federal guidelines, with one exception: under the 1970 Clean Air Act, California is able to seek a waiver to set stricter emission standards than the federal government. Further, other states are also able to adopt California's stricter standards. According to the 2020 State Climate Strategy, Nevada is considering adopting California's emissions standards for both cars and trucks. In particular, Nevada is looking at adopting California's:

- Low-Emission Vehicle (LEV) standards for vehicle manufacturer GHG emissions standards for new passenger cars and light-trucks.
- Zero-Emissions Vehicle (ZEV) standard creating a credit-based program for vehicle manufacturers requiring an increasing percentage of ZEVs (such as electric or hydrogen fuel cell)
- Clean Truck Program to reduce emissions and increase electrification of medium- and heavy-duty vehicles (Class 2b to Class 8)

California adopted an Advanced Clean Truck Act (ACT) in June 2020 with two components:

- Zero-emission truck sales will be required as an increasing percentage of sales from 2024 to 2035; by 2025, ZEV would comprise 55 percent of Class 2b-3 truck sales, 75 percent of Class 4-8 truck sales and 40 percent of truck tractor sales[25]
- One-time large company and fleet reporting for fleet owners with 50+ trucks aimed at identifying future strategies to ensure that future fleet replacements use zero-emission trucks

In March 2022, the EPA issued a notice of decision to reinstate California's Clean Air Act waiver for its Advanced Clean Car program (which had been revoked in 2019).[26] This will open the door for other states to follow California. Nevada is considering a similar Clean Truck Program following California's example, requiring LEV or ZEV new truck sales or operating requirements. Further, given that 70 percent of trucks operating in Nevada are coming from or going to California, more stringent standards in California should also lead to an increased proportion of LEV and ZEV operating in Nevada.

Now that California is able to move forward with the Clean Truck Program, Nevada is considering the following actions:

- Reviewing the state vehicle emissions statues for consideration of the alignment of Nevada's regulations with the California ACT program
- Working with the State Environmental Commission (SECT) to promulgate new regulations to adopt an enhanced Nevada-specific program
- Analyzing the potential impact on GHG reduction by analyzing fleet composition, trip composition (short versus long-haul, origin/destinations to/from California, etc.)
- Conducting an economic and financial feasibility study to understand upfront costs and infrastructure investments, carbon emission reduction and other benefits, and impacts on state revenues
- Reviewing and enhancing the placement of charging/fueling stations for trucks

[25] https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

[26] https://www.federalregister.gov/documents/2022/03/14/2022-05227/california-state-motor-vehicle-pollution-control-standards-advanced-clean-car-program

Locomotive Emissions Standards

Most railway locomotives used today are diesel-electric locomotives. The EPA regulates rail emissions standards via a Tier system. In 1998, the EPA adopted Tier 0, Tier 1 and Tier 2 emissions standards for manufactures and remanufactures of locomotives with engine years from 1973-2011. In 2008, the EPA developed stricter remanufacturing standards for Tiers 0-2 and developed Tier 3 (engine years 2012-2014) and Tier 4 (engine year 2015+) standards. Tier 4 locomotives are sold on the market today and emit 90 percent fewer emissions of NOx and 95 percent fewer fine particle matters than Tier 0 engines.

4.7.2.2 Adoption of Greener Transport Fleets

New Efficient and Green Truck Technology

The trucking industry has introduced new equipment to make their operations more energy efficient and environmentally sustainable. Trucking technologies in development aim to increase large truck gas mileage per gallon from six and less to nearly 10 miles per gallon with cleaner engines (DOE, 2014).

Zero-emission trucks are becoming suitable for more and more applications as technology advances. In the near future, ZEVs will likely be first adopted for short-haul freight trips. Short-haul trips are easier to adapt because shorter ranges require smaller batteries. Electric drivetrains are more efficient than conventional engines in stop-and-go traffic and congestion in urban areas. Short, predictable, urban routes are also conducive to electrification when the vehicles can be recharged or fueled overnight at the home base, removing the uncertainty of recharging enroute. Long-haul journeys require strong charging networks (see next section).

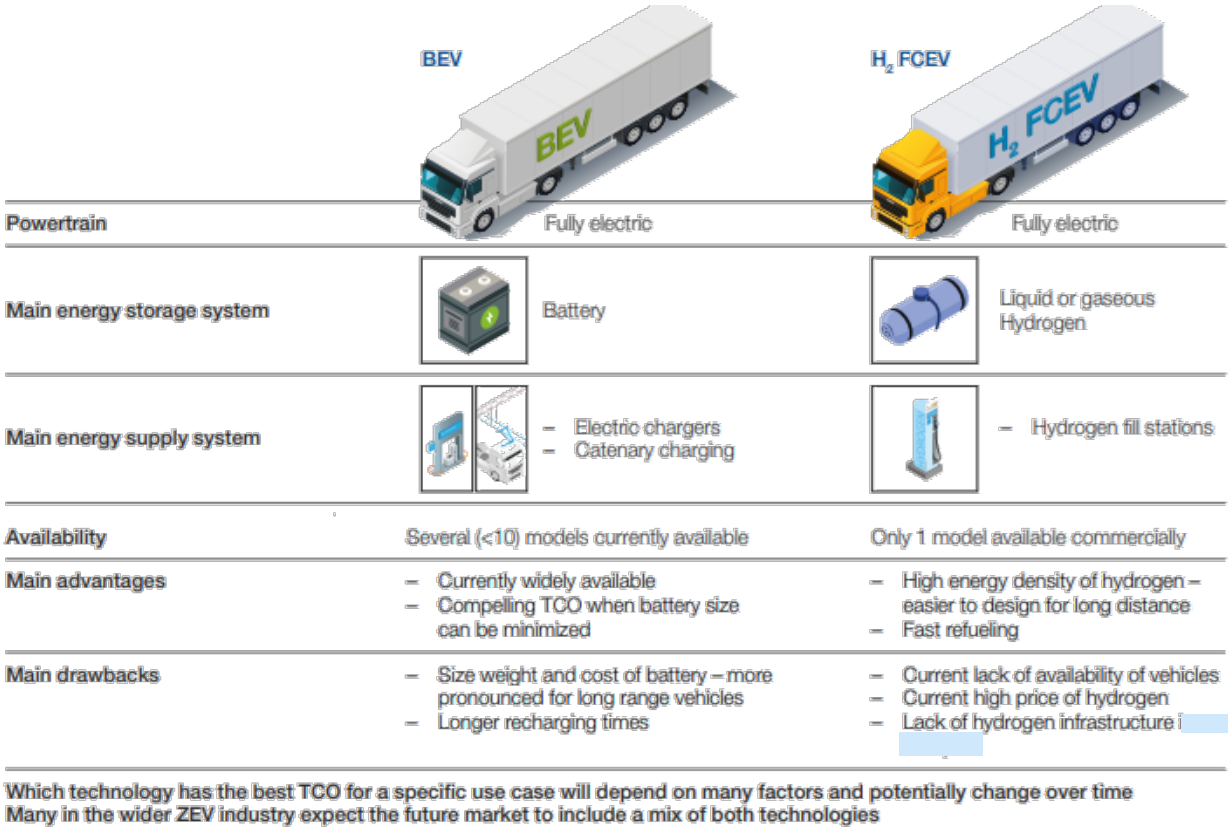


Figure 4-23. Comparison of Zero Emission Truck Technology

Source: https://www3.weforum.org/docs/WEF_RFZ_Pathways_to_faster_adoption_of_zero_emission_trucks_2021.pdf

Greening Nevada's Truck Fleets

Many Nevada-based trucking companies and individual owner-operators have customers in both Nevada and California. Therefore, many of these companies have been investing in retrofitting and/or upgrading their fleets in response to both the GHG emissions and fuel efficiency standards implemented by the U.S. government and the GHG emissions standards adopted by the California Air Resources Board (CARB). The more stringent CARB regulations (applicable to all trucks operating within the State of California regardless of point of origin) set specific timelines, based on the engine model year (MY), for installing required retrofit equipment and eventually upgrade existing fleets with MY2010 or newer engines that meet state emissions requirements. Based on 2016 data from the Nevada Department of Motor Vehicles, 22 percent of trucks registered in Nevada during 2015 had MY2010 or newer engines.[27] This is an increase of approximately 4 percent per year (14 percent in 2013, to 18 percent in 2014) and is expected to continue to rise through 2023 as fleets continue to be upgraded. The average age of trucks registered in Nevada during these three calendar years is 12 years.

Recent research estimates that, there have been 1,215 ZE truck deployments across the U.S. as of December 2021. This includes both MD and HD trucks, step vans, cargo vans, refuse trucks, and yard (terminal) tractors. The research also indicates that there are over 140,000 orders for commercial ZE

[27] Engine model year data is collected by the DMV maintained within their vehicle registration database.

trucks that are pending and have yet to be fulfilled. Of the 1,215 U.S. ZE truck deployments so far, none occurred in Nevada. Figure 4-24 shows the number of deployments by state.[28]

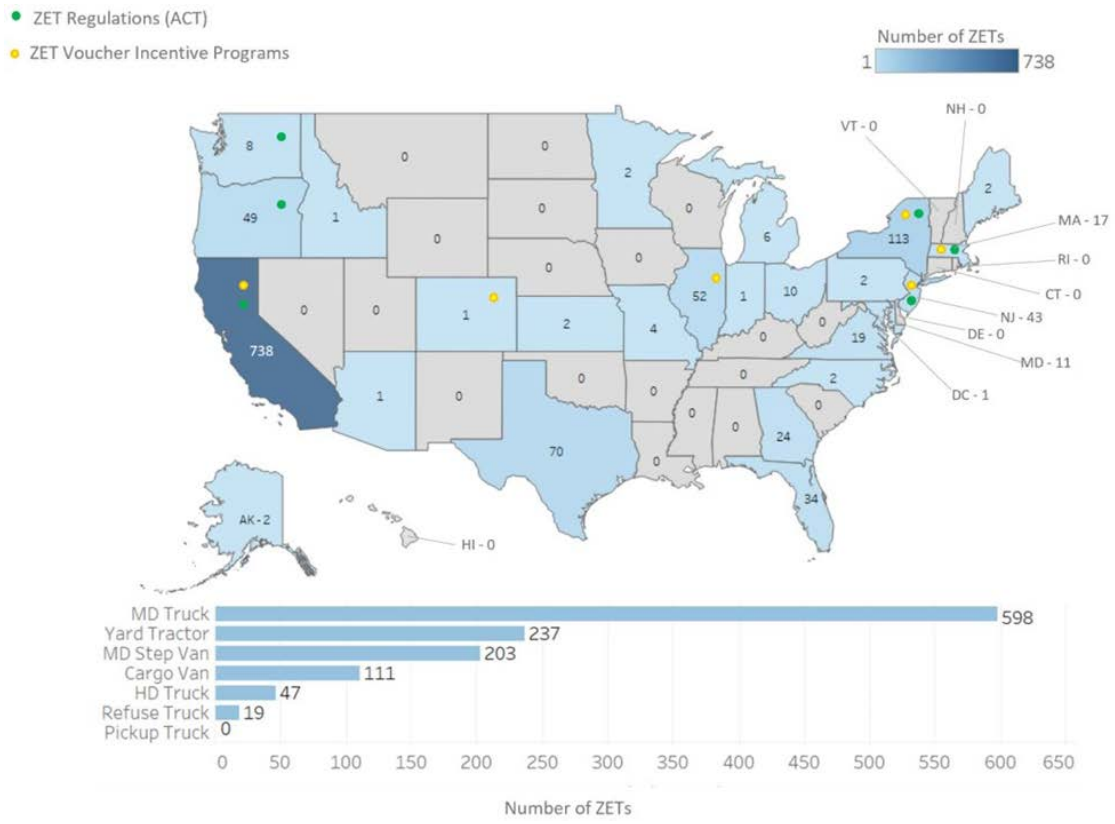


Figure 4-24. Zero Emission Truck Deployments by State (as of December 2021)

Financing and Incentivizing Cleaner Trucks

Investing in LEV and ZEV fleets requires substantial capital investment, and a recent report by McKinsey[29] found that financing gaps were amongst the top two largest barriers to adoption. While the gap between the total lifetime cost of operating zero-emission trucks compared to diesel is falling and parity is anticipated to be reached soon for electric vehicles, the upfront purchase costs are higher and annual operating costs lower, requiring larger upfront capital investments. The following strategies could help lower the upfront costs.

- **Truck leasing:** leasing ZEVs could introduce more trucks using alternative fuels into the market, but it also has several complexities compared to diesel trucks. To start, batteries and fuel cells comprise a large part of the vehicle cost (7 percent for fuel cells, for example) but degrade over time. This makes it hard to predict the residual value. Innovative financing models can be

[28] Al-Alawi, B., MacDonnell, O., McLane, R., & Walkowicz, K. (2022, January). CALSTART. Zeroing In On Zero-Emission Trucks. Retrieved from https://calstart.org/wp-content/uploads/2022/02/ZIO-ZETs-Report_Updated-Final-II.pdf

[29] https://www3.weforum.org/docs/WEF_RFZ_Pathways_to_faster_adoption_of_zero_emission_trucks_2021.pdf

developed to support zero-emission truck purchases. For instance, Daimler Trucks is providing dynamic leasing options which reduce risk for transport operators by linking the lease payment to usage (such as pay-per-mile). Volta Trucks, a medium-duty start-up, is offering a truck-as-a-service program where customers pay one all-inclusive monthly fee that covers not only the truck but also the servicing, maintenance and insurance. More advanced truck-as-a-service leasing programs could include refueling/charging infrastructure.

