Draft Arizona State Freight Plan

September 30, 2022

Glossary of Terms

AADTT	Average Annual Daily Truck Traffic
AAR	Association of American Railroads
ADAS	Advanced Driver Assistance Systems
ADOT	Arizona Department of Transportation
API	Application Programming Interfaces
ATRI	American Transportation Research Institute
AV	Automated Vehicles
AZ	Arizona
BNSF	Burlington Northern Santa Fe Railway
BQAZ	Building a Quality Arizona
BTS	Bureau of Transportation Statistics
CA	California
CAGR	Compound Annual Growth Rate
CAV	Connected and Autonomous Vehicles
CBP	Customs and Border Protection
CDL	Commercial Driver License
COG	Council of Government
COVID-19	Coronavirus Disease 2019
CRFC	Critical Rural Freight Corridor
CTPAT	Customs Trade Partnership Against Terrorism
CUFC	Critical Urban Freight Corridor
DOT	Department of Transportation
EB	Eastbound
EJ	Environmental Justice
EV	Electric Vehicle
FAC	Freight Advisory Committee
FAK	Freight of All Kinds
FAST	Fixing America's Surface Transportation Act
FASTLANE	Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies grants
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FY	Fiscal Year
GM	General Motors
GPS	Global Positioning System
HII	Lake Havasu City Municipal Airport
HPMS	Highway Performance Monitoring System
IA	Iowa
ICE	Immigration and Customs Enforcement
ID	Idaho

IIJA	Infrastructure Investment and Jobs Act
IL	Illinois
ITS	Intelligent Transportation Systems
IWA	Phoenix-Mesa Gateway Airport
KCC	Key Commerce Corridor
LLC	Limited Liability Corporation
LPG	Liquid Petroleum Gas
LPOE	Land Port of Entry
MP	Milepost
MPO	Metropolitan Planning Organization
MVMT	Million Vehicle Miles Traveled
NB	Northbound
NBI	National Bridge Inventory
NCHRP	National Cooperative Highway Research Program
NEVI	National Electric Vehicle Infrastructure Plan
NFSP	National Freight Strategic Plan
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHS	National Highway System
NM	New Mexico
NMFN	National Multimodal Freight Network
NPMRDS	National Performance Management Research Data Set
P2P	Planning to Programming
PDD	Personal Delivery Device
PHFS	Primary Highway Freight System
PHX	Phoenix Sky Harbor International Airport
PSR	Precision Scheduled Railroading
PTC	Positive Train Control
RFID	Radio Frequency Identification
RR	Railroad
SB	Southbound
SFPP	Santa Fe Pacific Pipelines
SHRCAP	State Highway-Rail Grade Crossing Action Plan
SHS	State Highway System
SR	State Road
STCC4	Standard Transportation Commodity Code
STSP	Strategic Traffic Safety Plan
TI	Traffic Interchange
TPIMS	Truck Parking Information System
TPTI	Truck Planning Time Index
TSMO	Transportation Systems Management and Operations
TTTI	Truck Travel Time Index

TTTR	Truck Travel Time Reliability
TUS	Tucson International Airport
TX	Texas
UAS	Unmanned Aircraft Systems
UAV	Unmanned Aerial Vehicles
UCP	Unified Cargo Processing
UP	Union Pacific
UPRR	Union Pacific Railroad
US	United States
USD	United States Dollars
USDOT	United States Department of Transportation
USMCA	US Mexico Canada trade agreement
VMT	Vehicle Miles Traveled
WB	Westbound
WMYA	What Moves You Arizona
WY	Wyoming
YUM	Yuma International Airport

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Technical Working Papers

The Arizona State Freight Plan was developed through a series of working papers. These working papers, listed below, provide details about the plan process.

Arizona State Freight Plan - Context Research

Arizona State Freight Plan – Inventory of State Freight Transportation System Assets

Arizona State Freight Plan – Arizona's Freight Forecast

Arizona State Freight Plan – State Freight System Needs

Arizona State Freight Plan – Goals, Objectives, and Performance Measures

Arizona State Freight Plan – Strategic Framework for Decision Making Prioritization

Arizona State Freight Plan – Implementation and Improvement Plan

1 IMPORTANCE OF FREIGHT AND STATEWIDE GOALS

1.1 Introduction and Purpose

The 2022 Arizona State Freight Plan is an update to the *Arizona State Freight Plan A to Z*, which was approved and adopted on November 15, 2017. The purpose of the 2022 Arizona State Freight Plan is to build upon the 2017 Arizona State Freight Plan to ensure the state's freight system remains strong by providing an action plan to guide decisions and investments that continue to support a safe, efficient, coordinated, and reliable freight system for moving goods in and through Arizona. The Arizona State Freight Plan serves as the guiding document for freight-related decision-making by providing a review of historical conditions, forecasting existing and emerging trends, and outlining the state's priorities for the future.

1.2 Why is Freight Transportation Important?

Goods movement is at the core of Arizona's economy. An efficient and cost-effective multimodal freight transportation system that safely and efficiently connects rural communities, urban centers, economic activity, and production areas is critical for the state's continued economic stability and growth. Beyond that, Arizona's freight system plays a critical role in the daily lives of its residents, visitors, and businesses. Arizona's freight system enables goods to be delivered to businesses and residents, manufacturing plants to continue operations, and store shelves to remain stocked.

Vision for Tomorrow. Solutions for Today.

Freight transportation infrastructure is essential to Arizona's economic vitality. The Arizona State Freight Plan represents an action plan for creating a robust and reliable freight system for Arizona's continued economic growth and diversification.

1.3 FAST Act and IIJA

The Infrastructure Investment and Jobs Act (IIJA) was signed into law by President Biden on November 15, 2021. In addition to identifying new investments and programs, the IIJA also extended or amended the Fixing America's Surface Transportation (FAST) Act statewide freight planning requirements. It is important for state Departments of Transportation (DOT) to meet these requirements to utilize National Highway Freight Program Funds for freight improvement projects. Appendices A and B illustrate federal requirements for state freight plans and descriptions of the sections of the Arizona State Freight Plan that address each requirement.

1.4 Goals Overview

Arizona Department of Transportation (ADOT) established the Arizona State Freight Plan goals through a collaborative and comprehensive effort. The goals development process included reviewing other statewide and regional planning documents, reviewing national transportation goals, and incorporating feedback from the Freight Advisory Committee (FAC).

The Arizona State Freight Plan Goals are:

Safety: A safe and secure freight transportation system

System Management & Mobility: A reliable, resilient, future-oriented transportation system that enables efficient multimodal freight movement

Competitiveness: Strategic policies, investments, partnerships, and infrastructure that position Arizona to benefit from emerging economic opportunities

Stewardship: Approaches to freight planning that include economic, social, and environmental stewardship

1.5 Stakeholder Engagement

Input from freight stakeholders was crucial to development of the Arizona State Freight Plan. The plan's engagement program focused on stakeholders who are directly involved with, affected by, or connected to the freight industry in Arizona. ADOT is committed to and relies on collaboration with the freight industry for this important effort.

The Arizona State Freight Plan engagement included various stakeholders. The following provides details about each audience/participant:

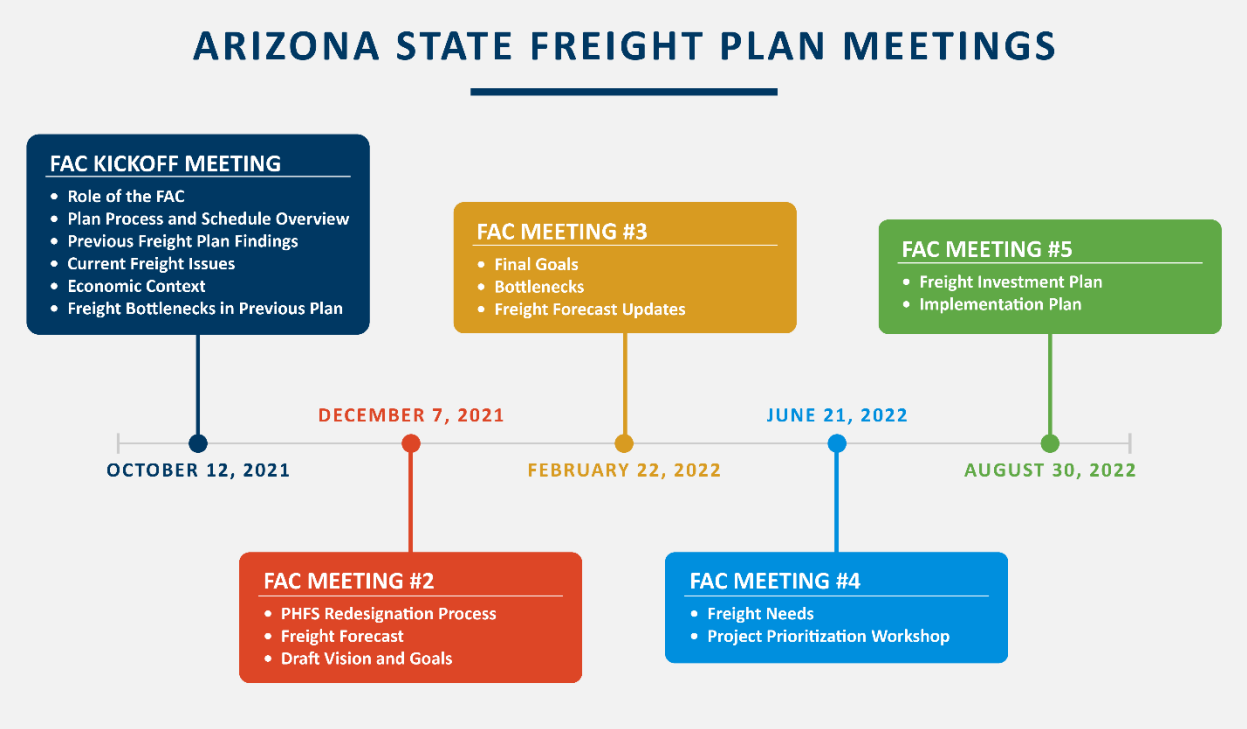
- **The FAC** was at the core of the engagement plan. The FAC is purposefully inclusive of all freight industry stakeholders.
- **ADOT staff and leadership** were involved throughout the plan process. These experts provided reviews, coordinated with the project team through ongoing meetings, and met internally to discuss the plan process and outcomes.
- **Metropolitan Planning Organizations (MPOs), Councils of Government (COGs), Tribal Governments, and Border States** were invited to participate as FAC members and were provided plan updates through email and on the project website. The ADOT project team also conducted meetings with MPOs and COGs to provide plan updates and gain input and guidance in the plan process.
- **The State Transportation Board** is the state-level approver of the Plan that is prepared and submitted by ADOT. Accordingly, the Board was briefed on Plan status at Board meetings and was engaged in a study session for the Plan on October 6, 2022.

Those invited to participate in the FAC included more than 300 public and private sector experts and freight stakeholders across the state. A relatively small but representative subset of participants attended the FAC meetings regularly. The FAC:

- Advised ADOT on freight-related priorities, issues, projects, and funding needs;
- Served as a forum for discussion of ADOT decisions affecting freight transportation;
- Communicated and coordinated regional priorities with other organizations;
- Promoted the sharing of information between the private and public sectors on freight issues;
- Participated in the development of the Arizona State Freight Plan; and
- Will continue working together toward implementation after the Plan is finalized.

The plan development process included five virtual FAC meetings from September 2021 through August 2022, where the FAC reviewed study information and provided input through chat functions, open dialogue, and polling applications. ADOT also incorporated input through online surveys distributed to FAC members. ADOT's project website provided updates, presentations, meeting summaries, and relevant documents throughout the plan process. Figure 1 illustrates the FAC stakeholder meetings throughout the freight plan process.

Figure 1: Freight Advisory Committee Timeline



2 ARIZONA FREIGHT TRANSPORTATION SYSTEM

2.1 Introduction

Arizona's freight system and supply chains serve a critical role in the operation of the state economy. The relationship between freight transportation and consumers, workers and businesses in Arizona has become especially clear during the pandemic, where disruptions affected many types of goods and business activity. The interdependency of Arizona businesses and global supply chains that rely on the freight system and its connectivity to the rest of the world has been demonstrated with empty store shelves, delayed e-commerce deliveries, and lost sales during the unprecedented disruption and shifts in consumption during the 2020-2021 period. It should be noted that these unfortunate impacts of the pandemic do not diminish the strong efforts of Arizona's freight transporters to keep freight moving during these challenging times.

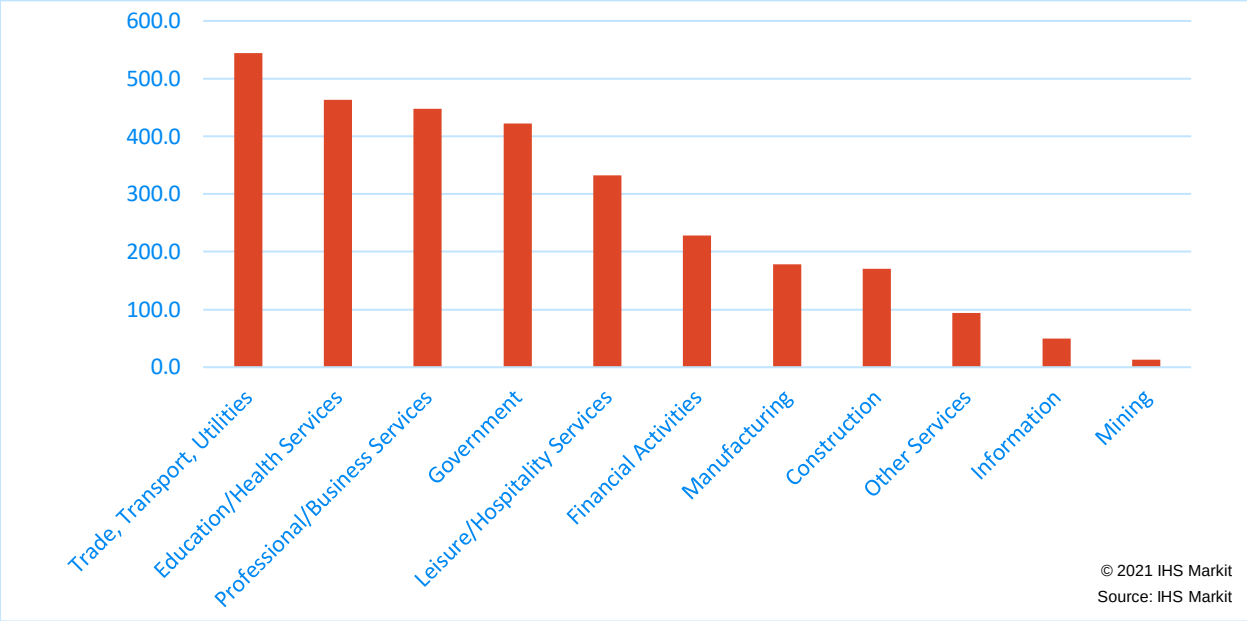
Long-term, Arizona faces competitive forces that are shifting across the world. International trade is seeing patterns change, following trade policy changes and new trade agreements, with more changes to come as the country and individual businesses work to reduce the risks of such dramatic supply disruptions occurring again. Understanding how Arizona's economy is supported by the freight transportation system provides this updated Arizona State Freight Plan with information used in development of updated transportation investment decisions. This section provides the economic context for freight transportation in Arizona, specifically how freight shipping affects the Arizona economy, as well as its key role as a mechanism that supports economic development. This section highlights how the Arizona economy is reliant on freight transportation and how the system contributes to the Arizona economy.

2.2 Economic and Demographic Indicators

In recent decades, Arizona has emerged as a national center for high-tech electronics and telecommunications manufacturing, attracting growth from nearby California. The state is also home to many defense-oriented manufacturing companies, which saw growth because of wartime contracts from the federal government and contracts with international buyers. Arizona's manufacturing base includes technology companies such as Intel, Honeywell International Inc., and Raytheon Co., all of which are among the state's six largest private employers.

With its relatively low business costs and well-educated workforce, Arizona has attracted a host of back-office operations in the services sector. Call centers employ workers to handle customer sales and support, telemarketing, software support, and a variety of financial services. Government and higher education employment provide stability to the Phoenix area. In the northwest corner of the state, the economy has been related to the gaming industry in nearby Las Vegas, while Tucson's economy has strong links with growing trade with Mexico. Figure 2 shows Arizona's employment by sector in 2019.

Figure 2: Employment by Sector, 2019 (In Thousands)



Widening vaccine distribution and removal of many business operating restrictions are opening the way for further job growth in Arizona following the 2020 recession. The state is forecasted to recover, albeit at a reduced pace in 2022 and 2023. Renewed strength in the leisure and hospitality services sector will drive much of the rebound, but most sectors will contribute new jobs. Overall employment growth will be substantial through 2023, with year-on-year employment changes of 5.4 percent in 2022.

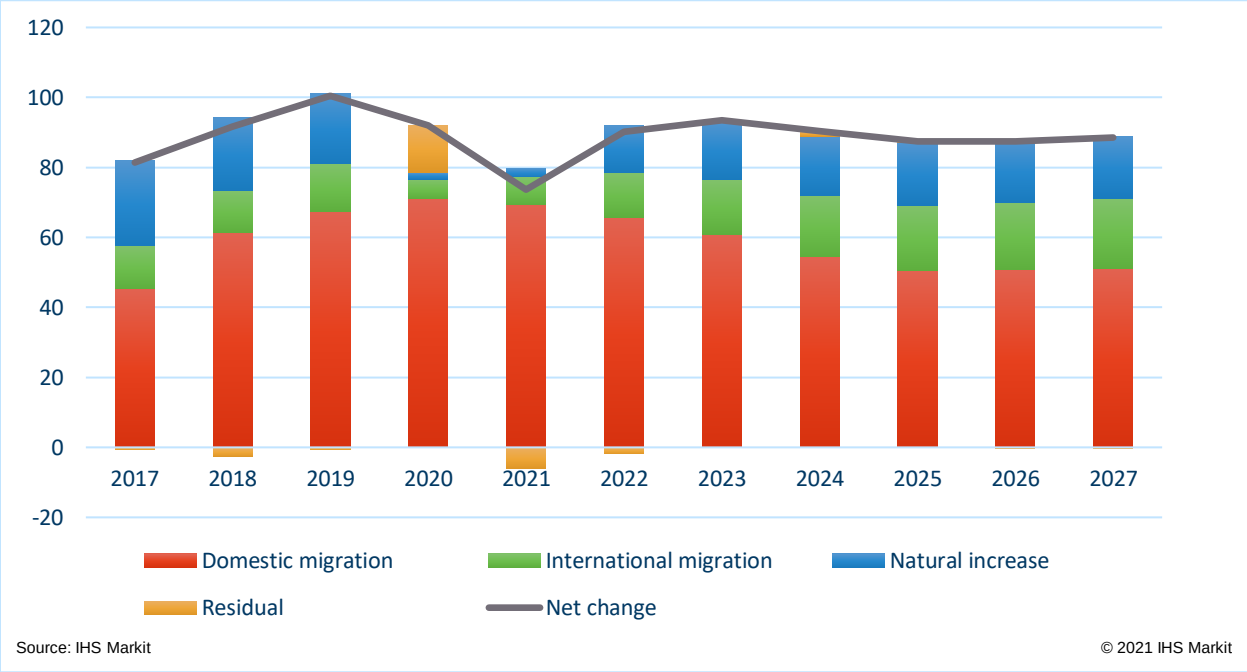
In 2019, Arizona maintained its rank as the 14th-largest state in the nation, with a population of 7.2 million. An overwhelming majority of Arizona's population lives in its two largest metro areas: Phoenix (4.9 million people, with Phoenix being the fifth largest city by population in the U.S.) and Tucson (1 million people). Together, the two make up 81 percent of the state's total population and 88 percent of its labor force. In terms of age, Arizona has many

Phoenix, Arizona is the 5th largest city by population in the United States.

retirees and the share of the population 65 and over is 17.5 percent, compared with 16.0 percent nationwide. Conversely, it also has a relatively large youth population, with 32.5 percent in the 24 and under category, versus 31.7 percent for the United States.

In 2021, Arizona's population grew by only 1 percent compared to 1.3 percent in 2020 (Figure 3). This is due to a drop in domestic migration during the Coronavirus Disease 2019 (COVID-19) pandemic in addition to some impact from mortality and household formation due to the pandemic. Arizona's population growth is forecasted to return to pre-pandemic trend levels in 2022 and beyond.