- **Partnerships with institutional investors**: the partnerships could be used to establish special purpose vehicles to develop long-term financing options at the fleet level. Institutional investors have over $85 trillion in assets (as of 2018) but less than 1 percent is invested into infrastructure,[30] leaving much room for growth in the sector. Government guarantees could de-risk the investment, increasing the attractiveness to investors.
- **Government policies**: Policies are another way to de-risk new technology purchases and incentivize adoption by subsidizing zero-emission truck or charging infrastructure purchases via grants, discounting tolls, or offering tax exemptions or credits. The state could explore expanding on the current incentive programs to provide grants, tax exemptions or tax credits to help offset the upfront costs of adopting ZEV truck fleets. In Nevada, state incentives include:[31]
  - Heavy-Duty Vehicle Emissions Reduction Grants: the Volkswagen Environmental Mitigation Trust administered by NDEP assists with renewal of pre-2009 fleets.
  - Idle Reduction Technology, Natural Gas Vehicle, and Plug-in Electric Vehicle Weight Exemption (Reference Nevada Revised Statutes 484D.635): Given that EV batteries typically add to vehicle weight, Nevada has a policy where natural gas and plug-in vehicles may exceed the maximum gross vehicle weight limit by up to 2,000 lbs.
  - Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (HEV) Emissions Inspection Exemption (Reference Nevada Revised Statutes 445B.770 and 445B.825): AFVs are exempt from emissions testing and new HEVs are except for the first five years.
  - Commercial Electric Vehicle Supply Equipment (EVSE) Rebates: Nevada Energy offers rebates to for the purchase and installation of Level 2 EVSE and DC Fast charging stations.
  - Plug-In Electric Vehicle (PEV) Time-Of-Use: Nevada Energy offers a time-of-use rate to residential and commercial customers who own or lease PEVs.

Hybrid Locomotives

The railroad industry has added energy efficient hybrid locomotives to their yards and fleets to reduce harmful pollutants. New locomotive engine technology includes after-treatment (compact selective catalytic reduction [SCR], diesel oxidation catalyst [DOC] filters), and on-board batteries for hybrid-electric locomotives. New zero-emission technologies are emerging such as battery and hydrogen fuel-cell electric locomotives.[32]

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[30] Meltzer, Joshua (2018). Blending Climate Funds to Finance Low-Carbon, Climate-Resilient Infrastructure. Brookings. Working Paper 120.

[31] https://afdc.energy.gov/laws/all?state=NV

[32] https://ww2.arb.ca.gov/sites/default/files/2020-07/final_locomotive_petition_and_cover_letter_4_3_17.pdf

Developing Alternative Fuel Corridors

A necessary requirement for eventual use of EVs and alternative fuels for both domestic and import-related drayage will be the establishment of strategically placed charging stations along major passenger and freight Highway corridors. Given the two competing types of truck zero-emission technology, this requires both electric charging stations as well as hydrogen refueling stations. Current Alternative Fuel Corridor standards require a maximum of 50 miles between stations to ensure range confidence.

In 2015, the Fixing America's Surface Transportation Act (FAST Act) required the USDOT to designate national alternative fueling corridors (AFCs) (Title 23, United States Code, Section 151). FHWA solicited nominations from State and local officials to designate AFC's via five rounds from 2016-2021. The first five rounds led to 125 nominations along segments of 134 Interstates across 46 States plus the District of Columbia. [33] Nevada's designations included I-15, I-580 and SR-28 in the first four rounds and US 95, I-80, I-15, US 50, I-580, and SR 28 in round 5.[34]

In November 2021, a "transformative investment in EV charging" was enacted as part of the BIL of the Infrastructure Investment and Jobs Act (IIJA), (Public Law 117-58).[35] A sixth round of FHWA AFC nominations was announced in February 2022 tied to the BIL. [36] The $7.5 of BIL funding includes $2.5 billion in discretionary funds and a new $5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program (Paragraph 2 under the Highway Infrastructure Program heading in title VIII of division J). Under NEVI, each state must submit an EV Infrastructure Deployment Plan by August 1, 2022 laying out how the state intends to use its NEVI funds based on the federal guidance.[37] The federal guidance mandates that the initial funding is directed towards developing designated AFCs as part of the national network. After the national network is developed, funding can be used on any public road or location. NEVI funding will be $1 billion per year from 2022 through 2026.

Nevada currently has one AFC Ready Corridor (defined as having a maximum of 50 miles between stations) and 1,566 alternative fuel stations (Table 4-57). As shown in Figure 4-25, Nevada's network of public electric fuel charging stations is mainly concentrated in Las Vegas, Reno and South Lake Tahoe. Nevada also has 2 compressed natural gas stations and 14 ethanol stations in Las Vegas and 22 LPG (propane) stations statewide. There currently are no hydrogen, biodiesel, or LNG fueling stations in the state.

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33 https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/2022_request_for_nominations_r6.pdf

34 https://energy.nv.gov/uploadedFiles/energynvgov/content/Pages/neh_report_final.pdf

35 https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/

36 https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/2022_request_for_nominations_r6.pdf

37 https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf

Table 4-57. Station Counts by Fuel Type as of April 12, 2022

Fuel Type	Nevada Public	Nevada Private	Nevada Total	National Total
Biodiesel	0	2	2	1232
CNG	2	3	5	1507
E85	14	2	16	4414
Electric[1]	472/1433/3/1091/339	20/87/12/71/4	492/1520/15/1162/343	50,326/130,818/3,099/ 104,302/ 23,371
Hydrogen	0	0	0	67
LNG	0	0	0	103
Propane	22	1	23	2771
Total	**1,471**	**95**	**1,566**	**14,0912**

1 station locations/EVSE ports/Level 1/Level 2/DC Fast. Excludes residential EV charging infrastructure.

Source: Department of Energy (https://afdc.energy.gov/stations/states)

Nevada is working to reduce the distance between EV charging stations, aiming to increase the number of AFCs from one at present to five (Figure 4-25). Nevada's first designated AFC Ready Corridor was completed in January 2020 and runs along Highway 15 connecting the Las Vegas area to Utah and California. Within Nevada, there are four additional Pending corridors: I-80, US 93, US 95 and US 50. Filling these gaps will facilitate long-haul trips using EV that are currently not feasible, but Nevada faces hurdles in meeting the 50-mile maximum distance requirement in vast, unpopulated areas of the state where power and other infrastructure (such as restrooms) are not available outside of rest stops. Further, FHWA funding prohibits fees, which limits potential private-sector led solutions.[38]

[38] https://energy.nv.gov/uploadedFiles/energynvgov/content/Pages/neh_report_final.pdf

Figure 4-25. Nevada's Alternative Fuel Corridors

Source: Department of Energy https://afdc.energy.gov/stations#/corridors

The Nevada Electric Highway (NEH) is a joint initiative between the Governor's Office of Energy, NV Energy and the Valley Electric Association aimed at expanding the state's EV charging stations in line with the FHWA's AFC program. The first phase of the NEH, announced in June 2015, will connect Reno and Las Vegas (450 miles of US Route 95). The NEH program was expanded to phase 2 in 2018 to include I-80, I-15, US 93, US 50, and additional stations on US 95. An aim of phase 2 was to aim to meet the 50-mile increment required by the FHWA AFC program. As of March 2021, 21 of 30 stations had been built.[39] These new stations are crucial because of their locations in connecting northern and southern Nevada. They also expand equity and provide opportunities for a range of income groups as charging on the state-provided EV charging stations will be free for the first five years.

REV West is a memorandum of understanding between eight intermountain west governors (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming) in October 2017 establishing a framework for developing an intermountain west EV corridor network. The eight states reconfirmed their commitment via an updated MOU in December 2019. In December 2020, the REV West partnership released a progress report noting that 100+ DC Fast charging stations were built since 2017, with 75 more planned. REV West also collectively engaged with FHWA to receive federal support and designate 1,250 miles of AFC program corridors with another 7,500 miles pending. In particular, the REV West states are collaborating to find solutions for developing EV charging stations within the 50-mile maximum range in remote areas.

[39] https://energy.nv.gov/uploadedFiles/energynvgov/content/Pages/neh_report_final.pdf

Finally, Nevada does not currently have any hydrogen refueling stations. Given that several large manufacturers are developing fuel-cell trucks and that California is currently piloting hydrogen trucks at Los Angeles port, in the medium-long-term, Nevada may have to look towards expanding its AFC network to include hydrogen refueling should these pilots be successful.

Financing Climate-Resilient Infrastructure

Developing resilient infrastructure and adapting to mitigate impacts of climate change requires investment. In most cases the economic benefits of resilient infrastructure outweigh the economic costs. The US government has found that mitigation programs have saved $6 for every $1 spent over the past 25 years.[40]

But designing and building resilient infrastructure can increase upfront costs. These costs can be covered through:

- Development of climate bonds to fund projects
- Carbon pricing or taxes
- Drawing on resources from the federal government programs[41] such as FEMA Hazard Mitigation Grant Programs[42]
- Incentive programs to encourage development by the private sector

The risk to the Nevada's freight transportation system is that any increase to the sea level has an immediate impact to U.S. West Coast ports including Ports of Los Angeles, Long Beach, and Oakland, and the potential to ultimately effect freight flows to/from Nevada.

NDOT can mitigate these potential impacts by:

- Working with the West Coast ports to understand the likelihood of alternative sea level rise scenarios
- Understanding the freight network impacts of different scenarios for the port infrastructure

Additionally, NDOT can also proactively evaluate the feasibility of incorporating certain climate resilience designs or actions into their freight-supportive infrastructure during the planning and design process such as:

- Absorptive capacity– which refers to the ability for the system to absorb the impacts of flooding or severe weather. This is decided at design as to how much to increase the hardness of the roadway and structures. There may also be opportunities for technology, such as better weather forecasting and temperature sensors in roadways (alert drivers to black ice and freezing conditions). But also designing or retrofitting roads with nature-based flooding solutions such as

[40] https://www.energy.gov/eere/slsc/federal-financial-assistance-programs-resilience-activities

[41] https://www.energy.gov/eere/slsc/federal-financial-assistance-programs-resilience-activities

[42] https://www.fema.gov/grants/mitigation/hazard-mitigation

adjacent flood ways or green infrastructure that can lower the level of water on the roadway, so it is still passable.

- Adaptive capacity – which refers to the amount of redundancy in the system. If one part of the system fails how easy is it to reroute or move to another location temporarily.
- Restorative capacity – which refers to how much effort it takes to resume operation or functionality of the system, but not necessarily return to normal. For example, in the case of a severe winter storm with heavy snow and white out conditions, it is inconceivable that NDOT could build a system that would absorb or adapt to that type of impact but could proactively address how quickly roads could be restored so that vehicles start moving again.

5. Innovative Technologies and Operational Strategies

Technology has always been one of the most important determinants of freight mobility and economic activities around the globe. On one hand, the freight industry is a massive market affecting a wide range of business sectors, making it a great opportunity for technology investments. On the other hand, the logistics industry trends are dependent on transformations driven by the implementation of technology innovations in business processes. Further, the supply chain industry is facing economic challenges, specifically during COVID-19 pandemic. The next-generation technology solutions are moving towards making the freight industry more, efficient, sustainable, and resilient to unplanned events.

The freight transportation system is currently undergoing tremendous change with growing populations, increasing demands for goods, shortage of industrial warehousing, increasing travel demand, increasingly larger container ships, the need for short-haul relief for California ports, and various technological advances that are altering supply chains tremendously. Additionally, several types of vehicle and logistic facility technologies are under testing or early stages of adoption. The technologies pertain to alternative fuel uses and emissions reductions, efficiency and safety, and manifold increases in utilization of capacity. Freight planning requires a fundamental understanding of how and when these technology shifts would affect future system usage and needs, and tools that may be required to analyze them.

NDOT has been incorporating technologies into its freight system planning. The section first identifies several technologies affecting freight mobility and then summarizes technology-related strategies proposed and implemented by NDOT.

5.1 Autonomous and Connected Vehicles

The emergence of autonomous vehicle (AV) and connected vehicle (CV) technologies represent a shifting paradigm regarding the nexus of capabilities between vehicles and roadways that support needs of both human drivers as well as AVs/CVs. This transition is evolving roadway infrastructure to include AV/CV technologies while continuing to support the needs of human drivers. AVs would have the potential to increase safety by relieving much of the driver fatigue involved in truck operations. They also improve efficiency by providing extended driving hours. Truck platooning, in which trucks are connected and travel together, is another solution to create efficiency in freight mobility.

According to FHWA, "*the freight industry is an early and incremental adopter of low-level AV with its own path to deployment*"[43]. Freight industry stakeholders mostly prefer to deploy technologies to assist freight vehicles equipped with low-level automated capabilities, focusing on operational support rather than sweeping changes to the physical infrastructure and transitioning to fully automated vehicles.

The state of Nevada has been at the forefront of recognizing the role of AVs in future transportation. In 2011, Nevada became the first state in the US to authorize the operation of autonomous vehicles by passing Assembly Bill 511. Later in 2017, the Assembly Bill 69 authorized AVs and driver-assistive platooning technology to be tested or operated on a highway within Nevada if safety requirements are met. In describing the major events impacting the trucking industry in 2015, the American Trucking

[43] https://www.fhwa.dot.gov/publications/research/operations/21015/21015.pdf

Associations' news journal noted "history was made through the continued expansion in rapid maturity of technology". The summary highlighted the debut of Mercedes-Benz's Daimler autonomous driving Inspiration truck at the Hoover Dam in early May 2015, as well as progress made by other companies.

Figure 5-1. Daimler's Autonomous Truck Being Tested in Nevada

Source: Daimler AG

Introduction of autonomous trucks is expected to provide a solution to industry driver shortage concerns. Truck drivers might be worried that as the technology matures, human drivers will be replaced by computers. However, some analysts believe that the increased efficiency of trucking will increase demand and require a greater number of professional drivers, especially during the start and end of complex trucking runs.

While the technology for fully automated trucks without a human operator may not be available for implementation soon, there has been ongoing research on improving efficiency and safety using advanced sensors and connected vehicle technologies. During 2016 to 2019 timeframe, FHWA's Exploratory Advanced Research (EAR) Program pursued research on allowing long-distance trucks to travel together more efficiently. Two research projects were defined and conducted on partial automation for truck platooning and cooperative adaptive cruise control. The projects developed technologies and strategies to maximize safety and efficiency by allowing two and three trucks to travel closely together. Since 2018, FHWA and Intelligent Transportation Systems Joint Program Office have been pursuing the Truck Platooning Early Deployment Assessment project since August 2018. The project is being conducted in two phases. The first phase included developing a truck platooning pilot deployment concept and preparing a comprehensive deployment and evaluation plan. The task was completed in December 2019. The second phase, which is currently being conducted, focuses on getting the truck platooning technology ready to implement by conducting field operational experiments and analysis and evaluation of the collected data.

Figure 5-2. Truck Platooning demonstration held in September 2017 on the I-66 Corridor in northern Virginia

Source: FHWA

The technology is not limited to cars and trucks. Autonomous trains operate automatically without any human intervention and are monitored from the control station. The autonomous train technology market was valued at $5.88 billion in 2018 and is projected to reach $15.57 billion by 2026[44].

In 2017, a Norwegian chemical production company teamed up with a maritime technology company to build the world's first all-electric and autonomous container ship, intended to replace 40,000 diesel-powered truck journeys every year. With its first voyage behind it, the vessel will commence commercial operations in 2022, while a two-year testing period will take place alongside designed to certify it as an autonomous vehicle. The technology company will be responsible for integrating the sensors and other systems for autonomous navigation, with the pathway to full autonomy to also include a phase of remote operation.

5.2 Alternative Fuels

The National Electric Highway Coalition (NEHC) is committing to create a network of direct current fast (DC Fast) charging stations connecting major highway systems from the Atlantic Coast to the Pacific of the United States. NEHC utility members agree to ensure efficient and effective fast charging deployment plans that enable long distance EV travel, avoiding duplication among coalition utilities, and complement existing corridor DC fast charging sites.

The Nevada Electric Highway (NEH) began as a partnership between the Governor's Office of Energy (GOE), NV Energy, and Valley Electric Association. NEH Phase I was initiated in 2015 to electrify Nevada's highways between Las Vegas and Reno. It outlined five initial sites along US 95 at Fallon, Hawthorne, Tonopah, Beatty, and Indian Springs. Phase I stations include two Level 2 chargers and one direct current fast charger (DCFC) and provide free charging for the first five years of operation. NEH Phase II program was officially kicked off in May 2018, seeking partners to build another 38 EV charging station locations across the state. The Phase II goal included determining whether EV infrastructure on interstate corridors I-80 and I-15 and state highways US 95 and US 50 could be installed to meet the 50-

[44] https://www.alliedmarketresearch.com/autonomous-train-technology-market

mile increment required by the FHWA program. As a result of the NEH program, Nevada is one of the leading voices in the intermountain west for transportation electrification and the Regional Electric Vehicle Plan for the West (REV West) partnership.

Between 2017 to 2021, FHWA solicited nominations from State and local officials to designate Alternative Fuel Corridors (AFCs) to help creating a national network of plug-in electric vehicle (EV) charging and hydrogen, propane, and natural gas fueling infrastructure along national highway system corridors. The designations to date have resulted in a total of 125 nominations, including segments of 134 Interstates along with 125 U.S. numbered highways/State roads, comprises 49 States plus the District of Columbia, covering approximately 165,722 miles of the National Highway System. The FHWA designates nominated highway corridors as either corridor-ready or corridor-pending. Corridor-ready segments contain a sufficient number of fueling facilities to allow for corridor travel with the designated alternative fuel. Corridors that do not have sufficient alternative fuel facilities to support alternative fuel vehicle travel are designated as corridor-pending. Until 2021, FHWA administered the AFC program under the Fixing America's Surface Transportation Act (FAST Act) and the last round of designations occurred in April 2021. During Rounds 1 to 5 of AFC nominations, FHWA designated Interstates 15, 80, 11 and 580, U.S. highways 50, 93, 95, 395, and state routes 28 and 215 as corridor-ready or corridor-pending AFCs. The complete and updated list AFCs can be found on FHWA's website[45].

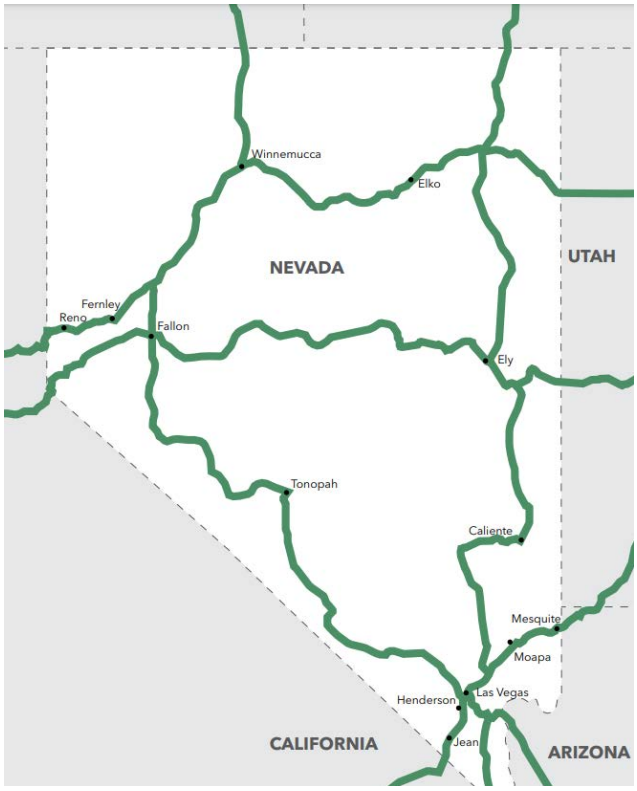

Figure 5-3. Nevada Electric Highway
(Source: NV Energy)

Beginning 2022, the nomination process of AFCs is tied to funding provisions under the Bipartisan Infrastructure Law (BIL). The BIL establishes the National Electric Vehicle Infrastructure Formula Program, and a Discretionary Grant Program for Charging and Fueling Infrastructure. In this respect, FHWA established an AFC grant program and released Round 6 Request for Nomination in February 2022 for designating Electric Vehicle corridors focusing on Interstate corridors. During the designation process, FHWA identifies charging and fueling infrastructure, analyzes standardization needs for fuel providers and purchasers, and reestablishes the goal of achieving strategic deployment of fueling infrastructure in the designated corridors.

[45] https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/all_corridors/

5.3 High-Tech Ultra-Large Ships

Since 2010, it can be observed that the number of container ships is only increasing rather slowly, while the average ship size in terms of nominal capacity continues to rise almost linearly. By using ever larger vessels, liner shipping companies are taking advantage of the economies of scale, which have enabled to continuously reduce costs per twenty-foot equivalent unit (TEU) transported. When operating at full or near full capacity, these mega-vessels have dramatically lower per slot operating costs than their smaller predecessors, in part because they utilize much less fuel per unit. In 2012, ultra-large vessels had a total capacity of approximately 143,000 TEU. As of 2021, more than 160 ultra-large ships with a total capacity of over 3.2 million TEU were in service. These huge vessels will operate primarily in the Asia-to-Europe trade as well as between East Asia and the U.S. West, and to the East Coast via the Suez Canal.

These large vessels have major impacts on the depths of channels needed to receive them as well as on landside terminals and supply networks. Ultra-large vessels require larger cranes that can extend over 22 rows of containers. These new high-volume cargo drops and pickups resulting from even a single ship visit stress current terminal operations, even at ports with the large-scale facilities, such as the San Pedro Bay Ports and the Port of New York and New Jersey. Recent events such as the 2021 Suez Canal obstruction (the six-day blockade of the Suez Canal after the grounding of Ever Given, a 20,000 TEU container ship) revealed environmental and safety risks of deploying these vessels, noticing even the scheduled and typical operations of ultra-large vessels can generate challenges, impacts, and significant costs.

The use of ultra large vessels and the consolidation of business among a few large ocean carriers is a worldwide trend to achieve economies of scale efficiencies in ocean trade. The changes taking place within the port industry will cascade through the international and domestic supply chains and have an impact on the modal services and networks serving Nevada and other inland points. Inland logistics chains, such as those in Nevada, will need to be readjusted to bring new supply and demand patterns into equilibrium as cargo arrives and departs ports in larger and less frequent bunches. The major adjustments and economic costs to the system largely will be felt at the ports and on the first and last miles of access.

5.4 Industrial Automation and Robotics

In addition to autonomous vehicles, industrial automation and robotics in the form of construction automation, automated ports and terminals, warehouse automation, and aviation drones are enhancing productivity and workplace safety, while also improving supply chain efficiency.

5.4.1 Construction Automation

The construction and roadway industry operates at a slower functional product pace than the technology industries over the past decade. Automation and technological advancements have already improved productivity and reduced costs on construction work sites, including roadway constructions. More investments in technology, machinery, and robotics are expected to occur over the next decade to address shortage of construction workers across the nation.

The automated machine guidance (AMG) is one of the technologies that has involved heavy construction equipment guided or controlled using position location information. For highway projects, 3-dimentional design data have typically been used to control dozers, motor graders, trimmers,

excavators, milling machines, and pavers. These systems have been available from multiple vendors in the industry. Iowa DOT has been considered one of the pioneering transportation agencies implementing AMG.

5.4.2 Additive Manufacturing

Additive manufacturing, also known as three-dimensional (3D) printing, is an innovative and transformative approach to industrial production that enables creating of lighter, stronger parts and systems. Using 3D printing technology, a printer reads a digital blueprint and methodically drops building material according to a set of instructions, creating a final product that is built up tiny layer by tiny layer. This new machine-based manufacturing process is revolutionizing the freight industry by helping to reduce the costs and improve efficiencies in all stages of delivering goods to customers, including both production and distribution. In fact, 3D printing is already a major disruptive trend in many industries, and it will certainly continue affecting them in the future.

Some analysts predict companies will soon create and manufacture a vast range of items in entirely new ways, far beyond the confines of traditional factor walls. This direct transfer from blueprint to finished products may revolutionize manufacturing and its supply chain. In effect, it allows individuals, small businesses, and corporate departments to make parts, appliances, tools, and a wide variety of materials right from the workplace or home. The future commercial viability of 3D printing and its mainstream adoption will be dependent on critical success factors such as affordability, material versatility, and the speed and quality of the print.

5.4.3 Automated Ports and Terminals

Port and rail terminal operators are in the process of introducing sophisticated new data-driven terminal management systems (e.g., NAVIS) to better coordinate and manage ship clearance, yard, and gate operations. Almost 40 partly or fully automated ports now do business in various parts of the world, and the best estimates suggest that at least $10 billion has been invested in such projects. The momentum will probably accelerate over the next decade.

Automation in ports and marine terminals has several components. First, it requires large investments across operations like ship to shore, yard operations, ground transportation, and gate automation. Second, it needs control systems and processes that control equipment, make operations smoother, and provide information for decision making. The main component of an automated terminal would be the control tower which coordinates of the entire port, forecast the demand and workflow, and optimizes the management, scheduling and monitoring the equipment and receives real-time feedback from them.

Similarly for rail terminals, once a terminal invested in the infrastructure and equipment to support high-throughput rail operations, automated solutions can be integrated with terminal systems for remote control operation and implemented unmanned wide-span rail-mounted gantry (RMG). While the isolated cost of an automated solution is small compared to total equipment and infrastructure costs, operating risk can be introduced if a solution is not reliable. Common issues include system integration, process mapping and exception management, job scheduling, and the container interchange design for truck and rail. The BNSF Railway recently launched its automated straddle carrier pilot project at its Logistics Park Kansas City (LPKC) Intermodal Facility. LPKC is a world-class inland port with capacity for 17 million square feet of industrial buildings.

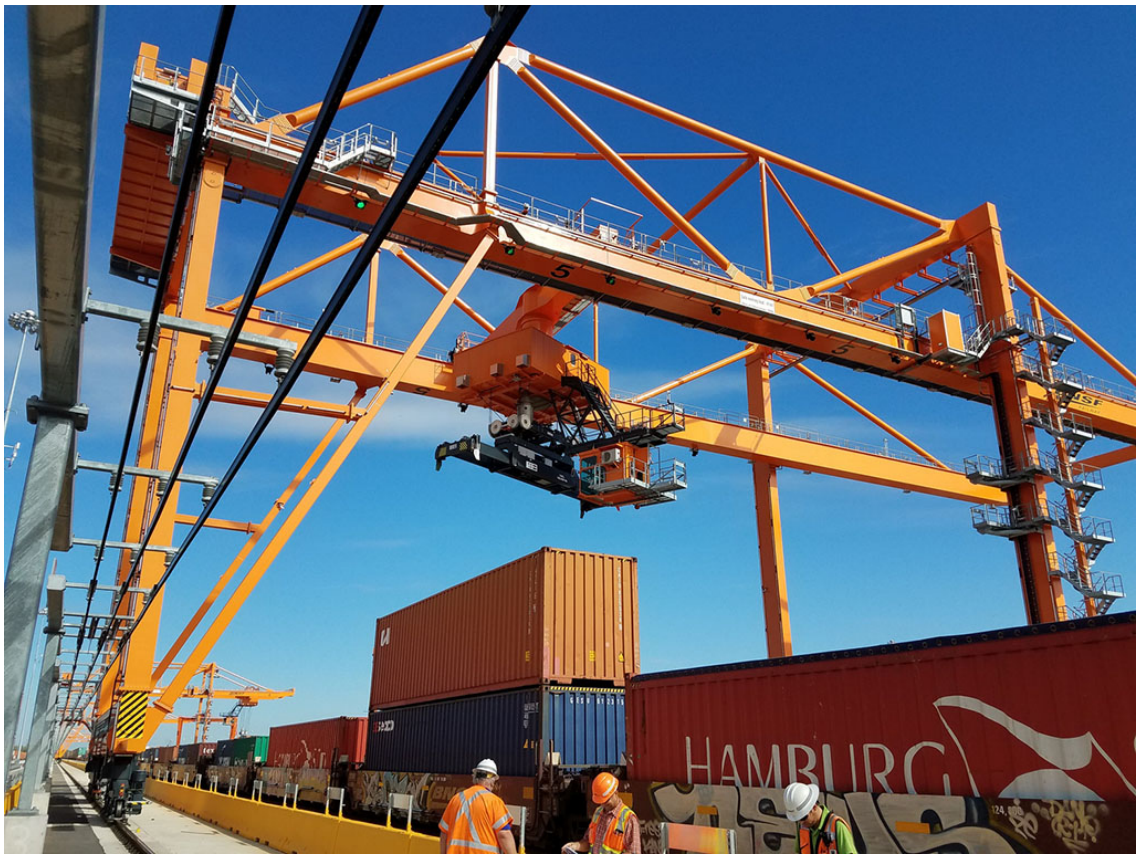

Figure 5-4. BNSF Logistics Park Kansas City Pilot Automation

Source: TranSystems

The implementation of automated systems in marine and rail terminals has not been smooth at ports such as San Pedro Bay, New York and New Jersey, and elsewhere, but it is critical to the long-term management of the handling and transfer of goods from post-Panamax megaships at U.S. ports.