Figure 3: Population Change, Thousand Persons



Source: IHS Markit

The economic outlook for Arizona remains robust as the demographic center of the United States continues to shift south and west. Strong growth in population and the number of households will be a driving force of Arizona's economic expansion over the next five years. Arizona's population is forecasted to rise at a 1.2 percent average annual pace in 2022.

2.3 Freight Characteristics

This section describes the geographic, commodity and transport mode-specific characteristics of Arizona's freight markets. These important dimensional perspectives on freight transportation in Arizona inform the subsequent analysis of the needs and prioritization of freight projects in the Arizona State Freight Plan.

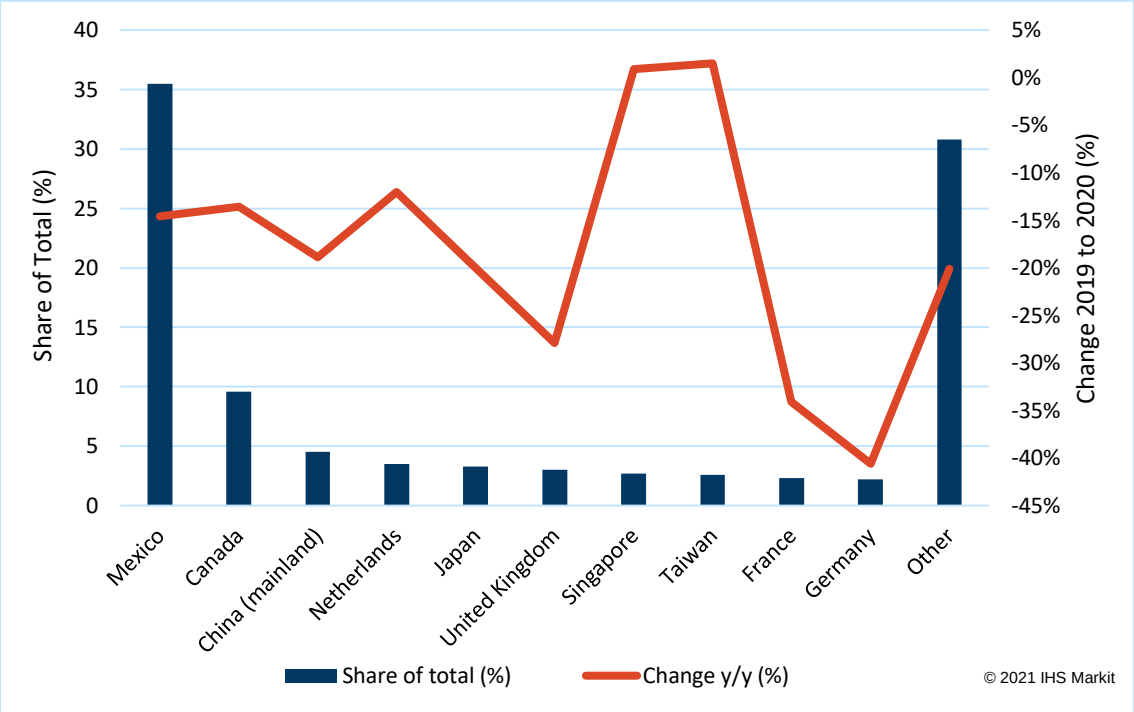
2.3.1 Arizona's Position in U.S. Regional and International Trade Markets

Arizona is a southwestern state on the border with Mexico which has substantial international and domestic freight traffic flowing through the state, supporting residents and businesses throughout the rest of the country. In 2020, Arizona exported $19.7 billion worth of goods abroad according to data from the US Department of Commerce, placing it 22nd among all states. This was a 20.1 percent decrease from the previous year as COVID-19 disrupted supply chains worldwide. Computer and electronics products, the largest export sector in the state, shipped out $5.2 billion in goods, a 16.3 percent decline from 2019. The next largest sector, transportation equipment, slid 35.5 percent to $2.9 billion. Electrical equipment ($1.6 billion), machinery ($1.5 billion), and minerals/ores ($1.5 billion), decreased 28.1 percent, 7.6 percent, and 29.9 percent, respectively.

Most of Arizona's major trading partners imported considerably less in 2020 than the previous year. Mexico, the state's largest trading partner, imported $6.9 billion, a 14.6 percent drop. Canada, Arizona's next largest trade partner, imported $1.9 billion, a 13.6 percent decline. Mainland China, the Netherlands, and Japan bought 18.9 percent, 12.0 percent, and 20.0 percent fewer exports, respectively, in 2020 than in 2019. Only Singapore and Taiwan imported more from Arizona in 2020, although the increases were negligible (

Figure 4).

Figure 4 Arizona's Largest Export Destinations in 2020 (2020 versus 2019 change)



In terms of freight tonnage, 13.6 percent of total freight flows on the Arizona freight network is related to international trade. Overseas imports and exports account for 4.2 percent or 12 million tons of freight movement, while trade with Canada and Mexico accounted for 28 million tons or 9.5 percent of total freight. Cross-border flows to and from Mexico total 22.5 million tons (7.6%) with the majority carried on trucks (64% of Mexico flows), and 31 percent on rail. Natural Gas pipeline flows represent 4 percent of total cross-border flows. Core commodities in Arizona from Mexico are fruits and vegetables, malt liquors, and motor vehicles and parts. Commodities exported to Mexico from Arizona include copper ores, soybeans, petroleum products, electronic equipment, deciduous fruits, and coal.

The geographic position of Arizona and its proximity to Mexico, including six border ports of entry (Nogales District), give Arizona the ability to facilitate trade between Mexico and the rest of the U.S. States such as Arizona, California, Michigan, Texas, Illinois, Pennsylvania, and Wisconsin utilize Arizona's road/freight network and its border ports of entry to export goods to Mexico. In terms of imports, Michigan, Arizona, California, Massachusetts, and Illinois are some of the top states that conduct trade with Mexico using Arizona's border ports of entry.

In general, Arizona's economy has become steadily more involved in international trade since 2013, predominantly in North America, portrayed in increasing volumes of goods transported to and from Canada and Mexico, but also in trade with China and other Asian and European countries.

2.4 Emerging Trends and Issues

Transformational technologies are impacting land use and transportation. Advances in vehicle technology are reducing driving stress, improving crash safety, and potentially increasing freeway capacity. Travel behavior is changing with a steadily increasing demand for e-commerce impacting the demand for goods movement and commercial deliveries. New freight modes are being tested, including aerial package delivery by drones and automated sidewalk delivery robots. ADOT should address these transformational freight technologies in their planning, policy making, and processes to ensure the impacts align with statewide transportation goals.

This chapter discusses technologies impacting the movement of freight on roadways, air cargo, pipelines, and at ports of entry. The focus is on highway goods movement using the freight networks that ADOT operates and maintains. Further detail on the Emerging Technologies can be found in the Arizona's Freight System Working Paper.

2.4.1 Travel Impact of Technology

Technologies are "transformational" if they are successful in the marketplace. To be successful, the technology must provide service that is better or cheaper than what is currently available. Transformational technologies will impact mobility by:

- Reducing the need for personal travel (though e-commerce is replacing personal trips with freight trips).
- Enabling better use of system resources (such as route guidance applications and real-time traffic information data).
- Improving management of system resources (such as freight logistics and urban curb management strategies).

Transformational transportation technologies can impact freight movement by:

- Reducing the **time cost of travel** compared to other modes of travel.
- Reducing the **monetary cost of travel** compared to other options (such as reduced labor costs from automated vehicles that do not require a driver).
- Making **new travel options** available (such as a new highway to a previously inaccessible area or package delivery drones that can fly over areas with underdeveloped roads).
- Shifting travel to **other times of day** (such as off-peak deliveries in urban areas).

Reducing freight travel costs may lead to increasing demand for goods and freight movement, changing incentives for locations of freight operations (due to changing values of land or due to same-day delivery demands), or changing demand placed on freight facilities. National Cooperative Highway Research Program (NCHRP) Report 924: *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation* provides more information on these impacts.

Planning and Uncertainties

The sustainable price point of new technologies is the greatest uncertainty to predicting which technologies will become transformational. Many freight vehicle technologies are still under

development or in pilot testing. Some freight business models are still at the loss-leader stage and require subsidized operating costs. As a result, ADOT needs to consider multiple potential future freight scenarios. However, until a technology reaches the self-sustaining phase, planners will be limited in their ability to assign probabilities to potential future technology scenarios.

2.4.2 Highway

Despite changing technology, three trucking trends have remained since the last ADOT freight and rail plans:

- Retirements and industry growth are causing driver and employee shortages (including truck maintenance employees).
- Federal mandates for hours-of-service restrictions and electronic logging devices increase truck parking needs and can sometimes favor rail transportation over truck.
- State and federal governments are considering truck size and weight requirement exemptions, which favors truck transport over rail but requires vehicle safety inspections to ensure brake and axle maintenance.

Emerging transformational technologies impacting highway freight include vehicle technology, sensor technology, infrastructure technology, last-mile delivery, and truck parking.

2.4.3 Rail

Rail freight movement is generally considered to be the primary freight alternative to truck movement. Rail and trucks compete on price and delivery time; rail becomes more competitive over longer distances. As a result, impacts of technology on rail should consider both rail technology and truck technology as emerging technologies that reduce the cost of truck operations are likely to reduce the competitiveness of rail.

2.4.4 Air Cargo

Air cargo demands are evolving as e-commerce demands increase. The COVID-19 pandemic has led to additional supply chain demands that are affecting air cargo demands. E-commerce is affecting land use by shifting away from the suburban fulfilment model (typical warehouse used for E-Commerce goods) to micro-fulfilment (meaning small volumes for a relatively small geographic area within the state) out of stores. Additionally, the distribution geography of e-commerce from airports is evolving, with shifts in land use and truck delivery demand as a consequence.

2.4.5 Pipeline

The West Line and East Line pipelines operated by Kinder Morgan carry retail petroleum oil. Increased demand for EVs could reduce petroleum demand, which would reduce pipeline demand. Risks to pipeline system disruption (i.e., those from controlling information systems failures or cyber-attack, which were seen with the Colonial pipeline in 2021 in the eastern US) remain a risk that could increase demand for alternative modes of truck and/or rail transport in the event of a sustained pipeline operational interruption.

2.4.6 Land Port of Entry Facilities

Goods movement innovations at land ports of entry facilities can make border crossings and goods processing more efficient.

2.5 Current Policies and Strategies

ADOT currently has policies and strategies which are guiding Arizona towards a more efficient, multimodal freight transportation system. ADOT has implemented previously adopted policies to focus freight system investments on reducing bottlenecks, improving operations on key corridors, and leveraging available Federal funds to the greatest benefit of the state. ADOT has implemented performance-based management of its transportation assets, including key roadways and bridges within Arizona and as part of the national interstate system of highways. ADOT's transportation planning policies coordinate efforts from the local and metropolitan area level to the state and multi-state regional level, under the oversight of the Federal Highway Administration and other Federal agencies with jurisdiction over elements of the system such as Ports of Entry.

Freight stakeholders have observed state policies that affect Arizona's freight system including existing truck size and weight limits, such as axle-load restrictions. Arizona's truck axle load restrictions are lower relative to other states, complicating interstate operations, especially for companies from such sectors as natural resources. Traffic safety and railroad stakeholders observe the need to maintain policies adopted for safety reasons and not change conditions under which owners and workers in the railroad industry made decisions to invest in and commit to working in Arizona.

2.6 Inventory and Assessment

Goods movement is at the core of Arizona's economy. An efficient and cost-effective multimodal freight transportation system that safely and efficiently connects rural communities, urban centers, economic activity, and production areas is critical for the state's continued economic stability and growth.

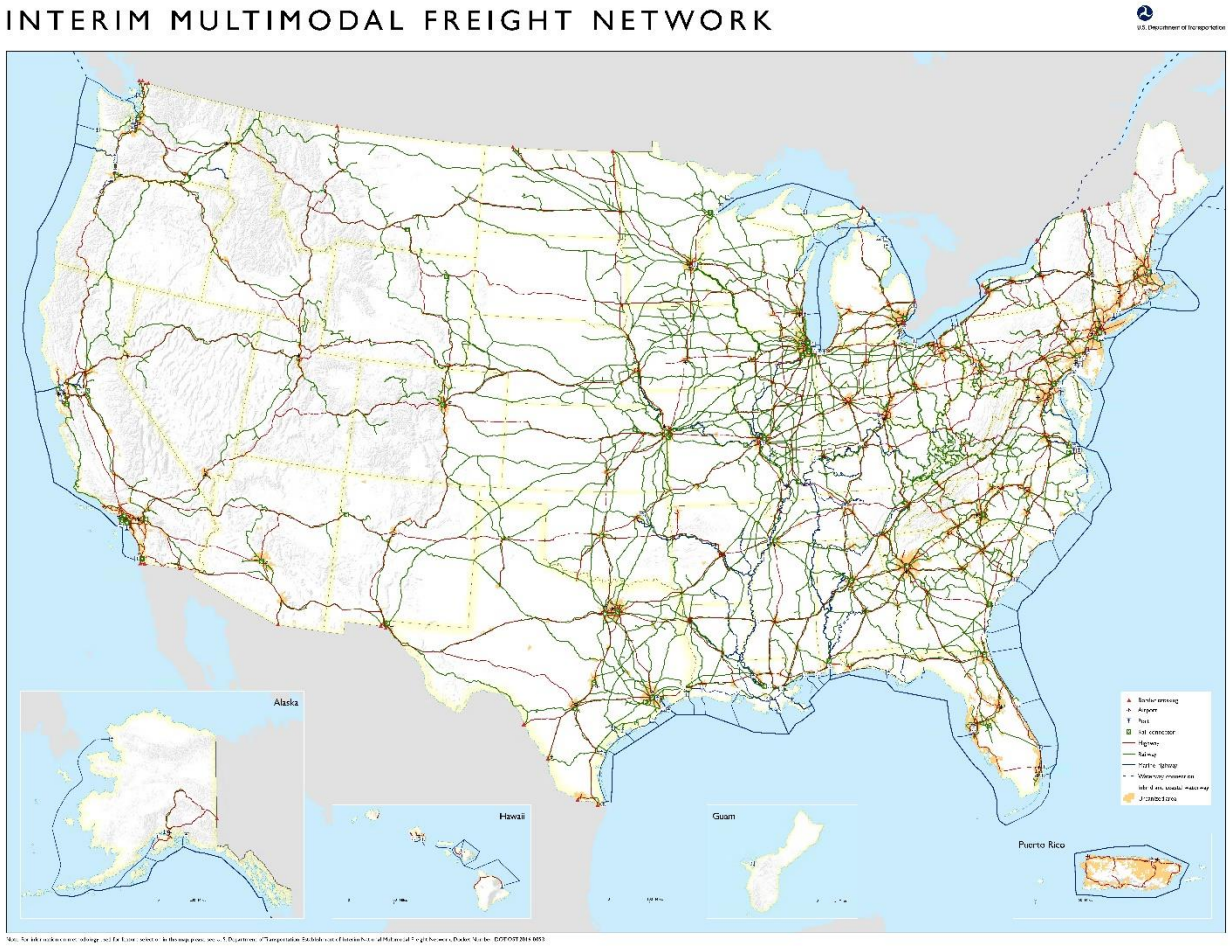
2.6.1 Federal Perspective

The FAST Act required the USDOT to establish a National Multimodal Freight Network (NMFN) that identifies important transportation assets for freight movement. The NMFN includes the National Highway Freight Network (NHFN) plus nationally important railroads, ports, and airports. During the timeframe of this plan update, the USDOT released an interim NMFN (see Figure 5) and is currently updating and finalizing the network based on feedback from stakeholders and the results of the National Freight Strategic Plan (NFSP). The interim NMFN includes:

- Over 1,500 miles of Interstates, Highways, and Key Roads in Arizona
- Major Railroads and Intermodal Connectors
- Phoenix Sky Harbor Airport
- Nogales – Mariposa Land Port-of-Entry

Until release of a final federally designated NMFN, viewing Arizona's overall freight network from a multimodal perspective will help to support the and development of multimodal improvement strategies; partnership or collaboration opportunities; and local, regional, or megaregional connectivity needs and opportunities.

Figure 5: Interim National Highway Freight Network



National Highway Freight Network

While goods generally move along the entire roadway network, the majority of freight utilizes portions of the NHFN. The NHFN is a federally designated network initially set forth by the FAST Act in 2017 and consists of four primary components:

- **Primary Highway Freight System (PHFS):** A mileage limited network designated by FHWA using measurable and objective national data to identify the most critical highway portions of the U.S. freight transportation system.
- **Non-PHFS Interstates:** Remaining portions of Interstate routes that are not included on the PHFS to support route continuity and access to freight transportation facilities.

Mileage of National Highway Freight Network in Arizona (rounded)

1,026 Primary Highway Freight Network (PHFS) and Intermodal Connectors

179 Interstates Not on the PHFS

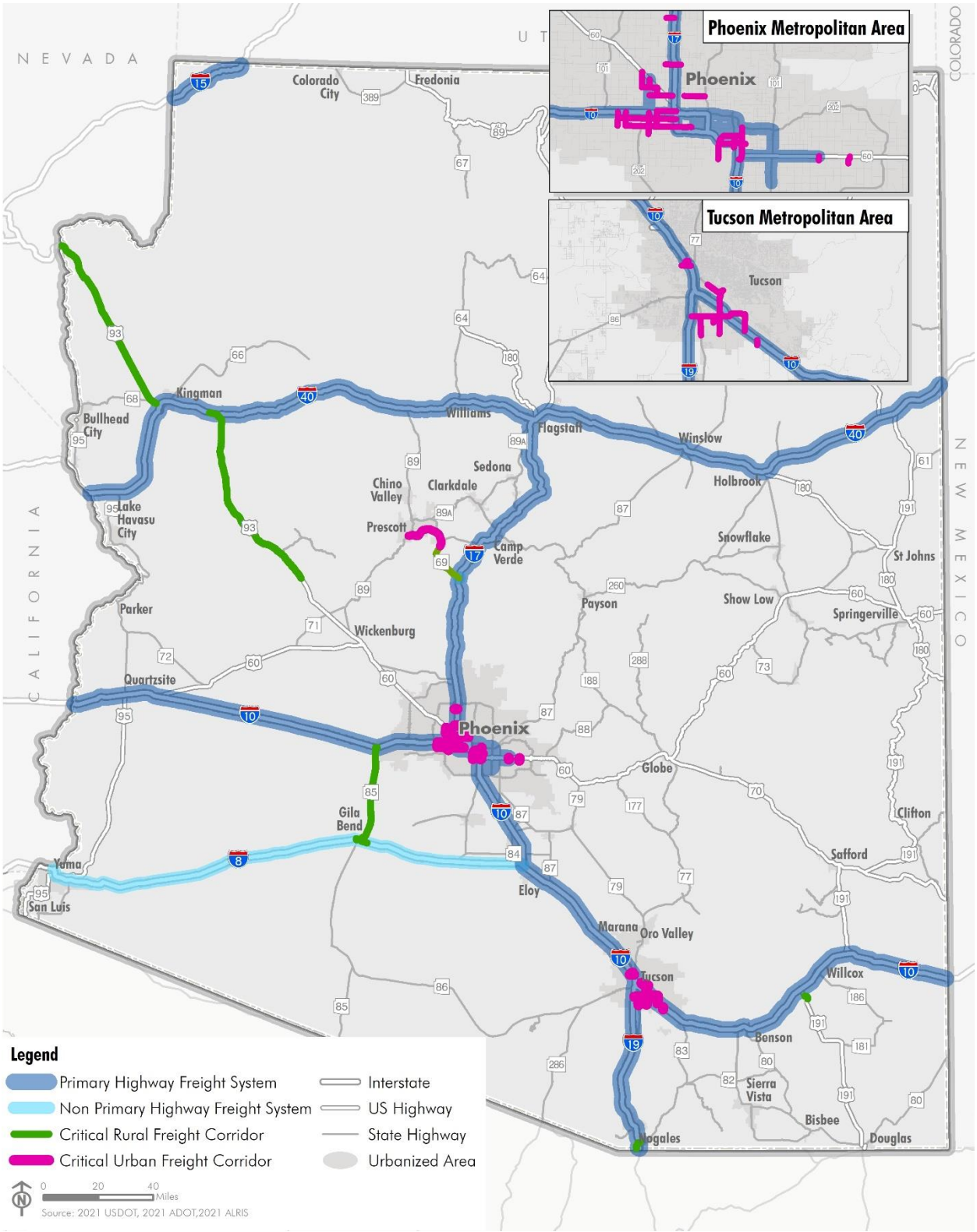
205 Critical Rural Freight Corridors (CRFC)

103 Critical Urban Freight Corridors (CUFC)

- **Critical Urban Freight Corridors (CUFCs)**: Public roads in urbanized areas that provide freight access, connectivity, or redundancy between the PHFS, Interstate routes, an intermodal freight facility, or a major freight generator, logistics center, or manufacturing and warehouse industrial land.
- **Critical Rural Freight Corridors (CRFCs):** Public roads not in an urbanized area which provide access and connection to the PHFS and the Interstate with important ports, public transportation facilities, or other intermodal freight facilities.