5.4.4 Warehouse Automation

Warehouse automation relies on software and equipment to reduce manual processes and improve the focus on customers and vendors. Automated warehouse management systems are software applications designed to help with day-to-day operations including tracking inventory, packing, picking, and shipping materials. Further, collaborative and autonomous mobile robots (robots working side-by-side with human workers) can reduce errors, increase efficiency, and free up labor and time for other warehouse operations. Automated storage, sorting, retrieval, and fleet management systems are other forms of warehouse automation.

5.4.5 Package Delivery Using Drones

Several companies like Amazon, UPS, Walmart, and Domino's are developing prototype models that would use drones or unmanned aerial vehicles (UAVs) to facilitate e-commerce deliveries. Like autonomous ground surface vehicles, drone manufacturers have demonstrated that the technology is well on its way to practicable development. Drone delivery services has shown sufficient potential that Amazon, Alphabet, and other tech giants are hailing it as the future of E-Commerce fulfillment. Many

major retail and logistics companies around the world are testing drone delivery services and drone delivery systems to solve the problem of “last mile” deliveries.

The FAA regulates air safety and is developing rules for the use of both commercial and non-commercial UAVs. The agency is proceeding cautiously in light of rapidly proliferating incidents where unmanned vehicles fly too close to traditional aircrafts. In December 2015, the FAA issued rules asserting the primacy of a federal framework, and governing matters such as permissible hours of flight, line-of-sight observation, altitude, operator certification, optional use of visual observers, aircraft registration and marking, and operational limits.

The first government-approved drone delivery took flight in July 2015, in which a drone successfully dropped medical supplies to a health clinic in rural southwest Virginia. A NASA plane delivered the medicine to a Wise County regional airport and a Flirtey-operated drone took 24 packages the rest of the way -- to a Remote Area Medical pop-up clinic that offers medical care to area residents one weekend per year at the county fairgrounds.

Amazon began testing delivery drones in 2013, aiming to drop off packages at customers’ doorsteps in 30 minutes or less. In August 2019, the company submitted a petition for FAA approval of those plans. In 2020, Amazon received federal approval to operate its fleet of Prime Air delivery drones. Amazon isn’t the only company seeking to expand commercial drone delivery. Alphabet-owned drone delivery company Wing also received FAA approval for commercial deliveries in the U.S. in 2020. UPS also won approval from the FAA to operate a fleet of drones as an airline.

Figure 5-5. Amazon Prime Air Drone

Source: Amazon

5.5 Urban Consolidation Centers

Transport might be organized efficiently from the perspective of the carrier, but not from the perspective of the city. Shared truck parking/staging areas, referred to as urban consolidation centers (UCCs) in the Best Urban Freight Systems (BESTUFS) Policy and Research Recommendations Report is a last-mile solution to improve truck parking in the urban environment. UCCs are operational concepts that reduce freight traffic circulating within a target area by fostering consolidation of cargo at a terminal. A UCC is a logistics facility that is in the proximity of an urban area, allowing to decouple and bundle inbound freight flows. In most cases, carriers transfer their loads to a neutral carrier that consolidates the cargo and conducts the last leg of the deliveries instead of making separate trips to the target area with relatively low load factors. By consolidating shipments, a UCC may perform last-mile delivery more efficiently than individual carriers.

In 2012, the pilot study for the Toyota City, Japan designed a system to address illegally parked freight vehicles during unloading and loading operations which deteriorated air quality, generated vehicle emissions, increased traffic, and in some instances caused traffic collisions. The results of the pilot program revealed that the number of freight vehicles was reduced by 56 percent near the new parking lot.

The I-15 Corridor through California and Nevada was one of four areas awarded a National Economic Partnerships grant by FHWA to develop an I-15 Freight Mobility Enhancement Plan. One strategy explored was urban truck parking technologies, including UCC. UCCs provide environmental and social benefits from more efficient truck operations, improved planning, and information availability for urban freight systems. In addition, the UCC may dispatch small and environmentally friendly vehicles more suitable for last-mile delivery. The primary disadvantages are potentially high costs associated with setup which may create a monopoly leading to higher costs and legal issues.

5.6 Digital Transformation and Smart Freight Mobility

Smart Freight Mobility has been the research spotlight under a joint modal ‘Smart Roadside’ program between FHWA and the Federal Motor Carrier Safety Administration (FMCSA). The program encompasses technologies for enhanced roadside condition and traffic information-sharing with commercial vehicle for route planning and improved access to intermodal ports, urban pick-up, and delivery locations that are crucial to the missions of the U.S. Department of Transportation. The vision emphasized under this program is one in which commercial vehicles, highway facilities, enforcement resources, intermodal facilities, and other modes on the transportation system collect and share data seamlessly to improve freight’s operational efficiency and mobility. Smart freight mobility includes big data analytics, technologies, and solutions.

Artificial Intelligence (AI) and Internet of Things (IoT) offer freight industry plenty of opportunities for improving efficiency, predictions, and safety. Supply chain management is transforming to use IoT devices and the data they collect to gain greater visibility into warehouses, distribution centers, and in-transit assets. Using AI and IoT, logistics provides can track location, temperature, humidity, and other environmental factors to help ensure that goods are stored under the right conditions.

The freight industry relies on supply chain management. Collaboration of compaclimatenies and stakeholders is a key factor, and the dynamic interchange of information is a need for planning, organizing, and tracking shipments. Cloud computing provides scalability, high availability and reliability compared to the traditional supply chain information management solutions.

The transparency and traceability of the supply chain is vital to enable flexible and dynamic relationships between the stakeholders involved in logistics and freight mobility. Blockchain is a decentralized open-source platform that allows a more efficient, transparent and trustworthy flow of transactions between companies and individuals. It is known as the main authentication and verification technology behind the digital currency that removes the middleman and cutting out the costs, time-lapses, while maintains privacy and security. The blockchain technology for logistics companies helps solve problems like fraud and human error and reduces costs. A blockchain solution eliminates duplication of data entry and the need for multiple reconciliations between parties, enabling multiple organizations to work together and coordinate efficiently.

5.7 Strategies

Indeed, some of the technologies previously mentioned are still far from implementation. However, NDOT has been working to incorporate mature technologies into its projects where practical.

5.7.1 I-15 Freight Mobility Enhancement Plan (MEP)

Supported by a National Economic Partnerships grant by the FHWA, the I-15 Freight MEP identified strategies for improving urban truck parking along the I-15 Corridor and developed an implementation plan that provided guidance on realizing recommendations in partnerships, technology, policy, and funding. The five technology strategies include:

- Develop a Truck Parking Availability System (TPAS) along the I-15 Corridor
- Install static signs indicating upcoming locations for truck parking (pre-TPAS)
- Deploy Smart Urban Parking Zones in/near major logistics center
- Deploy Truck Parking Marketplace mobile application
- Integrate I-15 truck parking locations with I-15 MCOM and regional 511/traveler information systems

Truck Parking Availability System (TPAS)

A Truck Parking Availability Systems (TPAS) is a dynamic signage system that shows upcoming available parking sites, distances, and the number of currently available spots at each site along highways. The TPAS contains sensors at parking facilities that detect and report parking space availability. The truck parking information is then displayed on pre-installed digital signs in real-time. The real-time truck parking information allows drivers to make better decisions and improve the efficiency on roadways.

NDOT is leading the effort to install detection at truck parking sites within the I-15 and I-80 ROWs and corresponding signage along I-15 and I-80 in Nevada.

Source: I-15 Freight Mobility Enhancement Plan; Nevada Truck Parking Implementation Plan

5.7.2 Transportation Systems Management and Operations (TSMO) Plan

Transportation System Management and Operations refer to a series of integrated strategies that optimize infrastructure performance. The TSMO Plan lays out strategies for incorporating TSMO into practices through NDOT. Table 5-1 lists the technology-related tactical elements that NDOT can implement in the near future.

Table 5-1. Nevada TSMO Tactical Elements

TSMO Tactical Elements	Related NDOT Activities
Real-Time Traveler Information	NDOT has been using multiple data sources and partnering with the Regional Transportation Commission of Southern Nevada to monitor and collect traffic data, such as speed, delay, incident response times, and incident clearance times to optimize traffic flows on the roadways.
Connected and Automated Vehicles	NV2X, the newly established innovation division within NDOT, has been developing an overarching strategy for implementing and integrating emerging transportation technologies. NDOT is also actively supporting the connected and automated vehicle initiatives in southern Nevada.
Active Traffic Management (ATM)	NDOT has been implementing ITS devices to support ATM. For example, NDOT constructed multiple Active Traffic Management Systems signs along I-15.
Traffic Incident Management	NDOT has partnered with Waycare and successfully reduced incident response times.
ITS Database and Communications	NDOT's ITS Strategic Deployment Plan identifies ITS device deployment projects (i.e., RWIS, CCTV, DMS etc.) and any required ITS communication infrastructure.

Source: Nevada Statewide Transportation System Management and Operations Plan (2020)

5.7.3 NV2X Research Program

NDOT's NV2X is the innovation office for NDOT. NV2X focuses on developing strategies for the implementation and integration of emerging transportation technologies. Connected and autonomous vehicles are some of the many emerging technologies that NV2X addresses. It includes a research program, which identifies and develops new transportation-based technical knowledge and assists with implementation into common practice. While this division is not freight-specific, the NV2X identifies research needs through solicitation of research problem statements each year.

6. Addressing Impacts of Heavy Vehicles on Road Condition

6.1 Freight-Dependent Industries in Nevada

Important sectors of Nevada's economy are reliant on freight movement. Agriculture and mining are two key components of the state's economy.

The recent energy boom in the United States led to a tremendous increase in the exploration and production of energy resources. The heavy trucks and freight flows necessary to support the energy boom have in some cases led to accelerated deterioration of roads and bridges not originally built for large volumes of heavy trucks. These adverse impacts can be significant. Movement of agricultural products, lumber, and coal by trucks at overweight conditions can also contribute to road and bridge damage.

For more than 150 years, Nevada mining has produced minerals that are key to an innovative and advanced society. Today, more than 20 minerals are mined in the Silver State (see Table 6-1). These minerals are found in thousands of items we use every day and are primarily shipped through the use of heavy vehicles to move the goods from mines to processing facilities across Nevada and throughout the U.S. Electronic devices, methods of transportation, and the buildings we live and work in are just a few examples of how mining benefits our lives. As new technologies continue to change the world, Nevada's original STEM (science, technology, engineering, math) industry will provide the minerals needed to help shape our future.[46]

Nevada houses the only active lithium operation in the United States at Silver Peak Mines.

Agriculture is one of Nevada's most important industries, contributing significantly to the economies of rural communities and the state as a whole (see Figure 6-1). Nevada's ranches may be few in number, but they rank third in the nation in size, averaging 3,500 acres.[47]

[46] Nevada Mining Association, https://www.nevadamining.org/minerals/

[47] Nevada Department of Agriculture, https://agri.nv.gov/Administration/Administration/Agriculture_in_Nevada/

Table 6-1. Summary of 2020 Nevada Mineral Commodity Production

Commodity	Production Amount	Unit	YOY Change (%)	Value ($)	YOY Value Change (%)
Gold	4,632,690	ounces	-4.8%	$8,198,192,912	20.9%
Silver	6,127,438	ounces	-2.5%	$125,888,212	23.6%
Barite (shipped from mills)	166,136	tons	-3.5%	$23,850,943	-51.8%
Copper	154,264,931	pounds	7.3%	$431,941,807	10.5%
Diatomite	419,893	tons	52.1%	$50,859,212	6.9%
Dolomite	37,075	tons	-16.7%	$4,346,029	-4.4%
Gypsum	2,416,743	tons	25.2%	$41,371,950	43.6%
Limestone (Incl. Lhoist Dolomite)	3,220,860	tons	-15.8%	$34,676,174	-6.7%
Lithium compounds (shipped)	6,902,966	pounds	-12.5%	$28,540,089	-20.8%
Magnesium compounds (shipped)	124,088	tons	4.7%	$8,584,903	34.0%
Molybdenite	426,538	pounds	-44.4%	$3,868,700	-57.3%
Perlite	2,715	tons	22.7%	$668,199	-3.8%
Salt (shipped)	15,042	tons	-38.7%	$511,428	-38.7%
Silica sand (shipped)	570,097	tons	-7.7%	$14,323,690	-17.2%
Specialty clays	191,689	tons	60.9%	$11,152,387	-19.6%
Geothermal energy (sold)	3,961,951	megawatt hours	2.7%	$313,956,383	1.0%
Oil (sold)	218,372	barrels	-17.3%	$7,329,877	-47.8%
Aggregates	24,700,000	tons	-26.3%	$197,000,000	-22.7%
				$9,497,062,895	

Notes:

$ Values are as reported to Taxation, except:

Gold = NDOM # times 2020 avg. price $1,769.64/oz. (Kitco)

Silver = NDOM # times 2020 avg. price $20.545/oz. (Kitco)

Copper = NDOM # times 2020 avg. price $2.80/lb avg. (USGS)

Moly = NDOM # times 2020 avg. price $9.07/lb (USGS)

Aggregates = Source USGS Mineral Industry Survey

Geothermal gross revenue as reported from Taxation

Source: State of Nevada Division of Minerals, https://minerals.nv.gov/uploadedFiles/mineralsnvgov/content/Programs/Mining/2020_Summary_of_Nevada_Mineral_Commodity_Production.pdf

2021 STATE AGRICULTURE OVERVIEW

Nevada

† Survey Data from Quick Stats as of: Apr/25/2022

Farms Operations†

Farm Operations - Area Operated, Measured in Acres / Operation	1,794
Farm Operations - Number of Operations	3,400
Farm Operations - Acres Operated	6,100,000