Figure 6 illustrates corridors included in the NHFN in Arizona. The FAST Act restricts National Highway Freight Program (NHFP) funding on non-PHFS Interstates in states deemed "high mileage states," defined as states containing more than two percent of National PHFS mileage. At 2.47 percent of total NHFP mileage, Arizona is classified as a high mileage state and thus may obligate funds for projects on the PHFS, CRFCs, and CUFCs.

Figure 6: National Highway Freight Network in Arizona



2.6.2 Statewide Freight Infrastructure – Highway Network

Arizona's roadway system consists of over 66,000 miles of public roads; the State Highway System (SHS) accounts for nearly 9,300 centerline miles and nearly 21,000 lane miles of this system. Arizona's Interstates handle most of the state's truck traffic due to their connectivity to major population centers, businesses, logistics centers, and international and domestic gateways.

What does ADOT maintain?

>66,000 Public road miles

>21,000 State Highway Lane miles

Arizona Key Commerce Corridors

The 2014 ADOT Key Commerce Corridor Plan identified a set of five corridors where improvements to transportation infrastructure supports the greatest potential commercial and economic benefits in the state. Table 1 outlines the location of these corridors.

Table 1. Key Commerce Corridors in Arizona

Corridor	Description
I-10	Crosses through the heart of the state, connecting Phoenix and Tucson and providing direct connections to ports in southern California and Florida.
US 93 (I-11)	The future I-11 corridor connects Arizona to Nevada and other western states.
I-17	Important commerce and tourist corridor connecting Phoenix to Flagstaff and I-40.
I-19	Connects Tucson and I-8 to the Nogales Land Port of Entry (LPOE). Nogales is Arizona's most important LPOE and a major economic engine for the state.
I-8	Direct connection from Arizona to southern California.

Supporting Highway Infrastructure

ADOT, along with other state agencies and private partners, operate and maintain infrastructure and facilities that improve truck mobility and safety, including:

- **Intelligent Transportation Systems (ITS):** ADOT's ITS infrastructure includes traffic operations centers, traffic cameras, variable messaging signs, ramp-metering, and web and mobile applications for travel information.
- **Truck Parking Facilities:** Parking areas designed specifically for trucks provide safe places for drivers to rest, check equipment, or comply with Federal hours of service regulations.
- **Weigh-in-Stations:** Checkpoints for weight and safety inspections.
- **Runaway Truck Ramps:** ADOT maintains 15 truck safety ramps along key mountain corridor routes.

Supporting Infrastructure

12 Public/Private Truck Parking Facilities

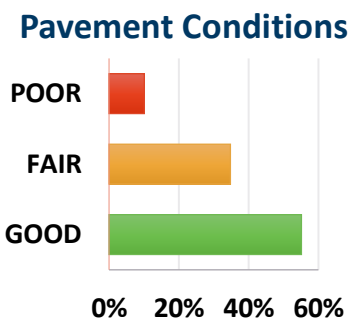
23 Weigh-in-Stations

15 Runaway Truck Ramps

14 Land Port of Entry

Land Ports of Entry (LPOE): A There are 14 LPOE sites and six international border crossing locations that host nine LPOEs Pavement Conditions

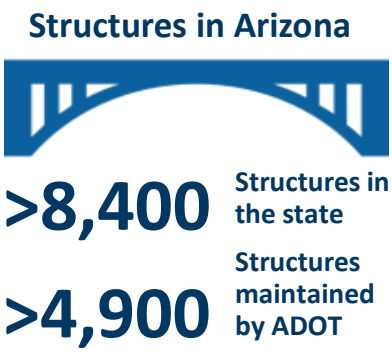
The condition of a roadway's pavement directly impacts goods movements, as it can influence the speed at which a truck can operate and may create safety hazards. Pavement in poor condition can also negatively impact the freight industry through increased wear and tear on vehicles and crashes resulting from unexpected changes in surface conditions. Poorly maintained roadways can also affect economic development, as it may reduce the attractiveness of warehouse and distribution sites. Figure 7 shows pavement conditions throughout Arizona.



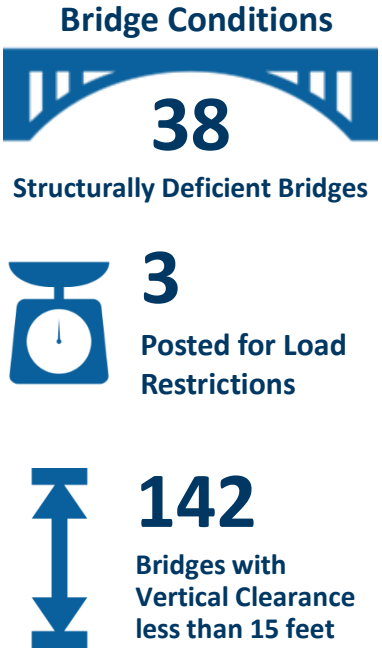
Bridges

Bridges are important components of the state's freight transportation system, as they help move people and goods across geological features such as canyons, rivers, and bodies of water that interrupt roadways. According to the National Bridge Inventory (NBI) data, Arizona has:

- Over 8,400 bridges, including culverts greater than 20 feet in length.
- ADOT owns 4,918 (59%) of these bridges, more than half of which are large culverts. Other bridges and culverts in the state are owned by cities, counties, railroads, and other jurisdictions.



Maintaining bridges and culverts in a state of good repair is essential for preserving mobility and connectivity. Bridges in poor condition may contribute to congestion as trucks often must reduce their speed to cross or make time intensive detours. Bridge conditions can also impact transportation costs since substandard bridges may require trucks to use longer routes and/or load restrictions my limit the amount of cargo trucks can carry.



Adequate bridge heights are also important for safe and efficient movement of people and goods. Many older structures or overpasses were constructed with vertical clearances less than current ADOT requirements. Currently, bridges should provide a minimum vertical clearance of 16 feet 6 inches on freeways, arterials, and all other State Highways and at least 15 feet 6 inches for all other highways and streets. Bridge clearances and conditions on the Arizona Highway Freight Network are summarized below and shown in Figure 8.

Figure 7: Pavement Conditions

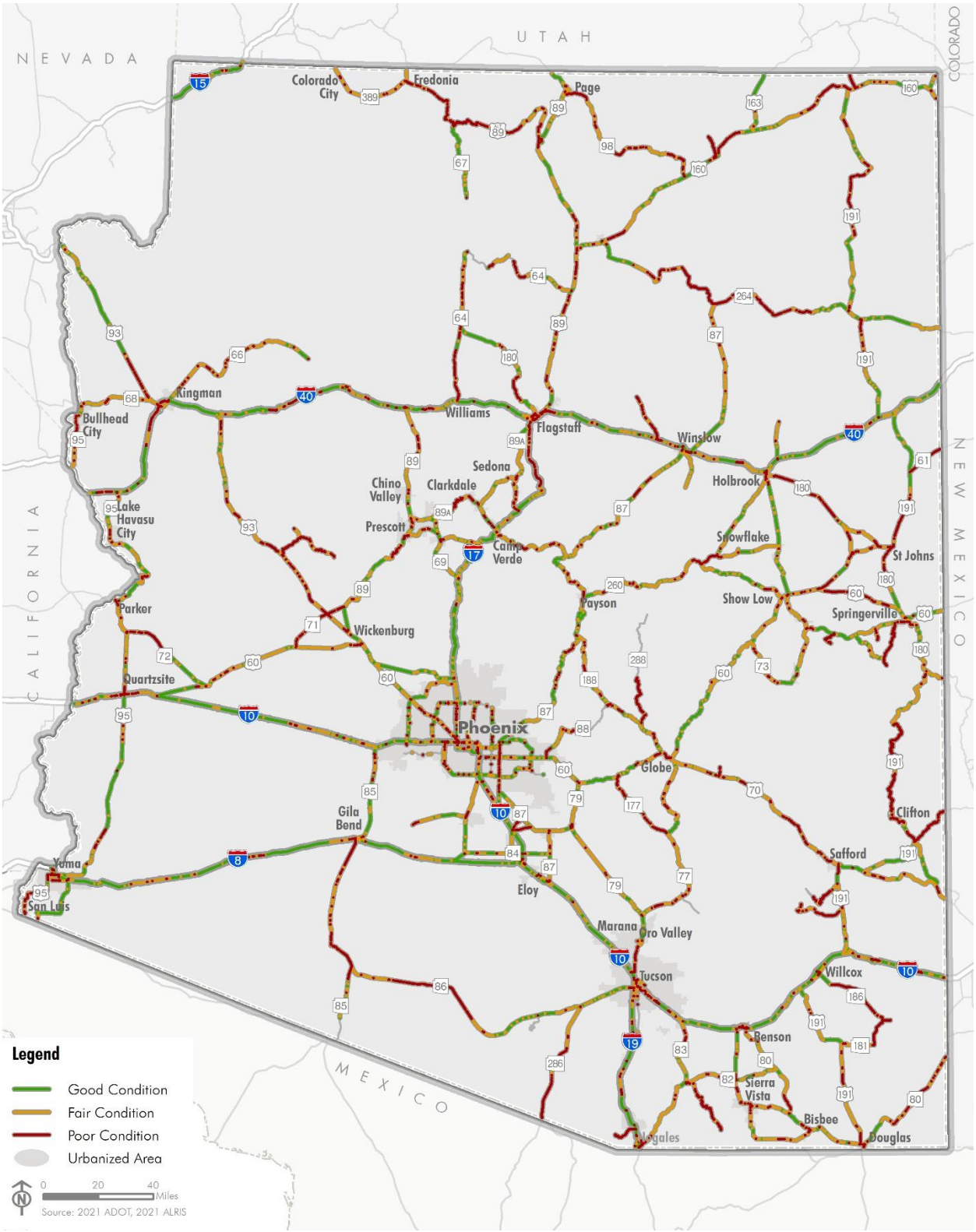
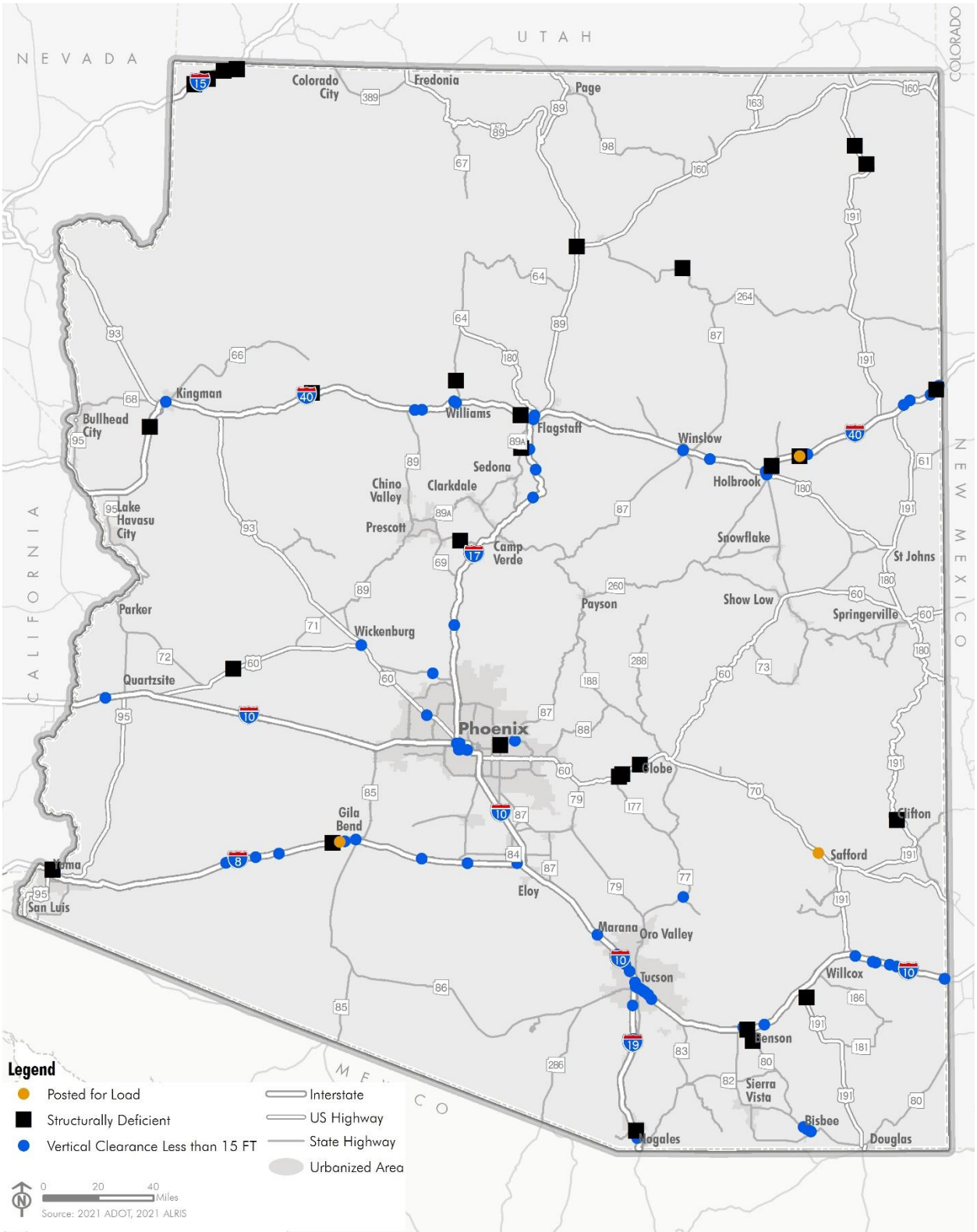


Figure 8: Bridge Conditions



Truck Travel Performance

Average Annual Daily Truck Traffic (AADTT) is a way to identify how many trucks are traveling on Arizona roadways and where they are traveling to. AADTT estimates the total number of trucks passing a given location. When compared to total vehicle traffic, AADTT can help determine corridors with a high percentage of truck usage. Figure 9 illustrates AADTT on the state's roadways.

Truck Travel Time Reliability

Just as traffic congestion delays everyday commuters, it also delays freight, which can create supply chain issues. Truck Travel Time Reliability (TTTR) is the measure used to determine delay for freight carriers. TTTR conditions are also calculated using the National Performance Management Research Data Set (NPMRDS) data. Average truck travel times are determined for five different time periods for each segment on the system: morning, midday, evening, overnight and weekends. TTTR is determined based on a comparison of the 95th percentile travel time to the 50th percentile travel time for each period. Within these time periods, travel time data is evaluated in 15-minute increments. As illustrated in Figure 10, key findings of TTTR include:

- In comparison to overall traffic travel time reliability, trucks generally have less reliable travel times throughout the State;
- Key truck corridors in the Phoenix and Tucson urban areas have poor TTTR; and
- I-17 and I-40 largely have poor and fair TTTR conditions.

ADOT established targets for infrastructure condition and travel time reliability for 2019 and 2021. Table 2 summarizes actual performance of the roadway system based on 2019 NPMRDS data versus the established targets.

Table 2: Infrastructure Condition and Reliability Performance

Performance Measure	2019 Target	2019 Actual	2021 Target
Percentage of Interstate Pavements in Good Condition	N/A	47	44.0
Percentage of Interstate Pavements in Poor Condition	N/A	1.1	2.0
Percentage of Non-Interstate NHS Pavements in Good condition	31.0	32.3	28
Percentage of Non-Interstate NHS Pavements in Poor condition	6.0	2.8	6.0
Percentage of NHS Bridges in Good Condition	52.0	57.8	52
Percentage of NHS Bridges in Poor Condition	4.0	1.2	4.0
Interstate Highway Reliable Person-Miles Traveled	86.0	86.3	85.8
Non-Interstate NHS Reliable Person-Miles Traveled	N/A	81.4	74.9
Interstate Highway Truck Travel Time Reliability Index	1.21	1.25	1.35