Livestock Inventory †

Cattle, Cows, Beef - Inventory (First of Jan. 2022)	244,000
Cattle, Cows, Milk - Inventory (First of Jan. 2022)	31,000
Cattle, Incl Calves - Inventory (First of Jan. 2022)	445,000
Cattle, On Feed - Inventory (First of Jan. 2022)	3,000
Sheep, Incl Lambs - Inventory (First of Jan. 2022)	60,000
Hogs - Inventory (First of Dec. 2021)	2,500

Milk Production †

Milk - Production, Measured in Lb / Head	24,545
Milk - Production, Measured in Lb	810,000,000

Crops - Planted, Harvested, Yield, Production, Price (MYA), Value of Production †
Sorted by Value of Production in Dollars

Commodity	Planted All Purpose Acres	Harvested Acres	Yield	Production	Price per Unit	Value of Production in Dollars
HAY						
HAY		340,000	3.99 TONS / ACRE	1,357,000 TONS	190 $ / TON	255,755,000
HAY, ALFALFA		210,000	5.1 TONS / ACRE	1,071,000 TONS	191 $ / TON	204,561,000
HAY, (EXCL ALFALFA)		130,000	2.2 TONS / ACRE	286,000 TONS	179 $ / TON	51,194,000
HAY & HAYLAGE						
HAY & HAYLAGE						255,755,000
HAY & HAYLAGE, ALFALFA	11,000					204,561,000
HAY & HAYLAGE, (EXCL ALFALFA)						51,194,000
CORN						
CORN	15,000					
CORN, SILAGE		14,000	26 TONS / ACRE	364,000 TONS		

(NA) Not Available
(D) Withheld to avoid disclosing data for individual operations
(S) Insufficient number of reports to establish an estimate
(X) Not Applicable
(Z) Less than half the rounding unit

Figure 6-1. Nevada Agriculture Data Review for 2021

Source: https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=NEVADA

6.2 Performance Targets for Highway Pavement Conditions

According to NDOT's Performance Management Report, December 2021, the Department was able to meet the performance targets for pavement condition for categories 1 and 3 but was unable to meet the performance targets for categories 2, 4, and 5 roadways to bring them up to the minimum target level (see Figure 6-2). To maintain the roadway network in fair or better condition, the Department performs rehabilitation work on the roadways each year. To increase the percentage of pavements in "fair or better" condition, rehabilitation work must exceed the rate of deterioration of the pavement on all roads.

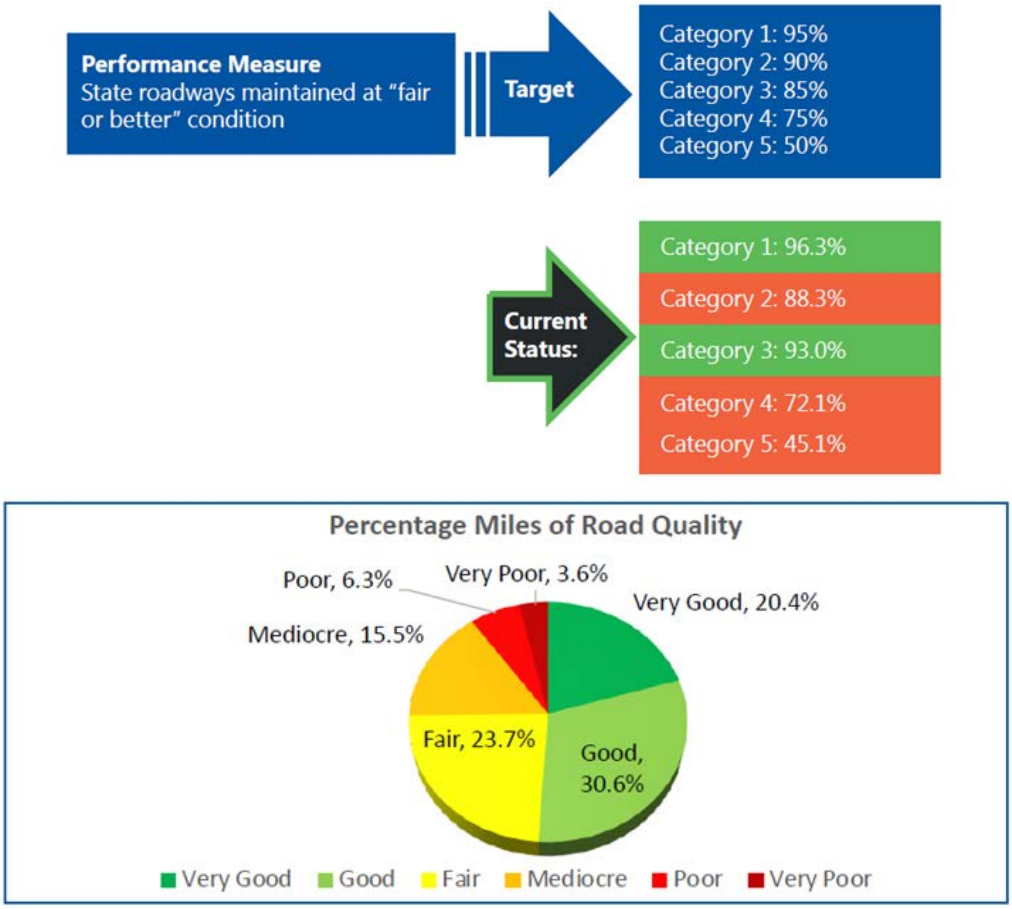

Figure 6-2. Performance Targets for Highway Pavement Conditions

Proactive approach in pavement preservation has a huge benefit in maximizing limited funds. Being proactive instead of reactive is more cost effective (4:1) in utilizing transportation project dollars. Pavement condition is also directly related to user vehicle maintenance and safety, and highway capacity. This performance measure works towards meeting the NDOT's Strategic Plan goals: safety first, efficiently operate and maintain the state transportation system to effectively preserve and manage our assets is the corner stone to the Department's pavement preservation program.

6.3 Pavement Management Challenges of Heavy Freight Vehicles

According to the Council of Supply Chain Management Professionals' 2020 State of Logistics Report, the annual logistics costs equal to more than 7.6 percent of the US GDP. Trucks carried 57.7 percent of the value of the freight, followed by rail, 16.2 percent; pipeline, 10.6 percent; vessel, 3.9 percent; and air, 4.7 percent. The surface transportation modes of truck, rail, and pipeline combined carried 84.5 percent of the value (source: Bureau of Transportation Statistics, 2017 North American Freight Numbers). Hence, NDOT and the traveling public often question what impact truck traffic has on the condition and service life of roadway pavements.

Pavement service life is a function of many parameters. The parameters of most consequence are the smoothness of the road and the amount of heavy truck loads that the pavement experiences. New

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

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

Progress towards the previously established pavement condition goal of 95 percent of all roads in fair or better condition was not being made with the funding available (see Figure 6-3). New performance goals were put in place that are both achievable and provide levels of service appropriate for each category. As part of the commitment to meet these new goals, funding levels have also been increased beyond what has been historically provided.

Performance Measure		Target	Current Status	Target Met	Trend (5yrs or less)	Desired Trend
Maintain State Highway Pavement (8)	State roadways maintained at "fair or better" condition (Road category definition in report)	Category 1: 95%	96.4%			
		Category 2: 90%	88.3%			
		Category 3: 85%	93.0%			
		Category 4: 75%	72.1%			
		Category 5: 50%	45.0%			

Figure 6-3. NDOT's Pavement Maintenance Performance, 2021 Performance Management Plan & Performance Measures

Source: Performance Analysis Division, Nevada Department of Transportation, 2021 Performance Manager Report

6.3.1 Strategies to Manage Heavy Freight Vehicles on Roadways

Nevada has developed and implemented many strategies to better accommodate heavy freight vehicles on its roadways. NDOT has identified and built many miles of passing and climbing lanes on rural freight corridors around the state and has developed a process to prioritize future passing lane locations, including the importance of freight routes.

Finally, NDOT's traffic engineering and design divisions include design provisions for freight routes that NDOT has implemented including providing wider shoulders on freight corridors, using signal timing plans that allow for vehicles that need extra time when starting, longer turning lanes to allow for vehicle length, and turning radii that accommodate longer combination vehicles.

Specific maintenance treatments vary by roadway, functional class and condition and are too specific for this plan. Although 5,421 miles of state roads are in fair or better condition (see Figure 6-4), allocating additional funds toward these critical freight-dependent routes/facilities will be necessary to help improve/maintain deterioration of these important freight corridors.

Category	1	2	3	4	5
Description	Interstates, freeways, and expressways with limited access and high traffic speeds	High traffic volumes and heavy truck loads	Relatively high traffic and truck loads	Lower volume state routes	Roads with low traffic volumes
Example	I-15	SR 146 (Clark County), SR227 (Elko County)	SR157 (Clark County), and SR028 (Douglas County)	SR158 (Clark County) and SR228 (Elko County)	SR121 (Churchill County), and SR229 (Elko County)
2017	99.3%	95.7%	95.6%	69.3%	30.1%
2026	97.9%	54.3%	21.2%	5.2%	10.8%
Performance Target	95% Fair or Better	50% Fair or Better	20% Fair or Better	5% Fair or Better	5% Fair or Better

Figure 6-4. Predicted Pavement Conditions (Percent Fair or Better), 2017 vs. 2026

Source: Nevada Department of Transportation, One Nevada Transportation Plan

Freight projects along with state's other multimodal needs, are prioritized by NDOT within the One Nevada Transportation Plan, the state's long-range transportation plan. The One Nevada Transportation Plan is built on a foundation of six critical goal areas as shown in Figure 6-5. These goals encompass an array of transportation issues and opportunities and reflect the priorities of Nevada's public and transportation partners. Many of the state's freight projects have traditionally prioritized high as they met several (if not all) of these goal areas.

Figure 6-5. One Nevada Transportation Plan Six Critical Goal Areas

6.3.2 Viability of Shifting Freight to Other Modes

Diverting freight from truck to other modes is a potential method of managing heavy vehicles in Nevada through decreasing the number of truck trips for the state. However, because many of the heavy trucks are used to support the mining industry, there would need to be rail infrastructure at mining locations for diversion to the rail mode to occur efficiently. Currently, the majority of Nevada's mine locations do not have rail infrastructure, which results in trucks being the most viable goods movement option.

6.3.3 Waterways, Ports, and Railroads to Accommodate Heavy Freight

With no navigable waters in Nevada, waterways do not factor into Nevada's freight infrastructure. However, Union Pacific Railroad's freight operations in Nevada handles an array of important commodities, including coal, chemicals, aggregates, lumber and consumer goods. Union Pacific serves Nevada with two separate operations split between two main lines that run across the state. One main line spans Northern Nevada, linking central California with Salt Lake City. The second runs through the southern part of the state, including Las Vegas. That line connects Los Angeles-Long Beach with Salt Lake City and Union Pacific's transcontinental line to eastern destinations.

In Northern Nevada, opportunities in the growing warehouse industry are made possible by the state's freeport laws. In Southern Nevada, Union Pacific operations are a link to markets for the industrial complex in Henderson, near Las Vegas.

From 2017-2021, Union Pacific invested $240 million strengthening Nevada's transportation infrastructure. The Ports of Los Angeles and Long Beach are Nevada's primary ocean global gateways, with the Port of Oakland in northern California sharing in a lesser capacity in Nevada's international and Pacific Rim intermodal business.

7. Freight Mobility Locations and Strategies

7.1 Freight Bottlenecks

Compared to most states in the U.S., Nevada has a relatively small amount of truck bottleneck locations. The American Transportation Research Institute develops an annual list of the top 100 truck bottlenecks in the U.S. Nevada has just one location on this list – the interstate interchange between I-15 and I-515 in Las Vegas which ranked as the 81st largest truck bottleneck in 2021. Based on ATRI's methodology, this location has an average speed of 49.2 miles per hour during the afternoon peak period, a 5.2 percent increase relative to 2019.

Within the state of Nevada, NPMRDS data was used to find the segments with the highest amount of truck delay. Figure 7-1 shows the locations of highway segments where trucks averaged less than 40 mph during the afternoon peak period.

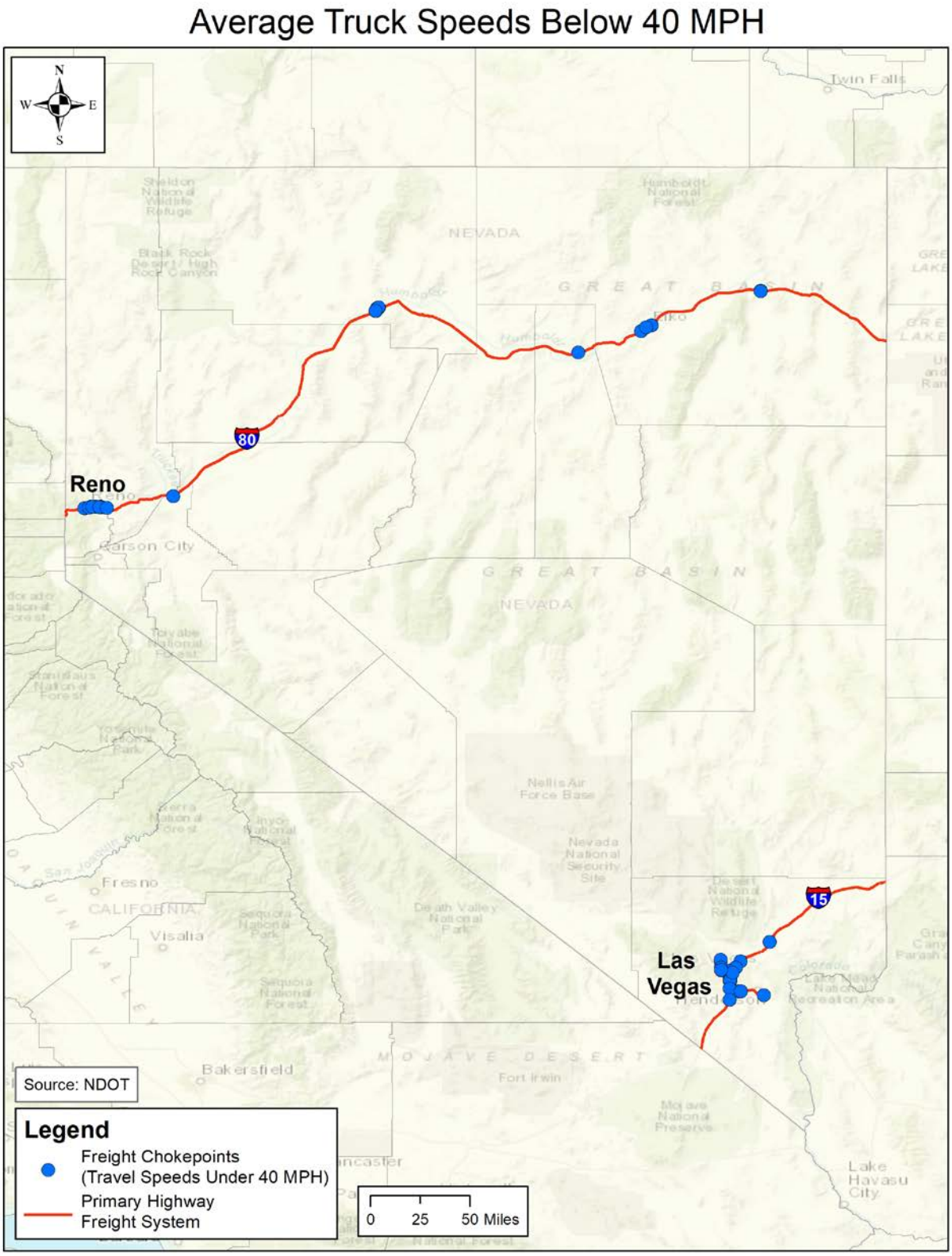

Figure 7-1. Congested Bottleneck Segments

Using NPMRDS data, the total amount of truck traffic at each location was measured by average annual daily truck traffic (see Table 7-1).