Figure 9: Annual Average Daily Truck Traffic

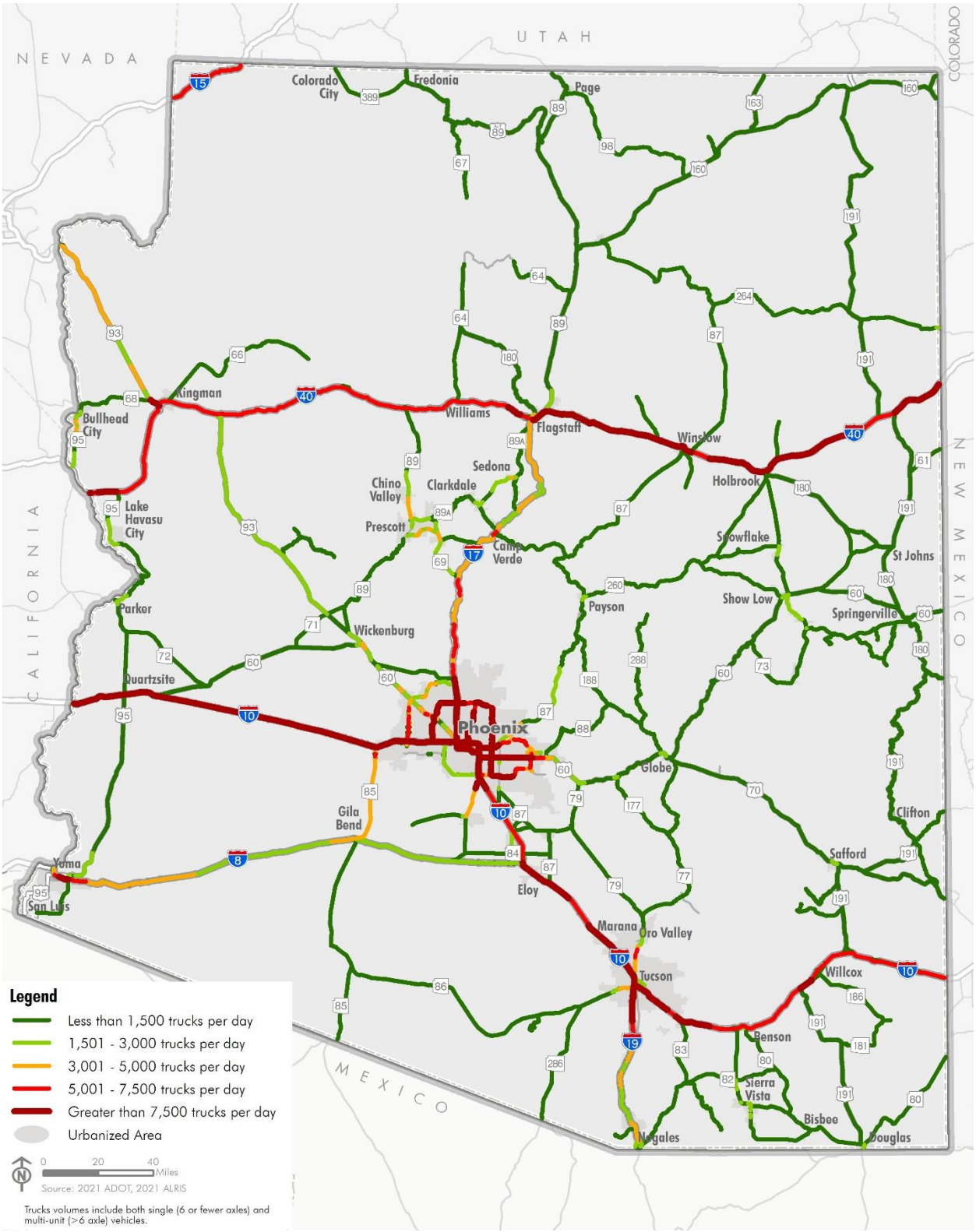
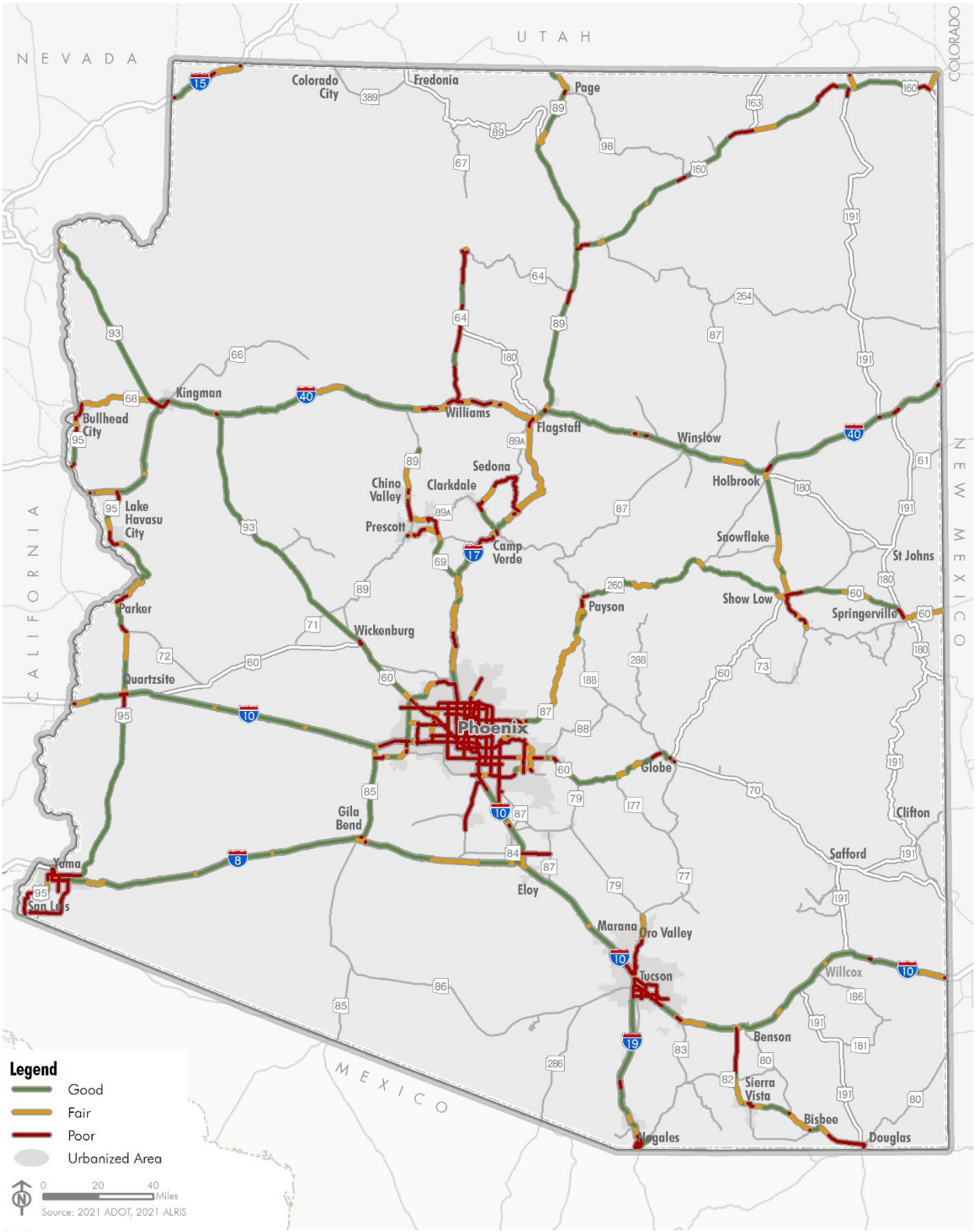


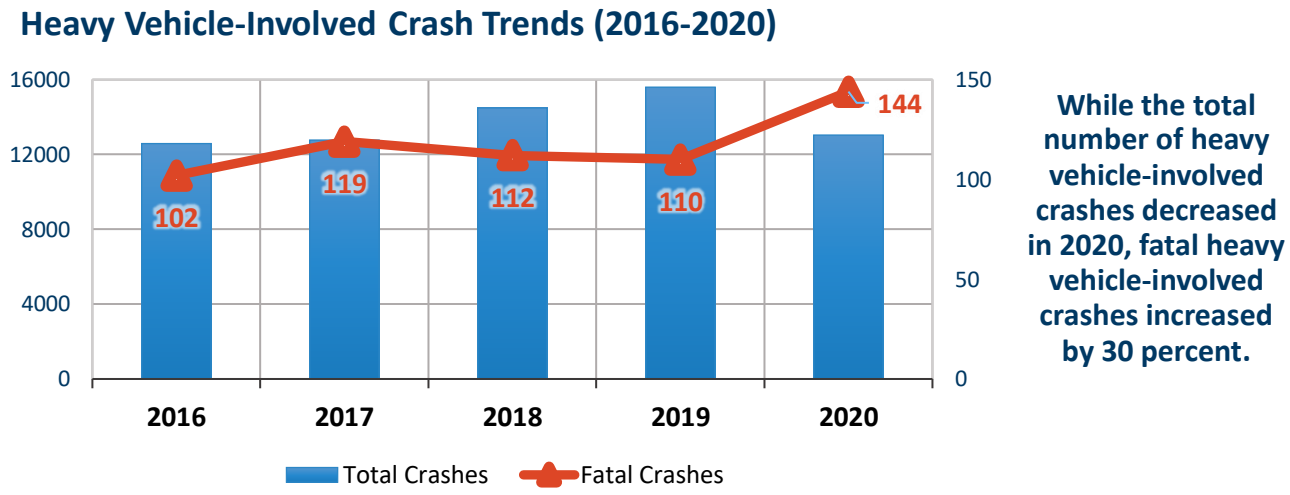
Figure 10: Truck Travel Time Reliability (TTTR)



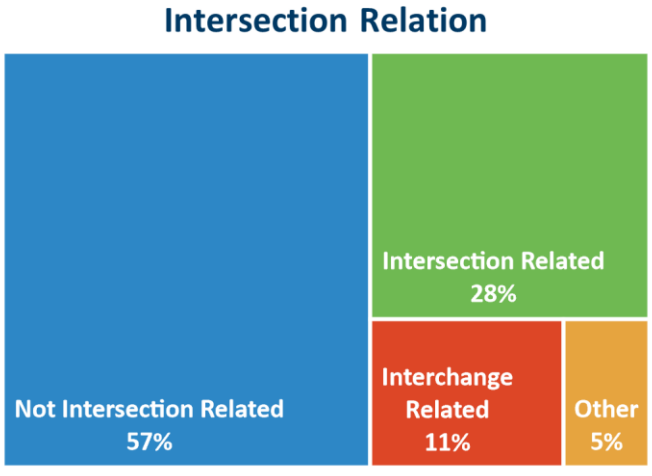
Highway Safety

The 2019 *Arizona Strategic Highway Safety Plan* indicated that approximately 13 percent of all fatalities and 10 percent of serious injury crashes in Arizona can be attributed to heavy vehicles. In addition to the loss of life and injuries, crashes can impact goods movements and supply chains by damaging goods or causing delays. Crash data analysis helps identify trends and patterns and provides insight on specific roadway locations that may be more hazardous than others for heavy vehicles and passenger vehicles. Crash analysis presented in this section is based on data obtained from ADOT for the five-year period of 2016 to 2020 (Figure 11). Figure 12 illustrates the location of fatal crashes and areas with a high density of heavy vehicle-involved crashes.

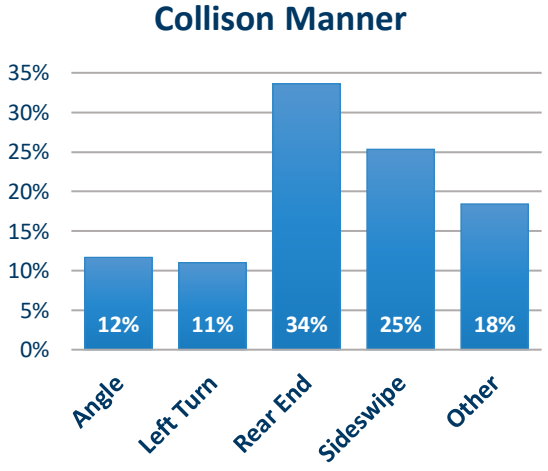
Figure 11: Heavy Vehicle-Involved Crash Trends (2016-2020)



While the total number of heavy vehicle-involved crashes decreased in 2020, fatal heavy vehicle-involved crashes increased by 30 percent.

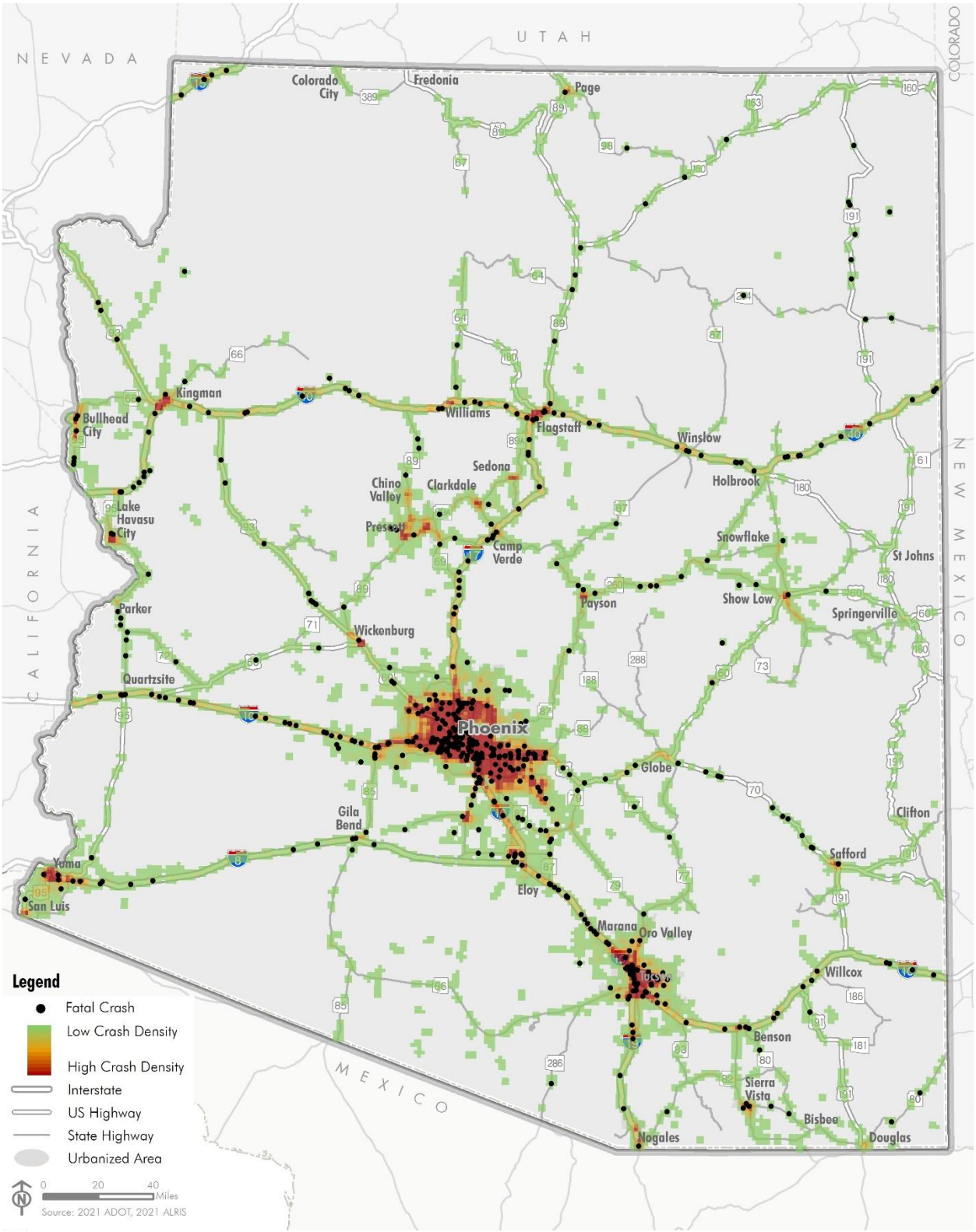


From 2016 – 2020, heavy vehicle-involved crashes primarily did not occur at intersection or interchange. 19 heavy vehicle-involved crashes included wrong way drivers and 79 occurred at a railroad grade crossing.



34 percent of heavy vehicle-involved crashes that occurred from 2016-2020 were due to rear-end collisions.

Figure 12: Heavy Vehicle-Involved Crash Density (2016 – 2020)



Rest Areas and Truck Parking Facilities

Truck parking has become a nationwide challenge, as truck freight volumes are increasing and parking supply cannot keep pace. With the projected growth of truck traffic, the demand for truck parking will likely continue to exceed the supply of facilities in Arizona and around the nation. Rest areas and truck stops contribute to truck drivers operating safely and efficiently within federal regulations for hours-of-service. According to the 2019 Arizona Truck Parking Study, Arizona has 129 public and private truck parking locations providing over 7,070 truck parking spaces statewide (Figure 13). Key statistics show:

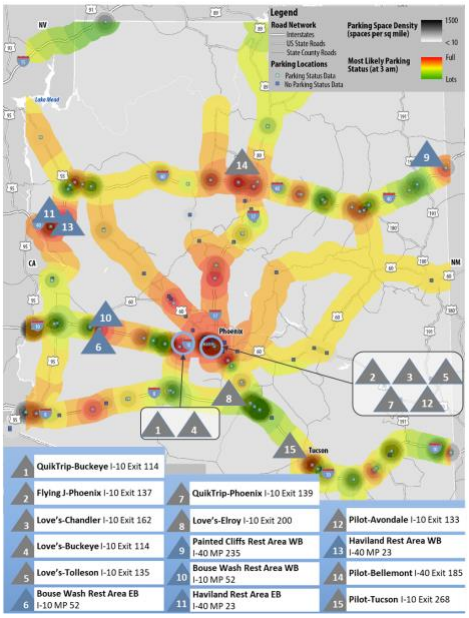
- ADOT provides 558 public truck parking spaces (over 7%) statewide, split between rest areas, overflow lots at rest areas, and parking only locations that have no amenities;
- Private truck stops provide 6,511 truck parking spaces at 98 private truck stops in Arizona – totaling 93 percent of truck parking spaces in Arizona; and
- Pilot, Flying J, TA-Petro, and Loves provide over 65 percent of private truck parking spaces in Arizona.

Table 3 outlines truck parking expansions since the 2019 Truck Parking Study.

7,070
truck parking spaces available statewide

92%
of truck parking spaces are privately owned

Top 15 Truck Stops or Rest Areas by Highest Overnight Utilization Rate



Utilization

The 2019 Arizona Truck Parking Study used data provided by Trucker Path to assess the utilization of truck parking locations by the time of day and identify where and when truck parking demand is highest. The data found:

- Phoenix, Flagstaff, and locations on I-40 near the Arizona/California border begin to fill by 9pm; and
- By 3am most of the state is at or nearing capacity.

Undesignated Truck Parking Locations

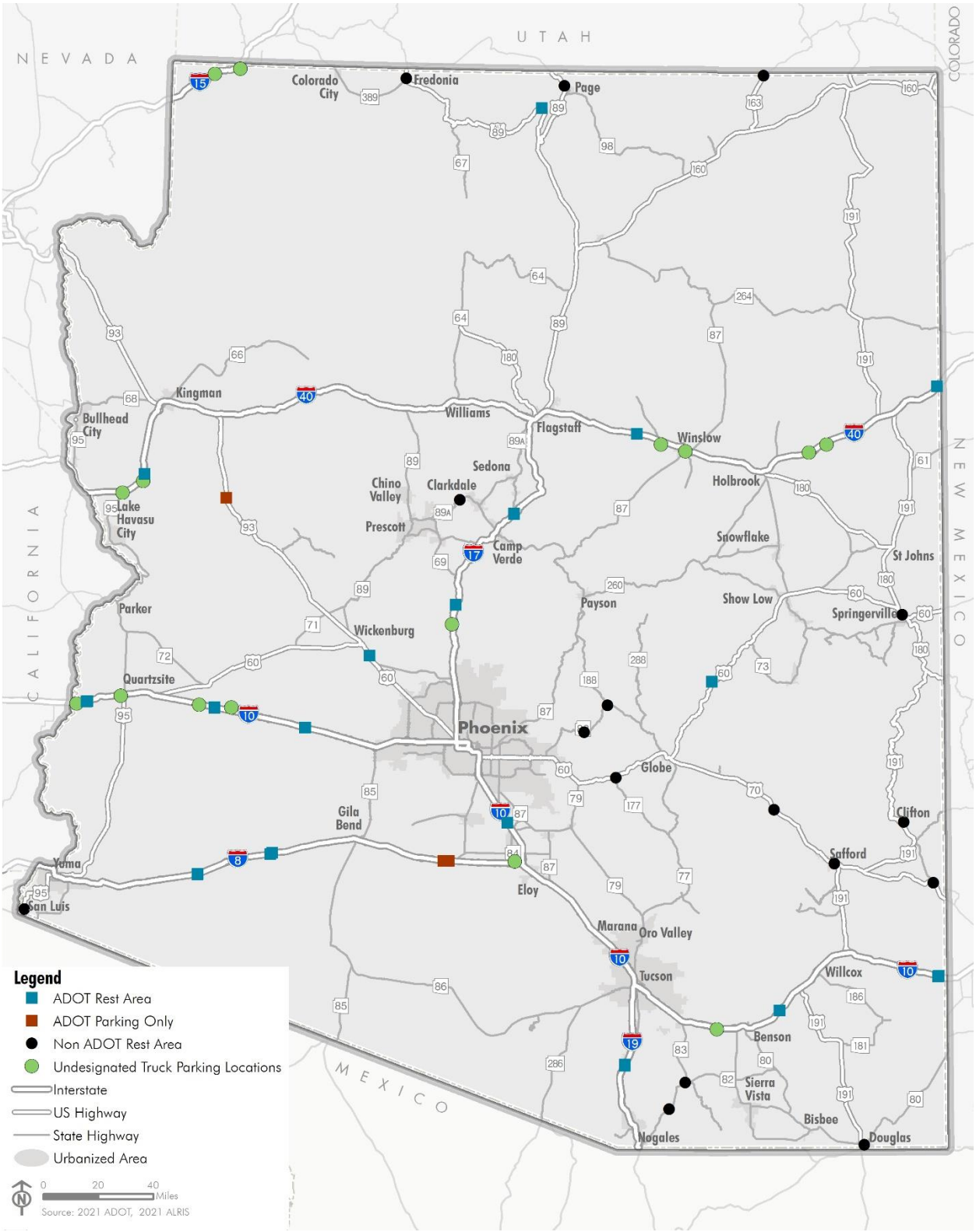
The 2019 Arizona Truck Parking Study identified the top 15 locations of undesignated truck parking based on truck GPS data (one year period) from ATRI. These locations include:

- Near Haviland Rest Area: over 1,000 trucks parked in undesignated areas;
- Near Sunset Point Rest Area: over 350 trucks parked in undesignated areas;
- Near Texas Canyon Rest Area: almost 340 trucks parked in undesignated areas;
- Near Ehrenberg Rest Area: 330 trucks parked in undesignated areas; and
- Near Meteor Crater Rest Area: 289 stops were in undesignated areas.