Table 7-1. Most Heavily Congested Truck Bottleneck Locations

Roadway	Direction	Interchange or Intersection	AADTT
I-15	SOUTHBOUND	CHARLESTON BLVD/EXIT 41	20,791
I-15	SOUTHBOUND	SAHARA AVE/EXIT 40	20,791
US-95	SOUTHBOUND	I-15/EXIT 76B	18,442
I-515	NORTHBOUND	EASTERN AVE/EXIT 73	13,209
I-515	NORTHBOUND	LAS VEGAS BLVD/EXIT 75	13,209
I-515	SOUTHBOUND	I-15/EXIT 76A	13,209
I-580	NORTHBOUND	US-50	2,344
I-580	SOUTHBOUND	US-50	2,344
DOUBLE R BLVD	NORTHBOUND	S MEADOWS PKWY	2,260
DOUBLE R BLVD	SOUTHBOUND	DAMONTE RANCH PKWY	2,260
DOUBLE R BLVD	SOUTHBOUND	S MEADOWS PKWY	2,260
I-580	SOUTHBOUND	FAIRVIEW DR	2,078
NV-343	NORTHBOUND	I-80	1,990
NV-343	SOUTHBOUND	I-80	1,990
NV-343	SOUTHBOUND	US-50 ALT	1,990
US-50	EASTBOUND	NV-207/KINGSBURY GRADE	1,757
US-50	WESTBOUND	CA--NV STATE BORDER	1,757
VISTA BLVD	NORTHBOUND	E PRATER WAY	1,696
VISTA BLVD	SOUTHBOUND	I-80	1,696
DAMONTE RANCH PKWY	EASTBOUND	I-580	1,672
DAMONTE RANCH PKWY	EASTBOUND	S VIRGINIA ST	1,672
DAMONTE RANCH PKWY	WESTBOUND	I-580	1,672
DAMONTE RANCH PKWY	WESTBOUND	S VIRGINIA ST	1,672
NV-146	SOUTHBOUND	S EASTERN AVE	1,583
NV-146	SOUTHBOUND	SEVEN HILLS DR/SPENCER ST	1,583

7.2 Strategies

Although the Nevada Highway Freight Network (NHFN) routes are in very good shape with regards to safe and efficient freight movement, many routes that link freight centers with these networks may need improvement. While some of these routes are state highways, many are roads and streets that are locally maintained; requiring greater multi-jurisdictional collaboration. The majority of facilities with freight mobility issues are found in Nevada's urbanized areas of Las Vegas and Reno/Sparks.

7.2.1 Methodology for Identifying Freight Mobility Issues

Feedback from representatives of the trucking and railroad industries help identify overall freight mobility issues and sometimes even specific locations. NDOT's Freight Advisory Committee (FAC) also provides insight on identifying freight mobility issues across the state.

A freight mobility issue is a situation where external forces interfere with the operational ability, roadway capacity, safety, or mobility of freight. Often, a project aimed at addressing one of these challenges, will yield benefits for another. For example, by constructing needed truck chain-up areas, safety, mobility and operational metrics all improve.

7.2.2 Inventory of Freight Mobility Issues

The majority of the freight mobility issues are related to Nevada's current and future number one freight mode – trucks. Addressing these highway issues will benefit truck freight, truck to rail freight, truck to air freight, and truck to pipeline multimodal operations.

It is worth noting that only one roadway in Nevada appears on the American Transportation Research Institute's (ATRI) 2021 list of the Top 100 Truck Bottlenecks in the United States. The location is the interstate interchange between I-15 and I-515 in Las Vegas, which is ranked as 81st largest truck bottleneck in 2021. This is a testament to NDOT's continued dedication and ongoing efforts to address freight mobility issues.

This section explores types of freight mobility issues within the state. Chapter 9 provides a specific list of freight improvement projects to help address the issues introduced in this section.

7.2.3 Highway

There are many highway freight challenges and needs that will benefit trucking and the efficient movement of highway freight. The design elements will not only benefit trucks, but it will work well for RVs and automobiles. When designing highways, it is important to keep in mind that if the highway is designed for automobiles, it may not work for trucks. However, if you design it for trucks, it will easily accommodate RVs and automobiles.

7.2.3.1 Interchange and Intersection Design

Routes that feature a high percentage of truck traffic are often not designed with trucks in mind. Often intersections along these roadways feature narrow turning radii that require trucks to cross into other lanes of traffic to complete a turn. Potential solutions include the following:

1. Increase turning radii at intersections along the Nevada Highway Freight Network.
2. Increase turning radii at intersections near warehouses, freight centers, truck stops, and other truck facilities.

7.2.3.2 Signal Timing and Turn Lane Lengths

Traffic signal timing along these truck routes are often not calibrated to account for the slower acceleration speed of trucks, resulting in travel delay. Similarly, turn lanes are often not long enough to permit the queuing of multiple trucks from the travel lane. Potential solutions include the following:

1. Calibrate traffic signal timing to better enable truck movement.
2. Increase the length of turn lanes at key locations near warehouses, freight centers, truck stops, and other truck facilities.

7.2.3.3 Acceleration and Deceleration Lanes

The Nevada Highway Freight Network is largely comprised of roadways with higher speed limits. Heavier vehicles such as trucks are slower when accelerating or decelerating. A traffic safety hazard is created when two streams of vehicles traveling at different speeds are forced to merge. In some locations, there is not adequate space for a truck to sufficiently decelerate in order to safely execute a turn without interfering with through-traffic. At other locations, merging trucks impede the flow of traffic because they are forced to merge into higher speed traffic without being able to accelerate to match the posted speed limit. Potential solutions include the following:

1. Construct acceleration/deceleration lanes at locations featuring high turning volumes for trucks on the Nevada Highway Freight Network.
2. Fully pave the shoulders of routes along the Nevada Highway Freight Network and intermodal connectors.

7.2.3.4 Insufficient Capacity at Freight Centers

At key junctions within the Nevada Highway Freight Network there are concentrations of warehousing and distribution centers. Naturally these roads have a high percentage of truck traffic that is only expected to increase as a result of Nevada's projected economic development trends. Many of these routes experience regular traffic congestion when demand exceeds the roadway's capacity. Travel delay also occurs along intermodal connector routes and impacts the mobility of freight traveling by non-highway modes. Potential solutions include the following:

1. Add additional travel lanes to alleviate traffic hot-spots near concentrations of industrial parks and warehouses.
2. Improve interchange and roadway geometry to better accommodate truck traffic.

7.2.3.5 Climbing and Passing Lanes

Nevada is a state comprised of rugged mountainous terrain that impacts many of the Nevada Highway Freight Network routes. This reality combined with the majority of freight being moved by trucks results in travel delay due to slower truck operating speeds when ascending or descending grades. Similarly, when one truck is attempting to pass a slower truck, it may obstruct the movement of other vehicles. NDOT has made it a focus to identify these locations and construct climbing lanes on interstate highways and passing lanes on non-interstate highways on the Nevada Highway Freight Network. Many

of these climbing and passing lanes can be addressed with estimated costs of less than five million dollars per location. Potential solutions include the following:

1. Continue to identify locations on interstates to construct climbing lanes.
2. Continue to identify locations on rural, two-lane highways to construct passing lanes.

7.2.3.6 Long-Term Truck Parking

Nevada's proximity to major freight origins in the western United States causes many long-haul truck drivers to frequently hit their DOT-mandated break times within the state boundaries. As a result, drivers are faced with a dilemma: park in unsafe locations when there is not available truck parking or illegally drive to find such parking. In 2019 NDOT completed a statewide truck parking study that researched this issue and identified ways that NDOT can work to alleviate these issues. To address areas with shortages of truck parking spaces, NDOT is exploring the expansion of public rest area facilities and truck parking only locations to expand truck parking capacity. Potential solutions include the following:

1. Continue to construct new truck parking locations on the Nevada Highway Freight Network.
2. Continue to construct additional truck parking location at existing rest areas on the Nevada Freight Network.
3. Coordinate with the private sector truck stop owners and operators about the need and location for additional long-term truck parking.
4. Pursue public-private partnerships to construct additional long-term truck parking.
5. Work with warehousing operators at larger freight centers to expand truck parking opportunities near or at their facilities.

7.2.3.7 Chain-Up Areas

The Nevada Highway Freight Network traverses mountainous terrain in several locations and truckers must contend with winter precipitation for several months of the year. Thus, segments of these routes require truckers to apply tire chains before proceeding. Unfortunately, many of the required chain-up highway segments either do not provide chain-up areas or are insufficient in scale to accommodate the application of tire chains by truckers. Thus, drivers are often faced with a challenging dilemma: risk causing congestion and a fine when they become stuck after not applying tire chains or create congestion when unable to adequately park outside of the travel lane while applying chains. Potential solutions include the following:

1. Continue to identify locations where truck chain-up areas are needed.
2. Construct new chain-up areas featuring lighting and pavement.
3. Expand chain-up capacity at existing busy chain-up locations.

7.2.3.8 Truck Routes

Interstates and state highways comprise the Nevada Highway Freight Network. However, truck mobility can be hindered by an absence of truck routes connecting major freight routes to freight origins or destinations. Potential solutions include the following:

1. Develop a freight toolbox for local government that provides information about truck routes.
2. Collaborate with communities to establish designated truck routes on non-state-maintained facilities.

7.2.4 Railroads

Railroads form another significant portion of Nevada's freight mobility portfolio. Many of the mobility issues related to railroads relate to highway-rail grade crossings and the delays caused by long freight trains or by freight trains switching operations.

7.2.4.1 Grade Separated Highway-Rail Grade Crossings

The movement of freight rail at select locations in Nevada where roadways cross railroads can interfere with the mobility of trucking and other non-freight modes of transportation including cars, transit, bicyclists and pedestrians. One means of avoiding this conflict is separating the roadway and railroad by constructing a bridge for either the roadway or railroad. Doing so also improves the mobility of train traffic since grade separation may eliminate the need to reduce speed when approaching an at-grade crossing. Further, roadway traffic is not stopped for long periods of time waiting for the train to pass. Potential solutions include the following:

1. Identify locations where grade separated railroad crossings are needed.
2. Construct grade separated crossings as identified.

7.2.4.2 Rail Intermodal Terminals, Transload Facilities, and Yards

Union Pacific Railroad has two intermodal terminals in Nevada – the Las Vegas Intermodal Terminal and the Sparks Intermodal Terminal. They also have two major transload facilities – the Moapa Transload Facility and the Pan Western Transload Facility. Union Pacific also has three major rail yards – Arden Yard, Sparks Yard, and Elko Yard. The length of the rail yards can sometimes affect vehicle routing. Further, Union Pacific has implemented a new operating model called Precision Scheduled Railroading (PSR), which is focused on moving long trains in order to maximize capacity and yield the greatest efficiency. Longer trains are a major safety concern for communities. The length of an average freight train is 6,000 feet. Union Pacific is running trains in Nevada that are more than 10,000 feet in length. Highway-rail grade crossings are being occupied for much longer than normal. This creates additional travel delay, impacts to air quality, affects emergency response times, and initiates unsafe motorist and pedestrian behavior at railroad crossings.

1. Construct grade separated crossings at highway-rail grade crossings where high volumes of train and truck traffic exist.
2. Consider identifying routes that avoid crossing at rail yards and terminals.

7.2.5 Pipelines

Some pipeline terminals are a form of multimodal freight connection since they combine truck freight service with pipelines. Most freight mobility challenges are related to roadway improvements that will better facilitate the movement of Nevada's current and future number one freight mode – trucks. Some of the accesses are intermodal connectors that have highway needs associated with interchange and intersections design, turning radii, signal timing, turn lane lengths, and acceleration and deceleration lanes. Pipelines are private infrastructure and are not constructed or maintained by NDOT, yet coordination with the pipeline industry is necessary for them to obtain permits for boring under roadway infrastructure. Potential solutions include the following:

1. Identify highway needs on intermodal connectors accessing the pipeline terminals.
2. Continue to coordinate with the pipeline industry on safety and highway improvement needs.

7.2.6 Aviation

The two primary air cargo hubs in Nevada are located at the Marnell Air Cargo Center at the Harry Reid International Airport in Las Vegas and the Reno-Tahoe International Airport. Separating accesses for air cargo and passenger service could provide more efficient access to air cargo by separating truck traffic from automobile traffic. Potential solutions include the following:

1. Identify highway needs on intermodal connectors accessing the air cargo terminals.
2. Coordinate with the NDOT Aviation Planning Section, Harry Reid International Airport, Reno-Tahoe International Airport, and the Federal Aviation Administration (FAA) on future air cargo access needs.