Table 3: Truck Parking Expansions Since 2019 Truck Parking Study

Route	Mile Post	Rest Area Name	No. Truck Parking Before	No. Added	Total Truck Parking	Status
I-40	235	Meteor Crater EB	32	25	57	Completed and open to traffic
I-40	235	Meteor Crater WB	31	33	64	Completed and open to traffic
I-8	85	Sentinel EB	12	2	14	Under construction, open to truck traffic only. Scheduled completion 2022-2023
I-8	85	Sentinel WB	13	2	15	Under construction, open to truck traffic only. Scheduled completion 2022-2023
I-10	53	Bouse Wash EB	13	8	21	Completed and open to traffic
I-10	53	Bouse Wash WB	14	8	22	Completed and open to traffic
I-40	23	Haviland EB	7	22	29	Completed and open to traffic
I-40	23	Haviland WB	7	16	23	Completed and open to traffic
I-17	252	Sunset Point	28	4	32	Under construction, open to all traffic now.
I-17	296	McGuireville NB	20	0	20	In design, scheduled to begin construction 2023
I-17	296	McGuireville SB	20	0	20	In design, scheduled to begin construction 2023
Additional Parking Information						
I-40	185	Parks EB	14		14	Open for Truck Parking Only. Portable Restroom Units (PRUs/porta-potties) and Handwash stations provided. Site lighting at PRUs, trash service and staff on site daily
I-40	185	Parks WB	14		14	Open for Truck Parking Only. Portable Restroom Units (PRUs/porta-potties) and Handwash stations provided. Site lighting at PRUs, trash service and staff on site daily
I-17	324	Christensen NB	10		10	Open for Truck Parking Only. Portable Restroom Units (PRUs/porta-potties) and Handwash stations provided. Trash service and staff on site daily
I-17	324	Christensen SB	12		12	Open for Truck Parking Only. Portable Restroom Units (PRUs/porta-potties) and Handwash stations provided. Trash service and staff on site daily
Truck Parking Availability System (TPAS)						
I-10	5	Ehrenberg				System under design by TSMO
I-10	53	Bouse Wash				System under design by TSMO
I-10	320	Texas Canyon				System under design by TSMO
I-10	389	San Simon				System under design by TSMO

Figure 13: Truck Parking Facilities



2.6.3 Statewide Freight infrastructure – Rail System

Arizona's rail network plays a major role in supporting domestic and international freight. Per the Association of American Railroads (AAR) Arizona ranked 28th in the country for total number of railroads (11 freight railroads) in 2019.

State Freight Rail System

Arizona's freight rail system is operated by two Class I railroads, Burlington Northern Santa Fe (BNSF) Railway and Union Pacific Railroad (UPRR), and multiple Class III railroads. Table 4 and Figure 13 outline Arizona's active and inactive freight rail network. Key routes include:

- BNSF's principal route in Arizona, the Southern Transcon corridor, is a part of the national freight rail system that connects through Arizona (connecting Los Angeles to Chicago) with connections to Kingman, Williams, Flagstaff, Winslow, and Holbrook; and
- Union Pacific's Sunset Route crosses the southern part of Arizona passing through Yuma and Tucson as it connects Los Angeles and Houston. The Sunset Route handles approximately 20 percent of the railroad's total traffic.

Table 4: Arizona Freight Railroad Summary of Track Miles Owned

Class I Railroads		
Railroad	**Route Miles (Tracks)**	**Percentage of State Miles**
BNSF	689	37.1%
UPRR	691	37.2%
Total Class I Railroads	**1,380**	**74.3%**
Class III Active Railroads		
Railroad	**Route Miles (Tracks)**	**Percentage of State Miles**
Apache Railway	46	2.5%
Arizona and California Railroad	164	8.8%
Arizona Eastern Railroad	135	7.3%
Clarkdale Arizona Central Railroad	38	2.0%
Copper Basin Railway	68	3.7%
San Pedro & Southwestern	20	1.1%
Kingman Terminal Railroad	3	0.2%
Drake Switching Company	4	0.2%
Total Class III Active Railroads	**478**	**25.7%**

Intermodal Terminals

Intermodal terminals and transload facilities are integral elements of the freight railroad network, providing connectivity between the rail system and other freight transport modes. Figure 14 and Table 5 illustrate intermodal facilities in Arizona, these include intermodal facilities, inland ports, and transload facilities. Three short line railroads also have transload terminals: ARZC (Parker), AZER (Globe), and SPSR (Benson). In addition to the Class I intermodal facilities, there are numerous container yards/depots throughout the state.

Figure 14: Arizona Rail System

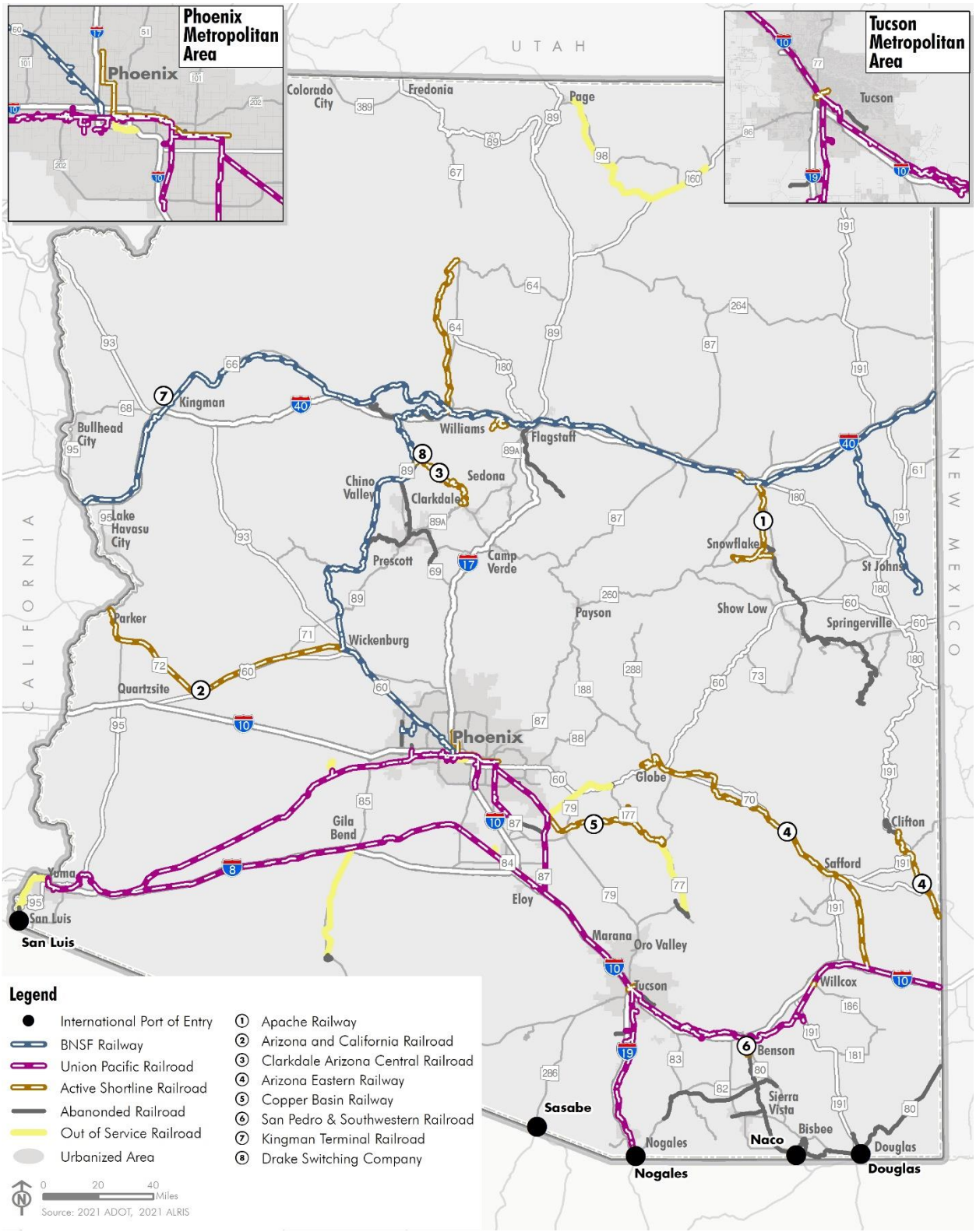


Table 5: Arizona Class I Railroad Intermodal and Transload Operations

Location	Type	Characteristics
BNSF Phoenix	Intermodal Terminal	• Handles domestic traffic only • One daily train connects Phoenix and Chicago
UPRR Port of Tucson	Inland Port	• Current size is 770 acres and can handle unit trains of 80 cars • Domestic service to Chicago, with plans to establish service to Houston • Began international service in 2013 • Seeking areas for expansion, including handling unit trains of liquid petroleum gas (LPG); heavy weight truck lanes; grain container loading; copper concentrate mixing center; and boxcar and refrigerator boxcar operations
UP Phoenix	Transload Terminal	• Has 8 tracks and 150 spots with open air and warehouse storage
UP Tucson	Transload Terminal	• Has 2 tracks and 10 spots with warehouse storage

Rail Weight Restrictions

The North American Class I rail network has a standardized shipment gross weight limit of 286,000 to 315,000 pounds. All Class I railroad lines in Arizona, except for the UPRR Chandler industrial lead, can accommodate a 286,000-pound car. Similarly, Class III short line railroads, other than the Arizona Eastern and the Clarkdale Arizona Central railroads, can handle the heavier cars. Table 6 outlines the percent of Arizona's railroads that can accommodate a 286,000-pound car.

91%

of the rail mileage in Arizona can support a rail car that weighs 286,000 pounds

Table 6: Arizona 286,000 Pound Rail Car Trackage

Railroad	Route Miles (Tracks)	% of 286K Compatible Miles
BNSF	689	100%
UPRR	691	97%
Apache Railway	46	100%
Arizona and California Railroad	164	100%
Arizona Eastern Railroad	135	0%
Clarkdale Arizona Central Railroad	38	0%
Copper Basin Railway	68	100%
San Pedro & Southwestern	20	100%
Kingman Terminal Railroad	3	100%
Drake Switching Company	4	100%

Source: 2021 Arizona State Rail Plan

Railroad Crossings

Arizona has 1,454 active roadway-rail crossings, with 62 percent involving public roadways and 38 percent involving private roadways. Of the total crossings, 1,139 are at-grade, with the remaining 315 crossings comprised of grade separations (locations where railroads and roadways are physically separated by a bridge structure). At-grade crossings along publicly maintained roadways total 700. Table 7 and Figure 15 outline existing railroad crossing facilities in Arizona.

Table 7: Arizona Class I Railroad Intermodal and Transload Operations

Type of Crossing	Private	Public	Total
At-Grade	431	700	1,139
Railroad Underpass	1	110	111
Railroad Overpass	114	90	204
Total	**546**	**900**	**1,454**

Source: ADOT 2021 Arizona State Rail Plan

Railroad Usage

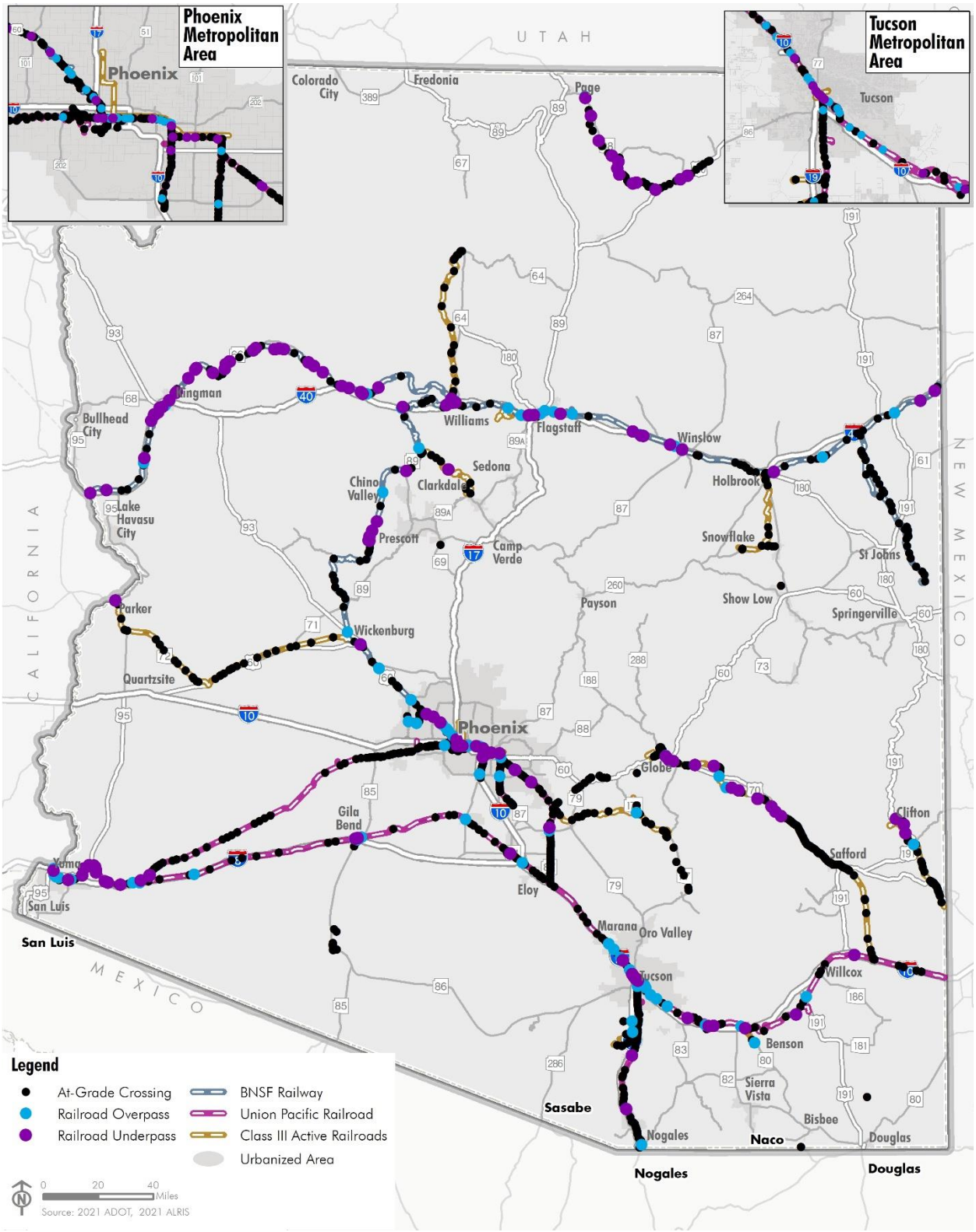
Rail usage (i.e., tonnage) in Arizona is forecasted to grow considerably, particularly for the movement of coal (2021 Arizona State Rail Plan). As volumes on the rail network increase, railroads will need to increase capacity and coordinate development within land use constraints. Figure 15 illustrates the daily trains during daytime hours at at-grade crossings according to 2021 Federal Railroad Administration (FRA) crossing database. Table 8 outlines performance characteristics of Class I and Class II railroads in Arizona today.

Table 8: Arizona Freight Railroad Characteristics

Railroad	Daily Trains	Track Class	Carloads Originated in Arizona	Carloads Terminated in Arizona
Class III Active Railroads				
BNSF Railway	100+	1 – 5	57,000	193,000
Union Pacific Railroad	50+	1 – 5	14,400	77,700
Class III Active Railroads				
Apache Railway	N/A	2 – 3	Mostly storage/repair of railcars	
Arizona and California Railroad	3 per day	3 – 4	10,000 - 20,000 carloads per year	
Arizona Eastern Railroad	1 per day, 6 days per week	2	10,000 - 20,000 carloads per year	
Clarkdale Arizona Central Railroad	1-2 per day	1	5,000 - 6,000 carloads per year	
Copper Basin Railway	Up to 5 per day	3	10,000 - 20,000 carloads per year	
San Pedro & Southwestern	2 per week	2	2,000 - 5,000 carloads per year	
Kingman Terminal Railroad	1 per day	1	1,000 - 2,000 carloads per year	
Drake Switching Company	Data not available			

Source: 2021 Arizona State Rail Plan

Figure 15: Railroad Crossings



2.6.4 Statewide Freight Infrastructure – Air System

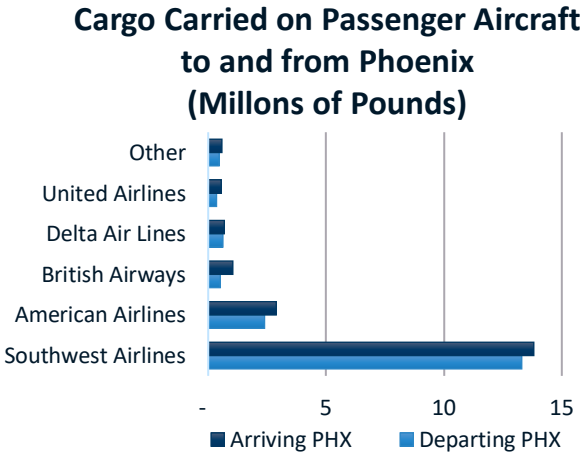
Arizona has 68 publicly owned airports and numerous privately-owned aviation facilities throughout the State.

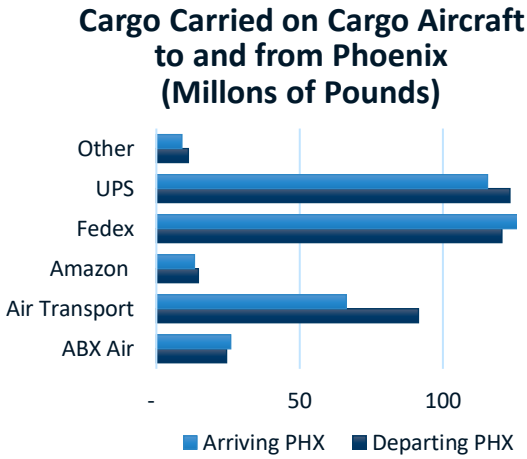
Figure 16 illustrates Arizona's airports. Air cargo hubs in Arizona are typically located in major metropolitan areas with access to aviation facilities that have sufficient capacity to handle large cargo aircraft, a large population base for customers and employees, and access to nearby industrial properties for cargo-handling. Key air cargo facilities in Arizona include:

- **Phoenix Sky Harbor International Airport (PHX)** – A 3,400-acre facility in Phoenix with four terminals, three runways, and moves more than 1,000 tons of air cargo on a typical day;
- **Tucson International Airport (TUS)** – A 8,280-acre facility in Tucson, less than 9 miles from the Port of Tucson, that has three runways and encompasses numerous manufacturing and aerospace business parks;
- **Yuma International Airport (YUM)** – A 3,100-acre facility located 15 miles north of the United States-Mexico border and convenient access to California, the Yuma Proving Grounds, and the Barry M. Goldwater Air Force Range; and
- **Phoenix-Mesa Gateway Airport (IWA) –** Located southeast of PHX, the airport is home to SkyBridge Arizona, the nation's first and only joint air cargo hub to house both US and Mexican customs agents.