7.2.7 Seaports

Although an inland state, Nevada depends on several major West Coast seaports to link it with the rest of the world. Nevada primary global gateways are in California. The Las Vegas Intermodal Yard provides direct rail intermodal freight service to the ports of Los Angeles and Long Beach, while the Sparks Intermodal Yard has direct rail service to the Port of Oakland. Labor relations, environmental standards and freight mobility issues affects intermodal freight through these seaports can affect businesses in Nevada. Potential solutions include the following:

1. Continue to monitor issues impacting Nevada freight movement through West Coast seaports.

8. Freight Travel Time Reliability

8.1 Delays Caused by Truck and Rail Movement

Truck and rail freight traffic increases travel delay experienced across the freight transportation system. Trucks are a significant portion of the total traffic on congested urban roadways in the morning and afternoon peak periods. Table 8.1 shows the roadway segments in Nevada that have total traffic over 100,000 vehicles per day, delay per vehicle of 0.005 hours or higher, and truck percentages of over 10 percent of the total traffic. At each of these locations, the data indicate that truck traffic is a significant contributor to the overall delay experienced by all vehicles in the traffic stream. At these locations, strategies that reduce truck delay or demand for trucking services will likely also reduce overall vehicular delay.

Table 8-1. Roadway Locations Where Truck Traffic Causes Delay for Other Travel Modes

Roadway	DIR	Interchange or Intersection	Average Annual Daily Traffic	Delay per vehicle during PM peak	Truck Percent of Total Daily Traffic
I-15	SB	SAHARA AVE/EXIT 40	305,812	0.007	14.5%
I-15	NB	WILBER CLARK DESERT INN WEST RD	296,226	0.006	14.4%
I-15	SB	CHARLESTON BLVD/EXIT 41	285,773	0.018	14.6%
US-95	SB	I-15/EXIT 76B	255,000	0.039	14.5%
I-515	SB	I-15/EXIT 76A	183,000	0.013	14.4%
I-515	NB	LAS VEGAS BLVD/EXIT 75	157,955	0.015	16.7%
I-515	NB	CHARLESTON BLVD/EXIT 72	155,626	0.006	17.0%
I-515	NB	EASTERN AVE/EXIT 73	154,000	0.061	17.2%

Freight rail movement impacts other travel modes primarily through its operation at locations where the track intersects with the road network. At these crossing locations, cars and other vehicles must wait for trains to cross causing delay to the roadway system. These crossings are also locations of increased crash incidents for cars, trucks, bicyclists, and pedestrians. Table 8.2 shows the at-grade rail crossings in Nevada where there are more than ten trains per day and 10,000 or more road vehicles per day. Infrastructure improvements at these locations have the potential to increase mobility and safety for multiple modes of traffic in Nevada.

Table 8-2. At-Grade Crossing Locations Where Rail Traffic Causes Delay for Other Travel Modes

Crossing ID	City Name	Street	No. of Trains	AADT	Trucks	School Buses
913212B	LAS VEGAS	SPRING MOUNTAIN ROAD	13	78,000	3,120	0
804208L	LAS VEGAS	SAHARA AVENUE	13	62,000	620	0
804002L	NORTH LAS VEGAS	CHEYENNE AVENUE	25	54,500	1,090	0
906354A	LAS VEGAS	TROPICANA AVENUE	13	53,500	1,605	0
804207E	LAS VEGAS	SPRING MOUNTAIN	20	53,000	4,770	0
804190D	LAS VEGAS	CHARLESTON BOULEVARD/NV 159	13	48,500	3,395	0
804003T	NORTH LAS VEGAS	CRAIG ROAD	22	41,500	4,980	32
913211U	LAS VEGAS	DESERT INN ROAD	13	35,000	1,400	0
740743S	SPARKS	MCCARRAN BOULEVARD	15	30,500	1,220	0
753563G	RENO	MCCARRAN BOULEVARD	15	26,000	1,820	0
740724M	RENO	KEYSTONE AVENUE	16	24,000	1,440	30
740735A	RENO	WELLS AVENUE	15	22,000	1,540	0
924131G	RENO	KEYSTONE AVENUE	15	21,500	1,075	0
906355G	LAS VEGAS	WASHINGTON AVENUE	20	15,500	775	0
804121V	LAS VEGAS	BLUE DIAMOND ROAD	20	15,200	1,368	18
804209T	LAS VEGAS	West Wyoming Avenue	14	15,200	760	2
906533R	PARADISE	West Desert Inn Road	14	15,000	750	0
740741D	SPARKS	KIETZKE LANE	15	14,500	1,015	0
922522U	LAS VEGAS	TWAIN ROAD	13	14,500	725	0
740731X	RENO	VIRGINIA STREET	16	13,900	834	2
804206X	LAS VEGAS	TROPICANA AVENUE	20	12,600	630	0
740798E	WINNEMUCCA	HANSEN STREET	10	12,500	875	0
740732E	RENO	CENTER STREET	16	11,700	585	2
740730R	RENO	SIERRA STREET	16	11,700	234	7
740728P	RENO	ARLINGTON AVENUE	16	10,800	216	6
924138E	RENO	VIRGINIA STREET	15	10,500	420	0
804001E	NORTH LAS VEGAS	CAREY AVENUE	25	10,000	500	0

8.2 Mobility Strategies

To address truck bottlenecks, NDOT will engage in the following activities:

8.2.1 Capacity Enhancements

Any roadway capacity enhancement project will also provide benefits for truck-borne freight. The American Transportation Research Institute uses GPS-based datasets to identify and rank the top 100 most significant truck bottlenecks in the United States. One location in Nevada appears on this list: the I-15 and I-515 interchange in Las Vegas. In the 2021 list, the interchange appeared at the bottom of the list at position 100. However, in the 2022 list the interchange advanced to position 81. As of this writing, there are ongoing capacity improvements to I-515 at the interchange.

Bottlenecks to truck movement are identified using the insight of public agency and private sector partners. The NDOT Freight Advisory Committee brings together public sector agencies with private sector partners quarterly. These committee meetings open direct lines of communication between representatives with on-the-ground experience with bottlenecks—such as the Nevada Highway Patrol and the Nevada Trucking Association to name a few—and NDOT project development.

8.2.2 Incident Clearance Improvements

8.2.2.1 Traffic Incident Management Program

The Traffic Incident Management (TIM) Program removes incidents from Nevada's highways and restores normal travel operations as safely and quickly as possible. It is a coalition of partner agencies that include NDOT, Nevada Highway Patrol, and local authorities.

8.2.2.2 Freeway Service Patrol[48]

The Freeway Service Patrol (FSP) program operates in the Las Vegas and Reno metropolitan areas to mitigate traffic congestion on the heavily traveled sections of freeways by providing quick and safe incident clearance of mitigations such as: crashes, disabled and abandoned vehicles, debris, lost or sick motorists, pedestrians, animals, scene safety, and other situations that disrupt traffic flow such as fires and hazardous spills. The NDOT FSP program is unique because each patrol vehicle is equipped with a fleet management system that leverages machine learning technology to predict where incidents are likely to occur based on real-time traffic flows, weather conditions, and crowdsource information. As a result, FSP drivers can proactively respond to incidents, minimize traffic disruptions, and keep traffic flowing for improved transportation system reliability and safety.

A component that the FSP Program is not optimally equipped to assist with is the quick clearance of commercial truck vehicles. In 2022, the Department will be evaluating the merits of implementing a Towing and Recovery Incentive (TRIP) Pilot Program in Las Vegas to complement the FSP Program. The focus of the pilot will be standardizing heavy-duty towing company response and facilitating the safe and quick clearance of commercial vehicle crashes on the Interstate System. Furthermore, if the TRIP Pilot Program is successful, the Department plans to fully implement and expand the program as necessary. The tables below reflect the 2020 facts and figures for the Las Vegas and Reno FSP Program from the Nevada Department of Transportation 2021 Annual Report.

Table 1: General Information

Freeway Service Patrol	Las Vegas	Reno
Number of Routes	13	3
Number of Centerline Miles	93	36

Interesting Fact #1: FSP routes, hours of operation, and coverage limits are monitored and adjusted regularly to optimize program efficiency and keep up with traffic flow

[48] Source: Nevada Department of Transportation 2021 Annual Report, https://www.dot.nv.gov/home/showpublisheddocument/20252/637825276821600000

demands. In July of 2020, FSP coverage was modified in Las Vegas from 87 to 93 centerline miles because there was a need for increased coverage along I-15 between Blue Diamond Road and St. Rose Parkway.

Table 2: Mitigation Data

Mitigations	Las Vegas	Reno
Abandoned Vehicle	4,208	1,340
Crash	3,285	1,056
Debris	2,146	834
Disabled Vehicle	20,990	4,599
Left on Arrival	2,789	1,804
Other	882	448
Scene Safety	8,418	3,167
Total Mitigations	**42,718**	**13,248**

Interesting Fact #2: Nearly 45,000 incidents are mitigated in Las Vegas and 15,000 incidents are mitigated in Reno each year. The most common type of incidents are disabled vehicles, which consist of flat tires, electrical issues, overheating and/or mechanical issues, and lost or sick motorists. The FSP technicians are specially trained to assist with a variety of freeway service-related issues ranging from minor mechanical problems to providing community first aid until first responders are able to arrive. The FSP fleet also consists of vehicles specially equipped to relocate crashed or disabled vehicles off the freeway and to the nearest secure location for the purpose of quickly and safely restoring traffic to free-flow conditions.

Table 3: Incident Clearance Times

Incident Clearance Time	Las Vegas	Reno
Less than 15 Minutes	79%	84%
15-30 Minutes	15%	11%
More than 30 Minutes	6%	5%

Interesting Fact #3: As a guideline, the FSP program aims to mitigate traffic incidents in less than 15 minutes to minimize traffic disruptions and improve safety for motorists and first responders. As indicated in Table 3 above, FSP technicians were able to clear approximately 80-85 percent of incidents within this timeframe. This is important because national statistics indicate that roadway incidents account for 25 percent of travel delays and that for every minute that a travel lane is blocked, the resulting delay takes 4 minutes to dissipate and the probability of a secondary incident increases by 2.8 percent.

8.2.3 Truck and Traveler Information Systems

8.2.3.1 511 Nevada Travel Information[49]

511 Nevada Travel Info is a free phone and web service that brings together traffic and transportation information into a one-stop resource for commuters and motorists in Nevada. 511 Nevada provides up-to-the-minute traffic conditions and is available by phone and on the internet seven days a week, 365 days a year.

Traffic and travel information offered on the 511 Nevada web site and telephone phone service is managed by a partnership of public agencies led by the NDOT. Data is provided by traffic monitoring devices on Nevada's roads such as traffic cameras and travel time sensors.

This service provides motorist information about crashes, construction, scheduled maintenance, weather and other conditions on Nevada Interstate and state highways. It offers real-time traffic and travel information seven days a week, 365 days a year. In addition, 511 Nevada broadcasts AMBER alerts and other statewide emergency messages.

By using any of the 511 Nevada resources, motorists can make informed decisions about planning trips, possible alternate routes and departure times. This can improve individual drivers' trips, helps reduce delay and improve safety on state highways.

511 Nevada also provides a personalized traveler service (My511NV) to help drivers better navigate Nevada's highways. With this free subscription-based service, users can create a catalog of often-used traffic cameras as well as their most frequently traveled routes. Saving these trips gives users quick access to information such as estimated travel times, road conditions, and traffic cameras along the route. Users can set daily or weekly text and email alerts for their commutes or frequently traveled routes throughout the state.

8.2.3.2 511 Website

The www.nvroads.com website was designed to complement the 511 Nevada telephone service. It provides a user-friendly way for drivers to see where incidents, crashes, congestion and events like weather and construction are located. This page contains an interactive map displaying current travel conditions that include:

- A list of current incidents in list format that can be filtered.
- Access to devices such as current traffic cameras, and freeway message signs.
- Access to maps that summarize current and historical conditions at Road Weather Information System sensors placed on routes throughout the state.
- Road and traveler safety information such as public safety alerts, winter driving tips, Nevada Highway Patrol, and other public safety information.
- Other traveler information resources including transit agencies, local and regional airports, Nevada tourism, and rest stop information among others.

[49] Source: Nevada Department of Transportation, https://nvroads.com/about-511-nevada/overview

8.2.3.3 Highway Advisory Radio

Highway advisory radio communicates location-specific information regarding construction, weather conditions, special events, and emergency notifications. This information is accessible in text format through the 511 website. If deemed necessary, roadside flashing signs can be activated to alert drivers that special information is being transmitted on an FM frequency displayed on the sign.

8.2.3.4 Freeway Message Signs

Almost 350 variable message signs are located along freeways and major highways throughout the state. Similar to the Highway Advisory Radio system, these signs can be used to provide useful and important information to drivers in a text-based format. The variable message signs can be changed to alert drivers regarding weather conditions, current travel times, and traffic conditions. Additionally, the signs occasionally display public service messages that promote safety. When traffic or weather creates a freight bottleneck, these changeable signs can alert drivers in advance, thereby empowering them to adjust their travel accordingly.

9. Freight Investment Plan

This chapter of the Nevada Freight Plan provides a fiscally constrained list of prioritized projects and describes how funds made available to carry out section 167 of title 23 would be invested and matched.

9.1 Supporting the National Highway Freight Program Goals

The NHFP states that the freight investment plan component of a freight plan shall include a project, or an identified phase of a project, only if funding for completion of the project can reasonably be anticipated to be available for the project within the time frame identified in the freight investment plan, which is eight years. Developing and updating a fiscally constrained freight investment plan from a list of freight infrastructure projects is a requirement of the NHRP.

The Nevada Freight Plan sustains the NHFP to improve the efficient movement of freight on the National Highway Freight Network (NHFN) and support several goals, including:

- investing in infrastructure and operational improvements that strengthen economic competitiveness, improve travel time reliability, reduce the cost of freight transportation, improve reliability, and increase productivity;
- improving the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas;
- improving the state of good repair of the NHFN;
- using innovation and advanced technology to improve NHFN safety, efficiency, and reliability;
- improving the efficiency and productivity of the NHFN;
- improving State flexibility to support multi-State corridor planning and address highway freight connectivity; and
- reducing the environmental impacts of freight movement on the NHFN.