Phoenix Sky Harbor International Airport (PHX)

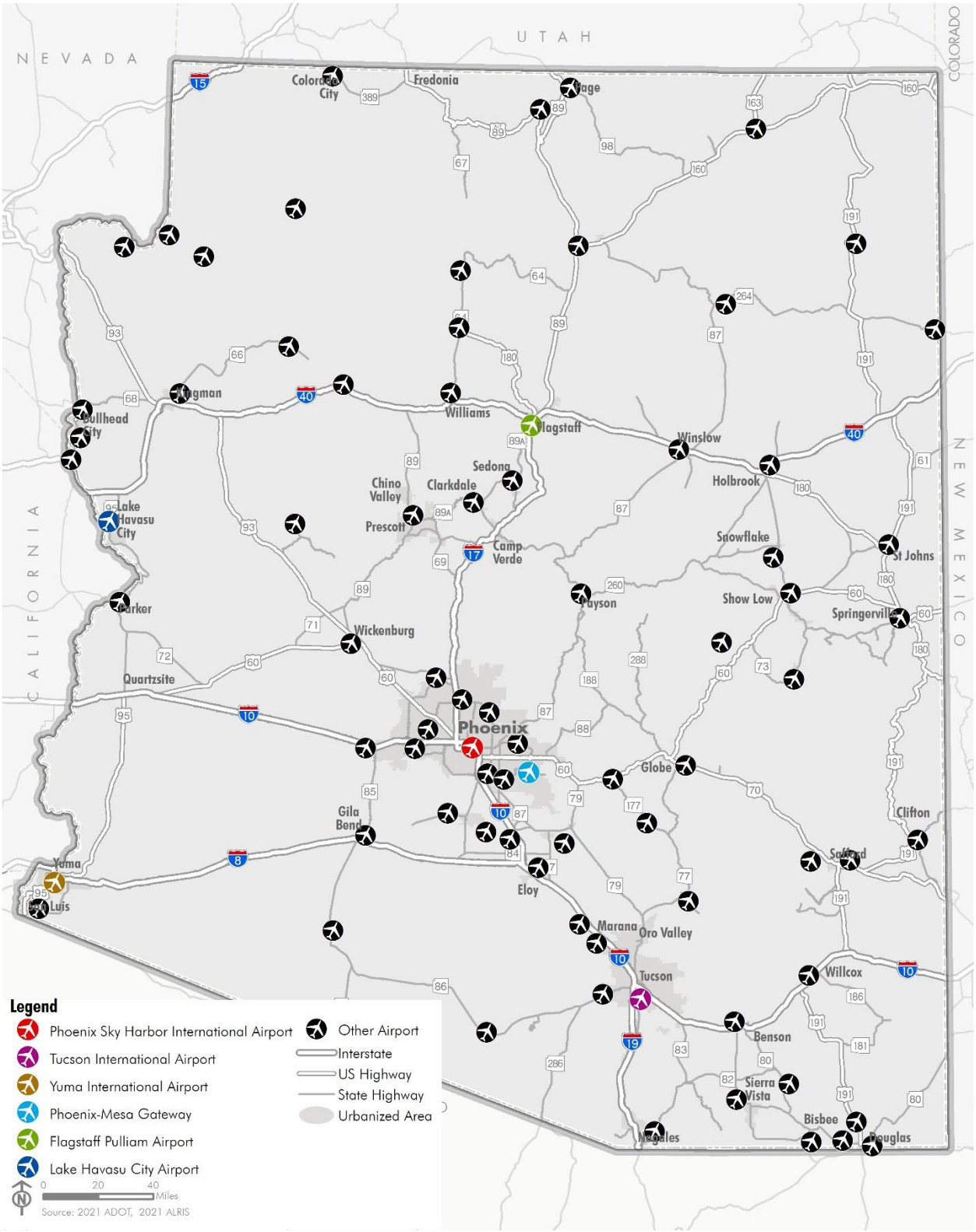
In 2019, PHX processed over 393,100 US tons of cargo between two complexes: South Air Cargo and West Air Cargo[1]. According to the Phoenix Regional Air Cargo Planning Study, integrated express carriers, such as FedEx and UPS, carry over 60 percent of the airport's cargo, while other air cargo carriers and passenger airlines carry much of the remainder. As illustrated below, cargo carried on passenger aircraft is dominated by Southwest Airlines.





[1] https://www.skyharbor.com/business/Opportunities/Cargo

Figure 16: Arizona's Airports



Tucson International Airport (TUS)

Air Cargo facilities at TUS serve aviation-related cargo uses including sorting and warehousing facilities. Cargo facilities at TUS serve both belly (uses passenger jets) and freight cargo. Separate air cargo facilities at TUS are located southeast of the main terminal. All air cargo integrators use a shared aircraft apron, which provides sufficient capacity for current and near-term future air cargo needs.

Other Major Airports

Phoenix-Mesa Gateway Airport (IWA)

IWA currently offers one cargo facility which provides aircraft parking and movement space, primarily for aerial firefighting and charter operators. While IWA currently does not have all air-cargo carrier service, a 360-acre planned development, called SkyBridge, is expected to ramp-up air cargo carrier service and is anticipating an increase of 2,000 cargo flights per year by 2036.

Yuma International Airport (YUM)

In 2019, YUM processed over 798 tons of domestic and international cargo. Per the Draft YUM Airport Master Plan, the facility has sufficient cargo handling apron space for expected air cargo demands and capacity to handle large cargo aircraft through 2040.

Lake Havasu City Municipal Airport (HII)

Air cargo operations at HII are currently being conducted on the main aircraft parking apronThe 2021 Airport Master Plan recommends the relocation of the cargo area, but this will be dependent upon the extension of Taxiway C.

Flagstaff Pulliam Airport

Air cargo in the Flagstaff region is transported to PHX by two operators (Ameriflight and Empire Airlines). Due to the airport's proximity to PHX, it is not anticipated that it will be served by major cargo carriers in the future.

2.6.5 Statewide Freight Infrastructure – Pipelines

47,869 miles
of gas pipelines are in Arizona today

>560 miles
of Kinder Morgan's FPP System runs through Arizona

In 2019, Arizona consumed
119.2 million
barrels of petroleum products

Pipelines play a critical role in moving oil, natural gas, petroleum products, carbon dioxide, water, and a variety of other fluid commodities (Figure 17). Arizona has an extensive network of more than 47,800 miles of gas pipelines. Most of the pipeline gas entering Arizona simply passes through the state. Gas pipelines in Arizona include:

- 25,606 miles of distribution main lines;
- 15,837 miles of distribution service lines; and
- 6,426 miles of transmission pipelines.

The state is also served by more than 580 miles of liquid pipelines for the following commodities:

- 574 miles for refined petroleum products; and
- 12 miles for highly volatile, flammable, and toxic liquids

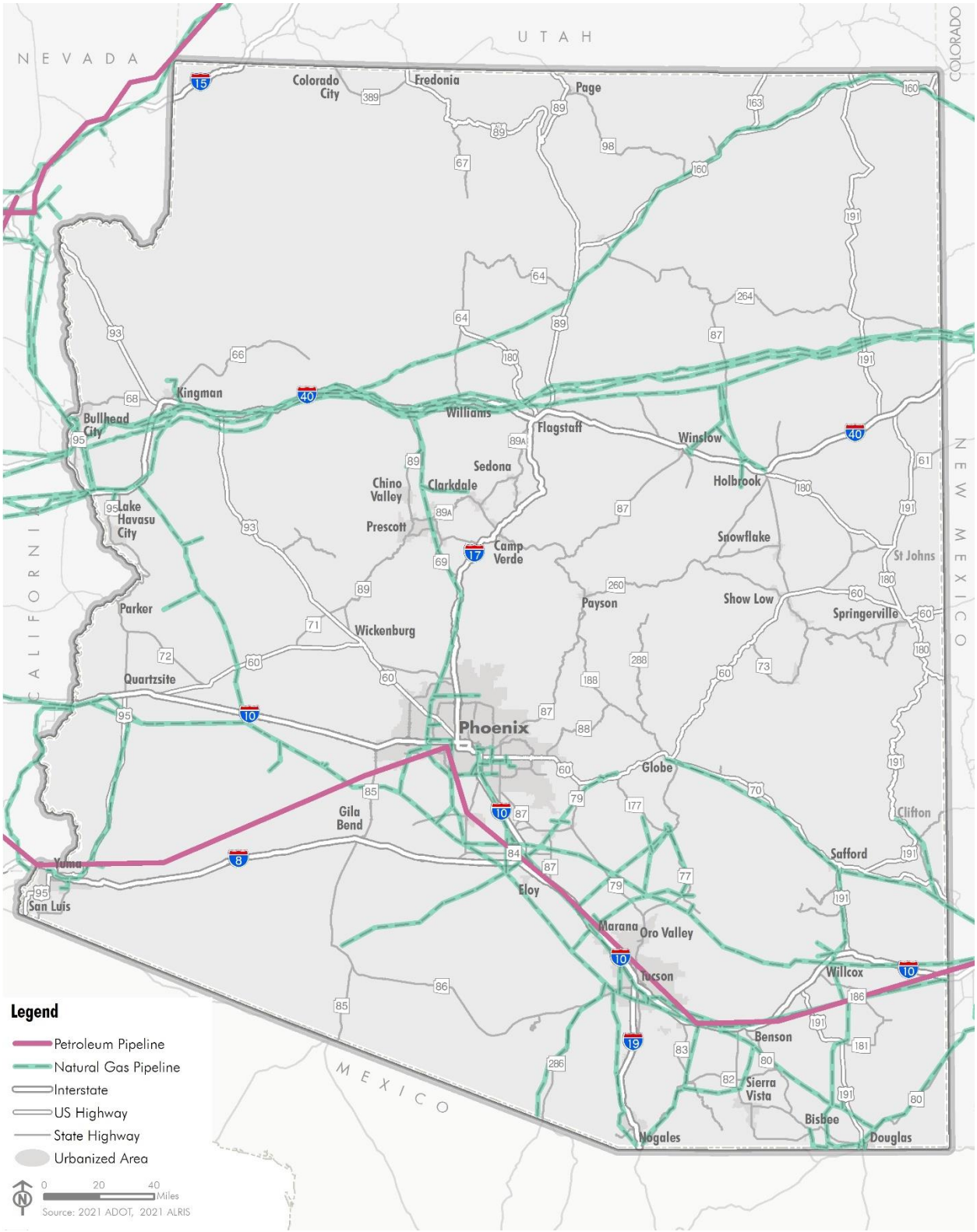
Pipeline Terminals and Storage

Storage systems are used to compensate for fluctuations in product demand and are vital to pipeline systems and end users. For example, during the peak winter season, storage facilities are used to ensure residential users have sufficient natural gas. Storage facilities are used when producers are not able to match production capacity with demand. There are ten active fuel terminals in Arizona as shown in Table 9. Arizona has storage capabilities for refined petroleum products—examples are Kinder Morgan's Santa Fe Pacific Pipelines (SFPP) Phoenix and Tucson terminals, which contain several petroleum products storage tanks.

Table 9: Arizona's Active Fuel Terminals

Terminal Name	Location
Caljet of America, LLC	125 North 53rd Ave, Phoenix, AZ
Arizona Fueling Facilities Corporation	4200 East Airlane Dr., Phoenix, AZ
Pro Petroleum, Inc. – Phoenix	408 S 43rd Avenue, Phoenix, AZ
SFPP, LP Phoenix Terminal	49 North 53rd Avenue, Phoenix, AZ
Holly Energy Partners - Operating LP	3605 South Dodge Blvd., Tucson, AZ
SFPP, LP	3841 East Refinery Way, Tucson, AZ
Circle K Terminal	5333 W Van Buren St, Phoenix, AZ
Liquidtitan, LLC	31645 Industrial Lane, Parker, AZ
Pro Petroleum, Inc - El Mirage	12126 W Olive Avenue, El Mirage , AZ
Lupton Petroleum Products	I-40 Exit 359 Grant Rd, Lupton, AZ

Figure 17: Arizona Pipeline Network



2.6.6 Inland Port

The Port of Tucson is Arizona's only inland port. It is located near Tucson's International Airport, and adjacent to the I-10 interstate and the Union Pacific railroad. The Port of Tucson is privately owned facility that has been operational since 2004 which provides international shipping and domestic linkages to California and Texas. The Port also provides services with Mexico and connections to Asian countries along the Pacific Rim. The Inland Port of Tucson provides following logistics solutions:

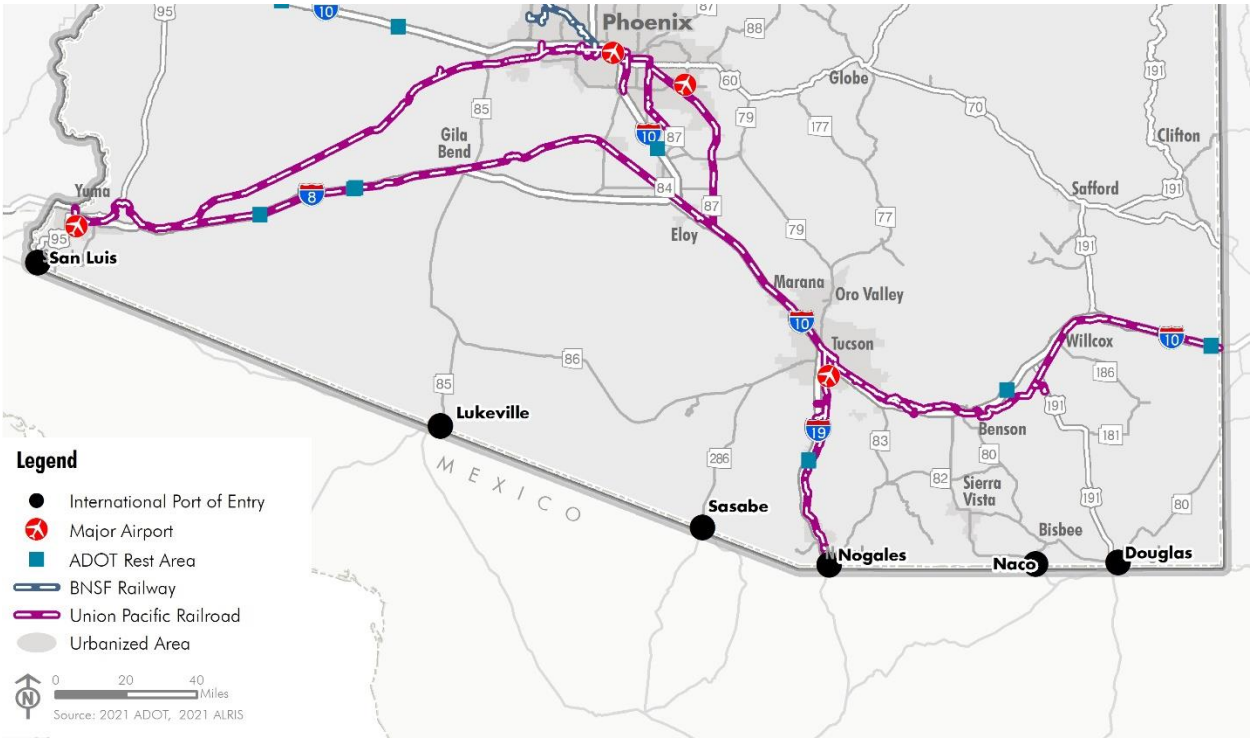
- 767 acres of available space;
- Over 1.7 million square feet of manufacturing, warehousing, and distribution capabilities; and
- 50,000 feet of working rail track with intra-plant switching services. Access is provided over high speed switches that allow trains to enter and exit the facility without reducing speed.

The Port of Tucson has been offering international services since 2013 from Arizona to ports in California. Rail is used to deliver containers to ocean ports, since this is less expensive than using trucks and it is more environmentally friendly, especially since trains can carry more than 100 cars. The port also offers storage for products, including beer, from Mexico that are destined to domestic flows in the US.

2.6.7 Border Infrastructure and International Trade Gateways

Arizona and the state of Sonora, Mexico share approximately 360 miles of international border. There are six border crossing locations, or Land Ports of Entry (LPOE), along Arizona's border with Mexico (Figure 18). These six locations are the gateways through which land-based travel and tourism as well as international trade between Arizona and Mexico occurs.

Figure 18: Border Crossing Locations on the Arizona-Sonora Border



There are four types of flows that Arizona's LPOEs may process: pedestrians, passenger vehicles, commercial vehicles, and rail. The type of flow processed by a specific LPOE depends on the infrastructure and staffing characteristics of each entry point (see Table 10).

Table 10: Arizona LPOE Flow Types

LPOE	Location	Type of Flows Processed
San Luis I	San Luis, Arizona	Passenger vehicles and pedestrians
San Luis II	San Luis, Arizona	Commercial vehicles
Lukeville	Lukeville, Arizona	Commercial vehicles, passenger vehicles, and pedestrians
Sasabe	Sasabe, Arizona	Commercial vehicles, passenger vehicles, and pedestrians
Mariposa	Nogales, Arizona	Commercial vehicles, passenger vehicles, and pedestrians
DeConcini	Nogales, Arizona	Passenger vehicles, pedestrians, and rail
Morley Gate	Nogales, Arizona	Pedestrians
Naco	Naco, Arizona	Commercial vehicles, passenger vehicles, and pedestrians
Douglas	Douglas, Arizona	Commercial vehicles, passenger vehicles, and pedestrians

Source: Arizona-Sonoran Border Master Plan

Border Infrastructure Usage

US BTS tracks border crossing data for each flow type. Table 11 illustrates the crossings for each mode for each LPOE. Nogales LPOE experiences the highest crossings for all modes. San Luis LPOE has the second highest crossings for trucks, pedestrians, and person vehicles. As illustrated in the table, Nogales LPOE accounts for the highest number of truck and rail crossings. Average trucks wait times at Arizona LPOEs are typically less than 10 minutes, apart from the Nogales LPOE which experiences average wait times of 20-45 minutes between 10AM and 1PM time periods.

Table 11: Arizona Border Crossings Usage

Measure	Port Name	Y2018	Y2019
Buses	Douglas	2,501	1,800
	Lukeville	532	683
	Naco	22	1
	Nogales	9,569	9,720
	San Luis	169	82
Rail Containers Loaded	Nogales	69,308	69,651
Trains	Nogales	737	695
Trucks	Douglas	27,804	26,588
	Lukeville	298	315
	Naco	2,997	3,439
	Nogales	337,179	349,377
	San Luis	28,211	36,885

Source: Bureau of Transportation Statistics

Border Crossing Capacity

Several factors contribute to the performance of a LPOE, such as facility design, the number of lanes and inspection booths, the schedule and efficiency of LPOE staff, and nearby population centers that affect the type of goods and volumes served by the LPOE. Therefore, it is difficult to define a single indicator that measures the performance of an individual LPOE. This section proposes a series of indicators that, when analyzed in conjunction, provide a good assessment of the performance of a LPOE facility. A summary of different capacity-related measures (such as processing volumes per day, operation schedule, number of lanes and availability of trusted traveler program facilities) is reported in Table 12.

Table 12: Capacity-Related Measures

LPOE	Original Design Capacity	Commercial Processing Windows	Commercial Lanes	Fast Lanes
Mariposa	400 trucks per day (currently processing an average 1,000 trucks per day)	8 a.m.–9 p.m., Monday–Saturday	Eight primary inspection lanes	Y
San Luis II	New facility recently completed – initial design 150 trucks per day, potentialto expand to 650 trucks by 2030	Peak season: 9 a.m.–8 p.m., Monday–Saturday Off-peak season: 9 a.m.–6 p.m., Monday–Saturday	Three primary inspection lanes	N
Douglas	Not Available*	9 a.m.–6 p.m., Monday–Friday, Noon–2 p.m. Saturday	Three lanes (only one used due to geometry of the site andvehicle turning radii)	N
Naco	Not Available*	9 a.m.–5 p.m., Monday–Friday	One	N
Sasabe	Not Available*	8 a.m.–4 p.m., Monday–Saturday	One	N

Source: 2017 Arizona State Freight Plan

**Data should be updated upon completion of the Arizona-Sonoran Border Master Plan currently in progress*

3 FREIGHT TRANSPORTATION FORECASTS

3.1 Introduction

Arizona freight forecasts information is analyzed by mode of freight transportation for truck, air, and rail, and for major commodities shipped in, out, within, and through Arizona. Forecasts and overall commodity flow information are provided through IHS Markit's Transearch database.

Transearch is an annual database of US commodity freight movement data used for transportation planning, freight modeling, market analysis and forecasting. The database utilizes data from dozens of official public, private, and proprietary industry sources. Flows are identified as international or domestic, and for trucking also by equipment type. Volumes measures are annual short tons and converted into unit counts and dollar value of commodities moved. For use in the plan, forecasts are provided out to 2045 with 2019 as the base year data, the most recent Transearch historic data. The meaningful impacts on the US and world economies from the pandemic are captured in the data, including the characteristics of the 2020 recession and the economic recovery in the United States and in other countries which followed.

3.2 Freight Demand and Commodity Group Overview

Arizona's transportation network carried 407 million freight tons valued at $880 billion in 2019. The total weight of freight transported in the state is expected to reach 653 million tons in 2045, which represents long-term growth of 1.8 percent Compound Annual Growth Rate (CAGR). The total value of freight is expected to reach $1.7 trillion by 2045 (growing 2.5% annually), higher than growth in weight terms due to faster growth forecasted for consumer goods that have a higher average value. Table 13 shows the forecasts for the top three freight transportation modes in Arizona. Rail is the dominant mode by value, carrying 48.6 percent of 2019 freight value, followed closely by truck at 44.9 percent. Trucking carries 70.0 percent of 2019 transportation by weight. 29.9 percent of freight tonnage is carried on rail and 0.1 percent by air. No major mode shifts are expected through the forecast period as freight will be carried mostly by truck and rail, with a smaller share of high-value cargo shipments carried by air.

Table 13: Freight Flows by Mode, 2019-2045

	2019 Tons (000's)	2045 Tons (000's)	2019 Share of Total Tons	CAGR 2019 - 2045	2019 Value (Million $)	2045 Value (Million $)	2019 Share of Total Value	CAGR 2019 - 2045
Truck	284,937	450,995	70.0%	1.8%	395,231	736,760	44.9%	2.4%
Rail	121,894	200,878	29.9%	1.9%	427,750	793,956	48.6%	2.4%
Air	364	874	0.1%	3.4%	57,785	125,519	6.6%	3.0%
Total	407,195	652,747		1.8%	880,766	1,656,235		2.5%

Figure 19 illustrates the shares of the top ten commodities by weight in Arizona in 2019 across all modes. The 'Freight of All Kinds' (FAK) commodity category, mainly transported in containers or trailers by intermodal rail, represents almost a quarter of the top ten commodities total and includes different commodities such as food and beverages or building products and others. Construction materials such as gravel and sand comprise slightly less than one third of the tonnage of these flows at 63 million tons. The remaining tonnage flows consist of 8 percent Petroleum Refining Products (such as gasoline and diesel fuel), 8 percent Broken Stone or Riprap, 7 percent Waste and Scrap, 5 percent Grain, 5 percent Asphalt Paving Blocks or Asphalt Mix, 4 percent Bituminous Coal, and 4 percent Concrete Products. Warehouse and distribution center commodities which mostly consist of consumer goods, represent 8 percent of the weight of the top ten commodities shipped in Arizona.

Figure 19: Top Ten Commodities by Tons, 2019

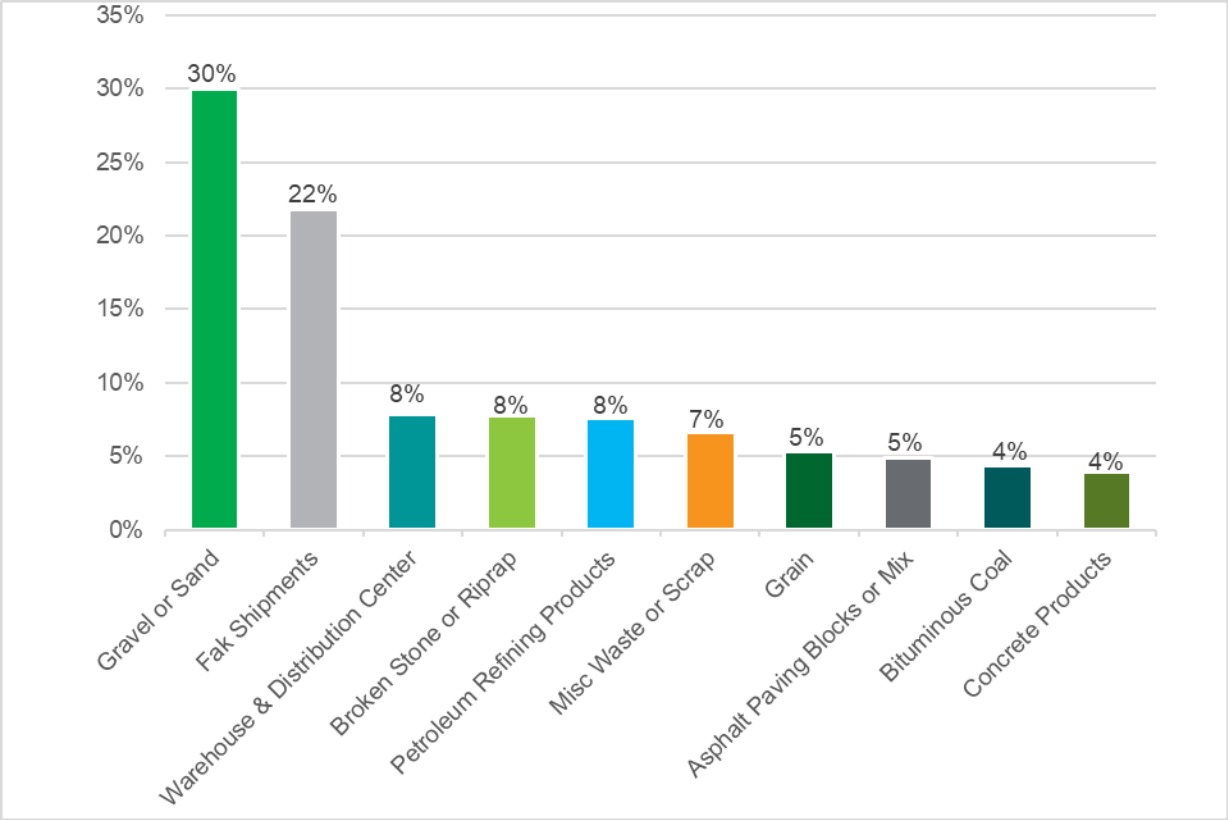
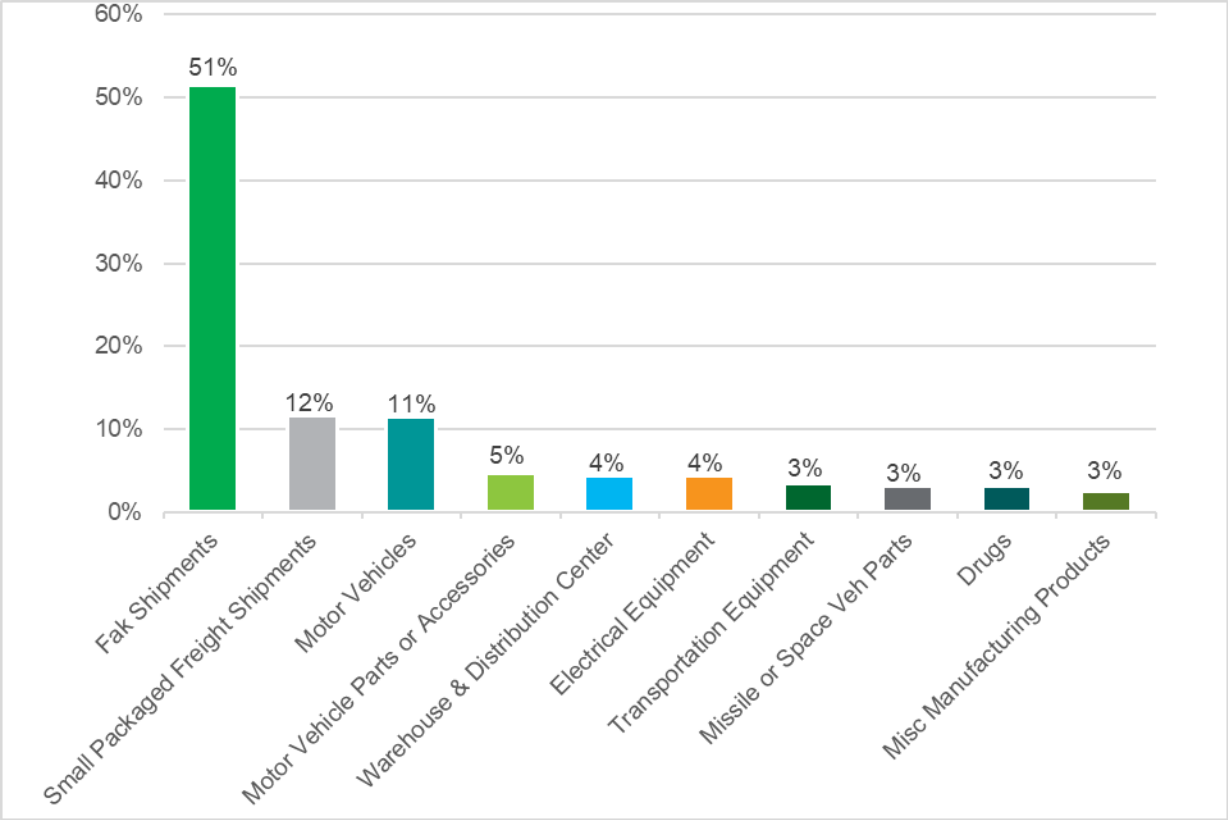


Figure 20 shows the top ten highest value commodities of the $460 billion of freight carried on Arizona's transportation system. The FAK category, valued at $237 billion, represents 51 percent of the top ten freight commodity categories by value, followed by $53 billion of Small Packaged Freight (12%), $52 billion of Motor Vehicles (11%), and Parts or Accessories worth $21 billion (5%). The remaining 21 percent of the top ten freight value is distributed almost evenly among Warehouse and Distribution Center, Electrical Equipment, Transportation Equipment, Missile or Space Vehicle Parts, Pharmaceuticals, and Miscellaneous Manufacturing Products.

Figure 20: Top Ten Commodities by Value, 2019



3.3 Arizona Truck/Highway Forecasts

Close to 285 million tons of freight valued at $395 billion were carried by truck in 2019 in Arizona (Table 14). Through traffic and local truck traffic have the highest share of Arizona's truck traffic in 2019, at 38 percent and 41 percent respectively. Inbound traffic share is 12 percent, while outbound truck traffic share is the lowest at 8 percent. By 2045 the forecasts for these shares will be little changed, and total truck tons are expected to increase 1.8 percent from 2019 to 2045, while total truck value is expected to increase 2.4 percent from 2019 to 2045.

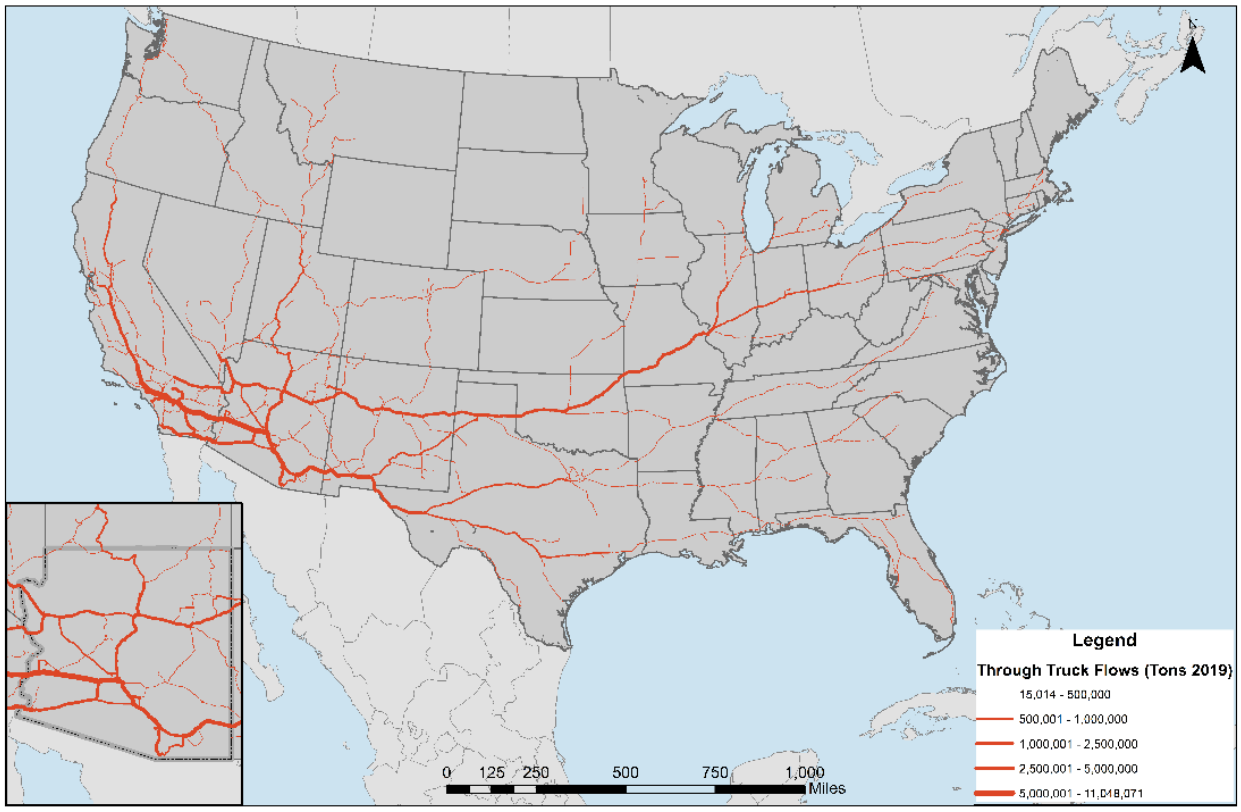
Table 14: Arizona Truck Flows, 2019 and 2045

Direction	2019		2045		CAGR 2019-2045 (Tons)	CAGR 2019-2045 (Value)
	Thousand Tons	Million USD	Thousand Tons	Million USD		
Through	108,565	239,795	177,213	432,348	1.9%	2.3%
Outbound	22,650	25,099	35,272	46,885	1.7%	2.4%
Inbound	35,552	72,120	67,826	133,867	2.5%	2.4%
Local	118,170	58,218	170,685	123,659	1.4%	2.9%
Total	284,937	395,231	450,995	736,760	1.8%	2.4%

3.3.1 Through Truck Freight Traffic

Through truck traffic accounts for about 38 percent of total truck traffic by tonnage, or 108.6 million tons in 2019. In terms of value, through truck traffic represents a much higher share (61% or $239.8 billion) of total truck traffic in 2019. Through traffic mainly originates in Texas, California, or Mexico and is destined for California, Utah, Texas, and other states in Midwest and East Coast (Figure 21). The top commodity categories shipped through Arizona in terms of value are plastic products, pharmaceuticals, and fresh fish. In terms of weight, the top commodities are construction materials.

Figure 21: Through Truck Traffic Flows, 2019



The top ten origin-destinations and commodities by tonnage illustrate the relative importance of construction goods from more-distant states (Table 15). Low-value commodities, mostly tied to construction, such as Asphalt Paving Blocks or Mix and Concrete Products, have disproportionate shares of truck tonnage compared to their value. Most construction materials are destined to California where they support the need for infrastructure and other construction activities. Other flows destined to California include Chemicals or Crude Fertilizer Minerals.

Truck through traffic tonnage totals for the top ten Origin/Destination pairs and commodities are not forecasted to change dramatically by 2045 (Table 16). Construction commodities drop from the top 10 set and Warehouse and Distribution Center commodities gain significance by

2045 as they are forecasted to increase an average of 4.9 percent from 2019 to 2045 due to increased growth in Consumer Goods and e-commerce nationally.

Table 15: Through Truck Flows by Origin, Destination and Commodity (Tons), 2019

Origin State	Destination State	Commodity	Thousand Tons
Texas	California	Asphalt Paving Blocks or Mix	2,748
Wyoming	California	Chem or Fertilizer Minerals Crude	2,098
Florida	California	Concrete Products	1,634
Texas	California	Concrete Products	1,251
Texas	California	Primary Iron or Steel Products	1,099
Texas	California	Misc. Coal or Petroleum Products	1,074
Utah	California	Chem or Fertilizer Minerals Crude	885
Nevada	Texas	Nonmetal Minerals, Processed	878
Montana	California	Misc. Field Crops	752
Wyoming	California	Clay Ceramic or Refrac Minerals	744
All Others			95,400
Top 10 Share of Total			12.1%

Table 16: Through Truck Flows by Origin, Destination and Commodity (Tons), 2045

Origin State	Destination State	Commodity	Thousand Tons
Texas	California	Asphalt Paving Blocks or Mix	4,593
Wyoming	California	Chem or Fertilizer Minerals Crude	2,140
California	Texas	Industrial Gases	2,083
Florida	California	Concrete Products	1,942
Texas	California	Primary Iron or Steel Products	1,931
California	Colorado	Warehouse & Distribution Center	1,798
Texas	California	Concrete Products	1,744
Texas	California	Misc Coal or Petroleum Products	1,734
California	Texas	Warehouse & Distribution Center	1,327
California	Utah	Warehouse & Distribution Center	1,275
All Others			156,645
Top 10 Share of Total			11.6%

Table 17 and Table 18 show the ten highest ranked origin-destination state pairs in 2019 and 2045 respectively and their importance when ranked by value. When analyzed in terms of value, a much more diverse picture emerges, as the top ten commodities in terms of value comprise 6.6 percent in 2019 and 7.3 percent in 2045 of the total truck though flows.

In terms of freight value, California is an origin or destination for most top ten through flows. By 2045, cross-border flows of Electric Equipment from Mexico gain significance. Shipments of Miscellaneous Office Machines, Plastic Products, and Motor Vehicles from Mexico and Texas destined to California make up six of the top seven ranked flows. Other important categories include Motor Vehicles from Ontario, Tropical Fruits and Miscellaneous Fresh Fruits or Tree Nuts from Mexico destined to California.

Table 17: Through Truck Flows by Origin, Destination and Commodity (Value), 2019

Origin State	Destination State	Commodity	Million USD
Mexico	California	Misc. Office Machines	2,501
Texas	California	Misc. Plastic Products	2,090
North Carolina	California	Cigarettes	2,019
North Carolina	California	Cigars	1,569
Ontario	California	Motor Vehicles	1,554
Michigan	California	Motor Vehicle Parts or Accessories	1,437
California	Texas	Pharmaceuticals	1,299
Texas	California	Primary Iron or Steel Products	1,234
Mexico	California	Tropical Fruits	1,192
Texas	California	Motor Vehicles	1,045
All Others			223,856
Top 10 Share of Total			6.6%

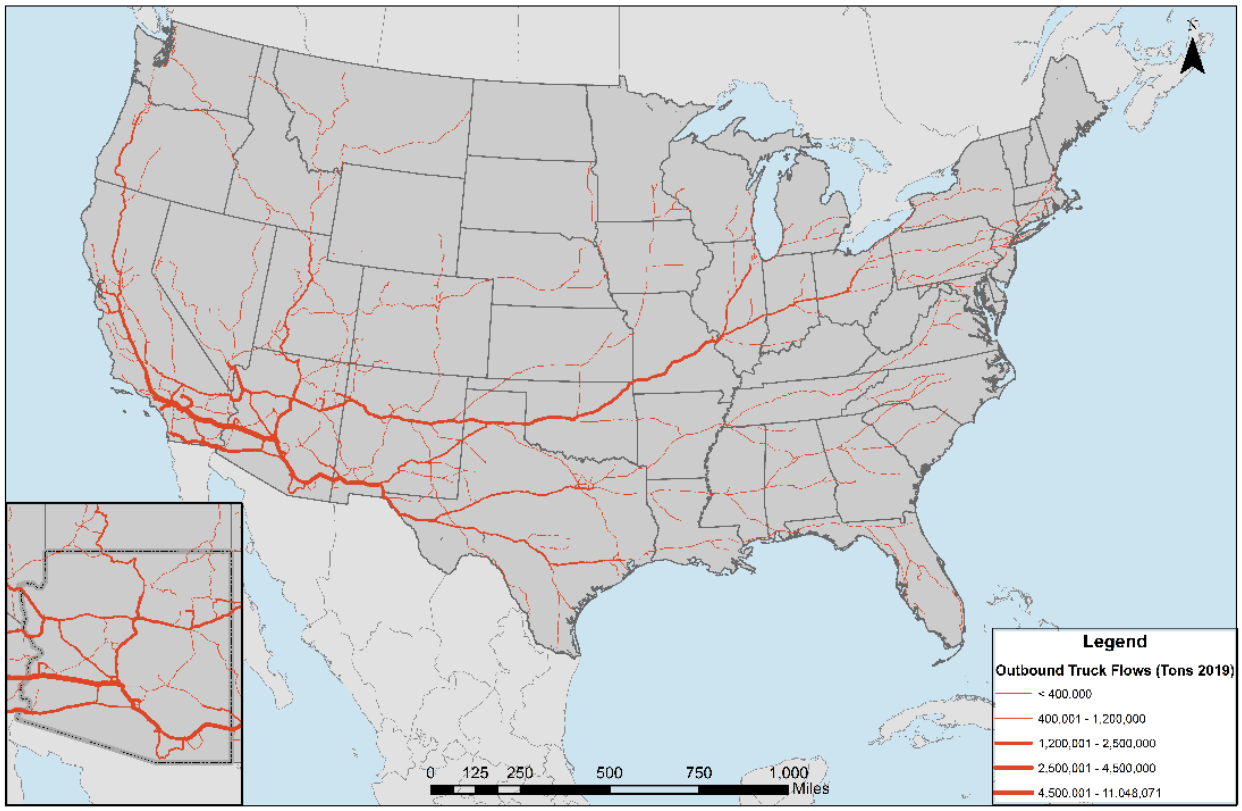
Table 18: Through Truck Flows by Origin, Destination and Commodity (Value), 2045

Origin State	Destination State	Commodity	Million USD
Mexico	California	Misc. Office Machines	5,647
Texas	California	Misc. Plastic Products	3,572
Mexico	California	Motor Vehicles	3,349
California	Texas	Pharmaceuticals	3,344
Ontario	California	Motor Vehicles	3,140
Mexico	California	Tropical Fruits	2,957
Mexico	California	Misc. Fresh Fruits or Tree Nuts	2,649
Mexico	Massachusetts	Electrical Equipment	2,296
Mexico	Georgia	Electrical Equipment	2,220
California	Colorado	Warehouse & Distribution Center	2,217
All Others			400,958
Top 10 Share of Total			7.3%

3.3.2 Outbound Truck Freight Flows

Outbound Arizona truck traffic accounts for 8 percent of total truck freight traffic by tonnage (22.6 million tons) and 8 percent of total truck freight traffic in terms of value ($25 million) in 2019. California is the number one destination for Arizona's outbound truck flows (Figure 22). In terms of weight, Construction materials constitute over a quarter of Arizona's outbound truck flows. In terms of value, Fresh Produce and Food Products amounted to one fifth of Arizona's outbound truck cargo in 2019. Besides California, other key destinations for goods shipped by truck from Arizona are other neighboring states (Nevada, Texas, New Mexico, and Utah) as well as Mexico. Other top outbound commodities in terms of value are Fresh Produce and Food, Warehouse and Distribution Center commodities, and Plastic Products.