9.2 National Highway Freight Program Funds

As an outcome of the Bipartisan Infrastructure Law (BIL) and the Infrastructure Investment and Jobs Act (IIJA), each state has been awarded an allotment of formula funds over a five-year period, from fiscal years 2022 through 2026. These funds may be obligated for various project types, with some restrictions on the percentage of uses (e.g., no more than 30 percent for intermodal or freight rail projects). In addition to the NHFP funds, Nevada has a required five percent match for funds received from the NHFP. Table 9-1 below shows the anticipated Federal funds from the NHFP for years 2022 through 2029.

The funding tables from FHWA only provides funds for 2021 and 2022. Therefore, the 2023 through 2026 funds were assumed for constant for the remainder of the transportation funding law. While the exact increase amounts by specific States are not currently available, the NHFP funds shown account for a 2% inflation increase throughout the BIL. In addition, since the freight plan needs to be an eight-year planning horizon, it was assumed the 2027 and 2029 NHFP funds would continue at the same estimated apportionment.

Table 9-1. National Highway Freight Program Estimated Funds for Nevada

Federal Fiscal Year	NHFP Funds [c]	NDOT Match (5%)	Total
2022[a]	$20,412,503	$1,020,625	$21,433,128
2023	$12,593,115	$629,656	$13,222,771
2024	$12,844,977	$642,249	$13,487,226
2025	$13,101,877	$655,094	$13,756,971
2026	$13,363,915	$668,196	$14,032,111
2027[b]	$13,363,915	$668,196	$14,032,111
2028[b]	$13,363,915	$668,196	$14,032,111
2029[b]	$13,363,915	$668,196	$14,032,111
Total	**$112,408,132**	**$5,620,408**	**$118,028,540**

a FAST Act funds unobligated and Bipartisan Infrastructure Law funds

b Estimated continued NHFP funds

c Adjusted by 2% for inflation from 2022 to 2026

9.3 Eligible Activities and Projects

Generally, NHFP funds must contribute to the efficient movement of freight on the NHFN and be identified in a freight investment plan included in the state's freight plan. In addition, a state may use not more than 30 percent of its total NHFP apportionment each year for freight intermodal or freight rail projects. Eligible uses of program funds are as follows:

- Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities.
- Construction, reconstruction, rehabilitation, acquisition of real property (including land relating to the project and improvements to land), construction contingencies, acquisition of equipment, and operational improvements directly relating to improving system performance.
- Intelligent transportation systems and other technology to improve the flow of freight, including intelligent freight transportation systems.
- Efforts to reduce the environmental impacts of freight movement.
- Environmental and community mitigation for freight movement.
- Railway-highway grade separation.
- Geometric improvements to interchanges and ramps.
- Truck-only lanes.
- Climbing and runaway truck lanes.
- Adding or widening of shoulders.
- Truck parking facilities eligible for funding under section 1401 (Jason's Law) of MAP–21.
- Real-time traffic, truck parking, roadway condition, and multimodal transportation information systems.

- Electronic screening and credentialing systems for vehicles, including weigh-in-motion truck inspection technologies.
- Traffic signal optimization, including synchronized and adaptive signals.
- Work zone management and information systems.
- Highway ramp metering.
- Electronic cargo and border security technologies that improve truck freight movement.
- Intelligent transportation systems that would increase truck freight efficiencies inside the boundaries of intermodal facilities.
- Additional road capacity to address highway freight bottlenecks.
- Physical separation of passenger vehicles from commercial motor freight.
- Enhancement of the resiliency of critical highway infrastructure, including highway infrastructure that supports national energy security, to improve the flow of freight.
- A highway or bridge project, other than a project described above, to improve the flow of freight on the NHFN.
- Any other surface transportation project to improve the flow of freight into and out of an eligible intermodal freight facility.
- Diesel retrofit or alternative fuel projects under the Congestion Mitigation and Air Quality Improvement program (CMAQ) for class 8 vehicles.
- Conducting analyses and data collection related to the NHFP, developing and updating freight performance targets to carry out section 167 of title 23, and reporting to the Administrator to comply with the freight performance targets.
- For the modernization or rehabilitation of a lock or dam.
- On a marine highway corridor, connector, or crossing (including an inland waterway corridor, connector, or crossing).

9.4 Transferability to and from Other Federal-aid Apportioned Programs

A State may transfer up to 50 percent of NHFP funds made available each fiscal year to any other apportionment of the State, including the National Highway Performance Program, Surface Transportation Block Grant Program, Highway Safety Improvement Program, Congestion Mitigation and Air Quality Improvement Program, Carbon Reduction Program (new), and Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Formula Program (new). Conversely, subject to certain limitations, a state may transfer up to 50 percent of funds made available each fiscal year from each other apportionment of the state to NHFP.

9.5 Nevada Freight Plan Projects

The current list of identified projects is found in Table 9.2. The projects listed are the freight investment plan for the next eight years – recognizing that freight investment plans can be updated and modified as needed. To be eligible for use of these National Highway Freight Program formula funds, projects must be located on the NHFN.

The amount of money available to Nevada under the NHFP over the 5 years of the BIL will be about $72.3 million, plus NDOT's 5 percent match of $3.6 million, for a total of $75.9 million available for projects. Since state freight plans are fiscally constrained to eight years, it was assumed that the transportation funding would continue at approximately the same amount as previously provided adjusted for inflation at 2% year over year throughout the BIL.

Table 9-2 outlines the funding allocation for implementation of the proposed list of projects eligible for use of the National Highway Freight Program funds. Projects are divided into the eight fiscal years and meet each year's specified apportionment.

Table 9-2. 2022 Nevada Freight Investment Plan

Project Description	Improvement Type	2022 Funding	2023 Funding	2024 Funding	2025 Funding	2026 Funding	2027 Funding	2028 Funding	2029 Funding	Total Funding
New I-15 NB climbing lane from MP 68.5 to 69.7	Climbing Lane	0	0	$7,948,000	0	0	0	0	0	**$7,948,000**
I-15 Riverside Rest Area, add truck parking with ramp and lighting improvements	Truck Parking	0	0	$3,498,000	0	0	0	0	0	**$3,498,000**
I-80 @ Wadsworth Rest Area, add 10 truck parking spaces	Truck Parking	0	0	0	$1,227,000	0	0	0	0	**$1,227,000**
US-95 Trinity Expansion Phase 1, add 36 truck parking spaces	Truck Parking	0	0	$765,000	0	0	0	0	0	**$765,000**
I-15 ramp improvements and truck parking expansion	Truck Parking	$3,325,000	0	0	0	0	0	0	0	**$3,325,000**
Mill and fill with open grade and truck parking improvements at US-6	Truck Parking	$1,045,000	0	0	0	0	0	0	0	**$1,045,000**
Add NB I-15 climbing lanes from MP 64.40 to 66.10 and from MP 70.70 to 71.90	Climbing Lane	$12,350,000	0	0	0	0	0	0	0	**$12,350,000**
Statewide TPAS Ph. 1 six locations (three on I-15 and I-80)	Traveler Information	0	$4,000,000	0	0	0	0	0	0	**$4,000,000**
Add NB 1-15 climbing lane	Climbing Lane	0	$8,000,000	0	0	0	0	0	0	**$8,000,000**
Add climbing lane at I-80 Beowawe Interchange Split Funding Between FFY 23-24	Climbing Lane	0	$9,979,750	0	0	0	0	0	0	**$9,979,750**
US-95 Trinity Rest Area, add 48 truck parking spaces	Truck Parking	0	0	0	$1,860,000	0	0	0	0	**$1,860,000**
Add NB I-15 climbing lane at Sandhill Road	Climbing Lane	0	0	0	$5,700,000	0	0	0	0	**$5,700,000**
Add NB I-15 climbing lane	Climbing Lane	$4,845,000	0	0	0	0	0	0	0	**$4,845,000**
Add 54 truck parking spaces at MP 84	Truck Parking	0	0	0	0	0	0	0	$1,320,000	**$1,320,000**
I-15 south new check station, add 20 truck parking spaces	Truck Parking/ Enforcement	0	0	0	0	$1,000,000	0	0	0	**$1,000,000**
Truck Parking Availability System Phase 2	Traveler Information	0	0	0	0	0	$3,000,000	$3,000,000	0	**$6,000,000**

Project Description	Improvement Type	2022 Funding	2023 Funding	2024 Funding	2025 Funding	2026 Funding	2027 Funding	2028 Funding	2029 Funding	Total Funding
Total Project Cost:		**$21,565,000**	**$21,979,750**	**$12,211,000**	**$8,787,000**	**$1,000,000**	**$3,000,000**	**$3,000,000**	**$1,320,000**	**$72,862,750**
Total NHFP Funds Available Including NDOT (5%) Match:		**$21,433,128**	**$13,222,771**	**$13,487,226**	**$13,756,971**	**$14,032,111**	**$14,032,111**	**$14,032,111**	**$14,032,111**	**$118,028,540**
Total After Advanced Construction (AC):		**$131,872**	**$8,888,851**	**$7,612,625**	**$2,642,654**	**$0**	**$0**	**$0**	**$0**	**--**
Carry Over Total:						**$10,389,457**	**$21,421,568**	**$32,453,679**	**$45,165,790**	**--**

Note: This Freight Investment Plan is subject to further updates. Total NHFP funding estimates including Nevada's match at 5% are included in Table 9-1.

10. Freight Advisory Committee and Other Outreach

NDOT is committed to a robust outreach and engagement program for the Nevada Freight Plan as well as all aspects of transportation planning. The goals of NDOT outreach initiatives are to identify and evaluate any concerns, suggestions, comments, and unique needs of transportation system users as they relate to proposed projects, studies, and plans. This Freight Plan was developed in conformity with the NDOT *Public Involvement Plan* as well as the FAST Act and Bipartisan Infrastructure Law.

The Freight Advisory Committee (FAC) provided the primary venue for gathering stakeholder input on the plan. The purpose of the FAC is to facilitate collaboration between a broad range of public and private sector stakeholders. The Bipartisan Infrastructure Law, which became effective on November 15, 2021, expanded the list of representation for FACs and established qualifications for committee members. In response to these changes, NDOT added the Nevada Department of Conservation and Natural Resources to the FAC, which houses the Nevada Division of Environmental Protection and is responsible for stewardship of the natural resources and air quality. Nevada Operation Lifesaver, a community organization dedicated to transportation safety at railroad crossings, was also added to the FAC.

A summary of FAC and other coordination meetings supporting the development of the Nevada Freight Plan is provided below.

November 2, 2021, Freight Advisory Committee

The FAC met on November 2, 2021, and supported initiation of the Nevada Freight Plan. The group discussed the important role of the FAC in providing input into the *Nevada Freight Plan* including identifying concerns, reviewing analysis and draft alternatives, and providing recommendations. They also discussed the federal guidance and options related to re-designation of the PHFS and priorities for the state. The FAC reviewed FAST Act freight plan guidance as well as the scope and schedule for the upcoming freight plan update.

The Regional Transportation Commission of Southern Nevada provided an update about the ongoing *Southern Nevada Freight Plan.* The RTC plan is scheduled to be completed in mid-2022 with a focus on developing transformation policies and infrastructure improvements needed to integrate Southern Nevada into global supply chains and strengthen the economy.

February 1, 2022, Freight Advisory Committee

At the February 1, 2022, FAC meeting, the group continued the discussion of the PHFS redesignation and shared the letter from NDOT to the US Department of Transportation with Nevada's comments on the proposed PHFS redesignation.

The FAC discussed major multi-state planning and coordination initiatives underway involving Nevada, including the I-15 Mobility Alliance and the I-80 Winter Operations Coalition, which are described further in Chapter 2 of this plan.

Key features of the Bipartisan Infrastructure Law, which was enacted after the previous FAC meeting, were presented. This included changes to freight plan requirements and FAC membership. The Freight Investment Plan requirements were presented with a description of the required 8-year forecast period.

There was a discussion of the freight analysis framework and commodity flow analysis that is provided in Chapter 1 of this plan. The existing highway freight network was presented, and an opportunity was provided for FAC members to comment on the designation of additional mileage for critical urban and critical rural freight corridors.

Additional updates were provided about the NDOT *Passing and Truck Climbing Lane Study* and implementation status of the *Truck Parking Implementation Plan*.

May 4, 2022, Freight Advisory Committee

A meeting of the FAC was held on May 4, 2022, in which an update of the draft Nevada Freight Plan was provided. The presentation given discussed the two-step approach to the freight plan update as well as a variety of safety, freight bottlenecks, zero emission technology, and industrial real estate markets. Other items discussed included the recommendations of the NDOT *Passing and Truck Climbing Lane Study*.

Coordination with FHWA

Coordination meetings with NDOT and FHWA were held to ensure compliance with applicable freight plan requirements. Meetings with the Nevada Division of FHWA and NDOT were conducted on January 27, March 17, and June 30, 2022. In addition, FHWA representatives are invited to the FAC.

In addition, NDOT submitted comments on December 10, 2021 to the USDOT concerning the re-designation of the Primary Highway Freight System.

Nevada Mining Association

An update on the Nevada Freight Plan was presented to the Nevada Mining Association on January 24, 2022. This included a discussion of the mining commodity flow analysis. The group had an opportunity to provide comments about the commodity flow analysis, freight needs of the mining industry, and the development of the *Nevada Freight Plan*.

NDOT Freight Plan Website and StoryMap

NDOT created a freight information portal on the NDOT website. This map includes easily accessible information about freight data and analysis. Interactive maps about the following are available:

- Nevada's Highway Freight Network
  - Primary Highway Freight System
  - Other interstate portions not on the PHFS
  - Critical rural freight corridors
  - Critical urban freight corridors
- Freight performance monitoring
- Freight projects
- Truck parking locations
- Document library of freight-related plans

The website also provides information about the FAC, including meeting agendas, presentation materials, and contact information for the NDOT Freight Planning Section.