Figure 22: Arizona Outbound US Truck Traffic Flows, 2019



The majority of outbound truck flows are destined to California (60% by tonnage and 51% by value) (Table 19). In terms of total value of all outbound flows, the cross-border flows to Mexico rank second, which represent 14 percent of Arizona's total outbound value. The average value of the cargos destined to Mexico is highest of all flows ($4,400 per ton), followed by flows to Ontario, Canada ($3,100 per ton) and to Washington ($2,400 per ton). Neighboring states receive cargo valued at an average of about $1,000 per ton, but cargo that is destined for New Mexico averages a lower value ($400 per ton). Major commodities destined to Mexico are high value goods manufactured in Arizona including Radio equipment, Electronic Equipment, Plastics, Solid State Semiconductors, Miscellaneous Electronic Components, and other high

value equipment. A sizable proportion of these goods are inputs used for vehicle manufacturing in Mexico.

From 2019 to 2045, outbound truck traffic is expected to grow an average annual compound growth rate of 1.7 percent in terms of weight and 2.4 percent in terms of value. The highest growth is expected for flows to Mexico at 2.9 percent in tons and 3 percent in value from 2019 to 2045. Growth in outbound flows to Mexico is due to growth in Copper Ores, Plastic Materials, Chemicals and Electronics. California is the top destination in 2019 and in 2045 both for tons and value. Top commodities destined to California are Warehouse and Distribution Center commodities, Plastics, Construction commodities and food commodities. Besides California, other key destinations for goods shipped by truck from Arizona are in other neighboring states (Nevada, Texas, New Mexico, and Utah) as well as to Mexico. Other top outbound commodities in terms of value are Bread or Other Bakery Products and Warehouse and Distribution Center commodities.

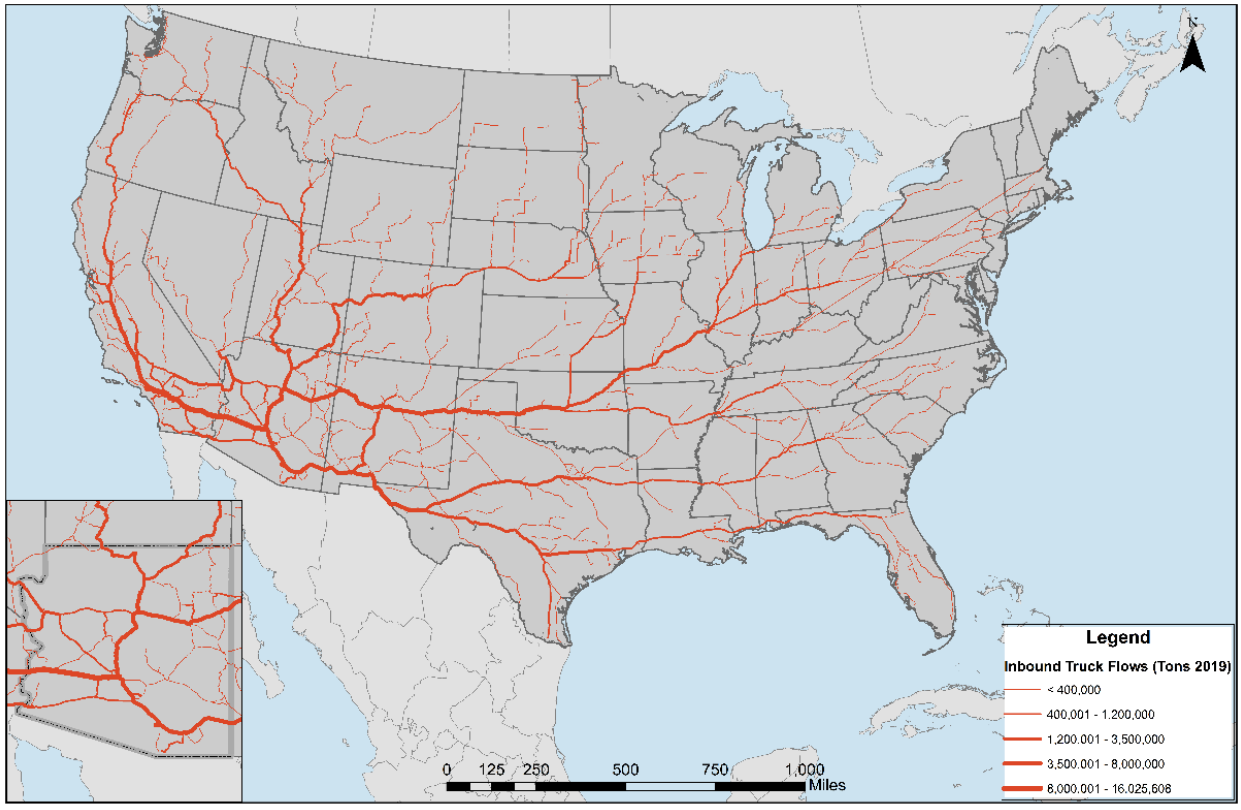
Table 19: Outbound Truck Traffic by Destination, 2019

	2019		2045		CAGR 2019-2045	
Destination State	Thousand Tons	Million USD	Thousand Tons	Million USD	Thousand Tons	Million USD
California	13,700	12,685	20,141	23,378	1.5%	2.4%
Nevada	1,624	1,438	3,053	2,807	2.5%	2.6%
Texas	1,243	1,002	2,376	1,874	2.5%	2.4%
New Mexico	1,076	441	1,245	606	0.6%	1.2%
Mexico	797	3,513	1,683	7,495	2.9%	3.0%
Utah	705	702	1,164	1,416	1.9%	2.7%
Colorado	396	390	660	822	2.0%	2.9%
Washington	306	728	561	1,296	2.4%	2.2%
Ontario	229	704	385	1,218	2.0%	2.1%
Florida	216	311	351	585	1.9%	2.5%
All Others	2,358	3,183	3,651	5,389	1.7%	2.0%
Top 10 Share of Total	89.6%	87.3%	91.6%	88.5%		
Total	**22,650**	**35,272**	**25,099**	**46,855**	**1.7%**	**2.4%**

3.3.3 Inbound Truck Freight Flows

Inbound Arizona truck traffic accounts for 12 percent of total truck traffic tonnage (35.5 million tons) and 18 percent of total truck freight value ($72.1 billion) in 2019. Compared to outbound flows, Arizona's inbound truck flows by tonnage and value were 57 percent and 187 percent higher, respectively. Inbound freight traffic originates across the nation, with higher value goods mainly coming from Washington, Mexico, and California (Figure 23). Arizona inbound flows from California include consumer goods and vehicles coming from Asia handled through California seaports which are then moved by truck into the state.

Figure 23: Inbound Truck Traffic Flows, 2019



Warehouse and Distribution Centers goods from California represents the highest inbound truck flow by tons and value in 2019. Table 20 shows that the top ten inbound truck flows account for 79.5 percent of all 2019 inbound truck traffic. Freight from California accounts for 39 percent of all inbound truck flows in terms of weight and 41 percent in terms of value. Other major truck origins are Mexico and Texas.

Overall inbound truck traffic is forecasted to grow at an annual average of 2.5 percent from 2019 to 2045 in terms of weight and 2.4 percent in terms of value. The highest growth is projected from neighboring California and Mexico (3.4% and 3.0% in terms of weight, respectively). However, the composition of commodities inbound flow from these two regions differs. The fastest growing commodity category for inbound flows from California is Warehouse and Distribution Center Goods at an annual average growth of 5.4 percent,

followed by Industrial Gases with an average of 3.7 percent growth. Inbound flows cross-border from Mexico include perishable goods such as Fresh Vegetables and Farm Products which are forecasted to grow 2.2 percent and 3.6 percent by weight, respectively from 2019 to 2045. In value terms, the highest growth is expected for imports from Mexico (3.6% CAGR) which, besides the already-mentioned commodities, will include specialty Electrical Equipment forecasted to be growing at an annual average rate of 4.2 percent to 2045.

Table 20: Inbound Truck Traffic by Origin, 2019 and 2045

	2019		2045		CAGR 2019-2045	
Origin State	Thousand Tons	Million USD	Thousand Tons	Million USD	Thousand Tons	Million USD
California	13,910	29,240	32,911	57,832	3.4%	2.7%
Mexico	3,818	8,904	8,220	22,457	3.0%	3.6%
Texas	3,337	5,457	5,937	9,180	2.2%	2.0%
New Mexico	2,411	1,320	3,264	2,267	1.2%	2.1%
Nevada	1,247	884	1,876	2,097	1.6%	3.4%
Washington	904	2,501	1,160	3,437	1.0%	1.2%
Colorado	784	1,285	1,164	1,925	1.5%	1.6%
Utah	728	1,334	1,285	2,331	2.2%	2.2%
Oregon	606	654	690	882	0.5%	1.2%
Florida	506	876	575	1,255	0.5%	1.4%
All Others	7,301	19,665	10,744	30,205	1.5%	1.7%
Top 10 Share of Total	79.5%	72.7%	84.2%	77.4%		
Total	**35,552**	**72,120**	**67,826**	**133,867**	**2.5%**	**2.4%**

3.4 Arizona Rail Forecasts

In Arizona, rail transported almost 122 million tons in 2019. Of those, 97 million tons or 80 percent was through traffic, as illustrated in Table 21. Inbound rail traffic accounted for a little over 17 percent of the total, while outbound traffic accounted for just 2.3 percent of the total. This pattern is forecasted to remain largely similar by 2045. Through rail tonnage will grow faster at an annual average of 2.3 percent followed by outbound averaging 1.7 percent annually, and local traffic will average 1.5 percent annual growth. Inbound rail is expected to decline at an annual average of 0.3 percent from 2019 to 2045, mostly due to drops in coal transport by rail. Total rail traffic is forecasted to grow 1.9 percent from 2019 to 2045.

A slightly different picture emerges when rail freight is measured in cargo value terms. The share of rail through traffic is higher in value terms, exceeding 94 percent or $10.2 billion from the total $10.8 billion carried on Arizona railways in 2019. Rail traffic is projected to grow at annual average of 2.4 percent from 2019 to 2045, with dominant through traffic averaging 2.4 percent annual growth.

Table 21: Arizona Rail Flows, Tons, and Units 2019 and 2045

Direction	2019		2045		CAGR 2019-2045	
	Thousand Tons	Millions USD	Thousand Tons	Million USD	Tons CAGR 2019-2045	Value CAGR 2019-2045
Through	97,377	400,562	176,295	749,586	2.3%	2.4%
Outbound	2,862	6,508	4,429	10,562	1.7%	1.9%
Inbound	21,158	20,189	19,428	33,055	-0.3%	1.9%
Local	498	491	726	753	1.5%	1.7%
Total	121,894	427,750	200,878	793,956	1.9%	2.4%

3.4.1 Through Rail Freight Flows

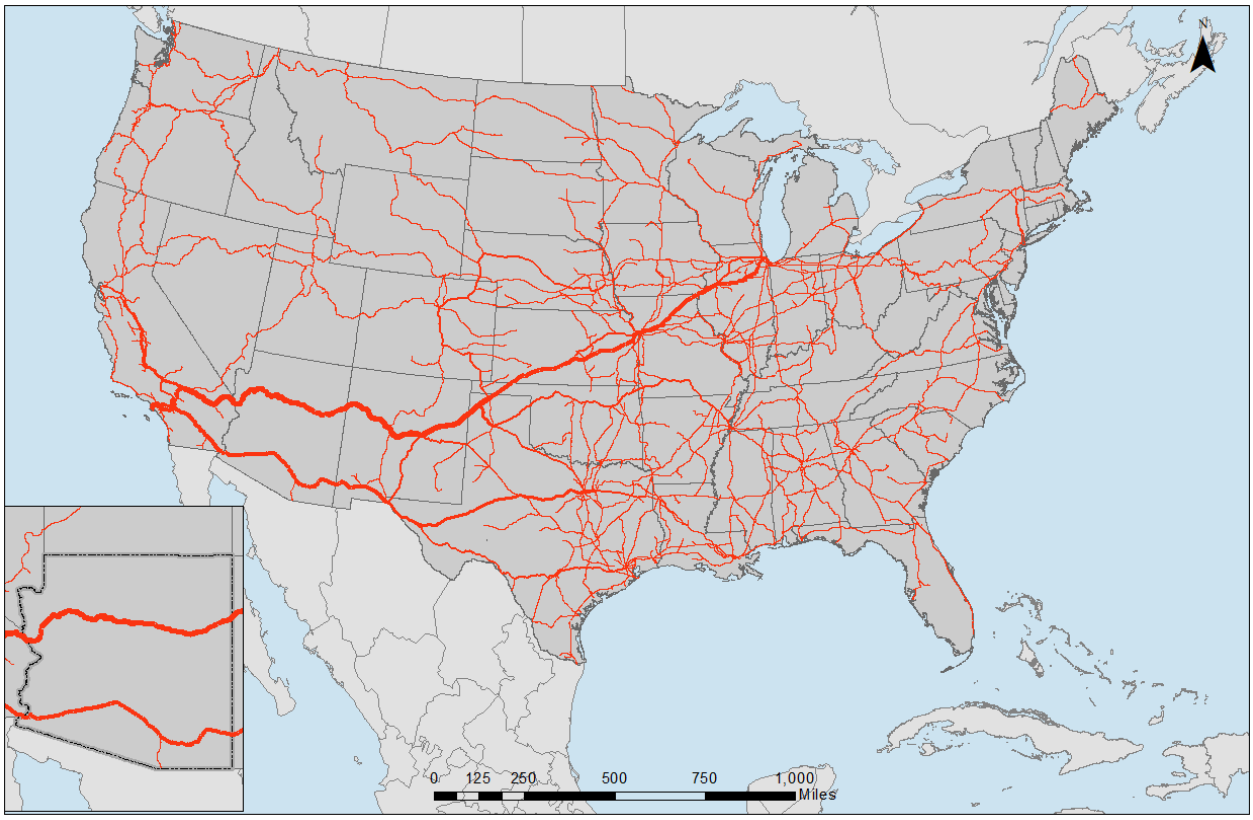
Through rail traffic makes up the highest share of Arizona's rail freight flows. Arizona is a freight rail through state for two major transcontinental rail corridors, which are the major drivers for the large through flow volumes:

- BNSF's Transcontinental (Transcon) Corridor
- Union Pacific' Sunset Route

Through rail traffic originates/destines all over the country with the highest volumes originated or destined in California, Illinois, and Texas. The BNSF Transcon Corridor connects Southern California, especially the Port of Los Angeles and the Port of Long Beach to Chicago and points east. Some rail traffic headed to Chicago is carried further east by truck or rail to ultimate destinations. Union Pacific's Sunset Route connects Southern California to El Paso and Dallas, TX and points east. Both routes are high-volume intermodal freight corridors and serve as a land bridge between trade that originates in Asia and is destined to East Coast, Midwest and Southeast markets (Figure 24). Goods moved on this route are intermodal goods shipped in FAK

containers and are typically manufactured goods such as e-commerce, or products typically shipped in containers such as apparel, electronics, appliances, and other consumer goods.

Figure 24: Through Rail Traffic Flows, 2019



The cargo moving on rail through Arizona mostly consists of FAK Shipments or intermodal commodities primarily flowing from California to Illinois, Texas, Tennessee, and Kansas. There are also intermodal flows from Illinois and Texas to California (Table 22). These goods are shipped to and from California and Chicago, Dallas and El Paso, TX. Intermodal shipments for top 10 origin destination pairs represent 37 percent of all through rail flows in terms of total tons in 2019 and are forecasted to be 39 percent in 2045.

Table 22: Through Rail Flows by Origin, Destination and Commodity (Tons), 2045

Origin State	Destination State	Commodity	Thousand Tons
California	Illinois	FAK Shipments	20,375
Illinois	California	FAK Shipments	18,087
California	Texas	FAK Shipments	11,437
Texas	California	FAK Shipments	8,153
Nebraska	California	Misc. Industrial Organic Chemicals	5,322
California	Tennessee	FAK Shipments	4,959
Kansas	California	FAK Shipments	3,150
Texas	California	Plastic Mater or Synthetic Fibers	2,908
California	Kansas	FAK Shipments	2,771
Nebraska	California	Grain	2,607
All Others			176,295
Top 10 Share of Total			45.2%

When measured in terms of value, there is a similar pattern among Arizona through rail Origin/Destination pairs (Table 23). The California to Illinois and Illinois to California rail routes represent the highest share in terms of value ($198.2 billion combined or 26% of total through rail flows). The through rail flows to and from California and Texas represent 13.5 percent of total of all through rail flows in terms of value. Other important through rail flows are FAK flows between California and Tennessee (5.0% combined).

Table 23: Through Rail Flows by Origin, Destination and Commodity (Value), 2045

Origin State	Destination State	Commodity	Million USD
California	Illinois	FAK Shipments	105,002
Illinois	California	FAK Shipments	93,212
California	Texas	FAK Shipments	58,938
California	Illinois	Small Packaged Freight Shipments	42,685
Texas	California	FAK Shipments	42,017
California	Tennessee	FAK Shipments	25,558
Illinois	California	Small Packaged Freight Shipments	24,094
Kansas	California	FAK Shipments	16,234
California	Kansas	FAK Shipments	14,281
Tennessee	California	FAK Shipments	12,034
All Others			400,562
Top 10 Share of Total			57.9%

3.4.2 Outbound Rail Freight Flows

Outbound rail shipments originating in Arizona represent just 2.3 percent of total state rail tons and 1.5 percent of the total state rail shipments value. Originating outbound rail traffic is comprised of Malt Liquors (mostly beer imported to Nogales from Mexico) where the rail shipments are recorded as originating from Santa Cruz County and destined for California, Texas, and Seattle. Other noteworthy rail flows originating in Arizona are classified as FAK shipping from mostly Maricopa County to Chicago, Kansas City, and to Los Angeles; Motor Vehicles (first imported to Nogales from Mexico) and then shipped by rail from Santa Cruz County to Chicago, Kansas City, St Louis, and Los Angeles. Major outbound originating rail traffic counties are Maricopa and Santa Cruz County, while major destinations are Los Angeles, Chicago, San Francisco and Dallas, TX. Figure 25 illustrates the outbound rail tonnage flows Arizona has destined for California, Chicago, Kansas City and Texas, where the thicker line represents the higher tonnage routes.

Figure 25: Outbound Rail Traffic Flows, 2019

The share of outbound rail traffic to California is highest (1 million tons out of 2.86 million total or 35%) and that traffic predominately includes the Malt Liquor (including beer) shipments originating by rail in Santa Cruz; the Misc. Field Crops category which is mostly hay and alfalfa shipped from La Paz County; and Liquified Petroleum Gasses, mostly shipped from Maricopa County to Los Angeles. Illinois shipments represent the highest percent in terms of value of overall outbound flows (45%) and they mostly include imported Motor Vehicles from Mexico that are shipped onward by rail from Santa Cruz County to Chicago; Also, high value shipments

include FAK shipments and the Small Packaged Freight Shipments categories of mixed products from Maricopa County to Chicago. Overall outbound rail traffic is forecasted to grow at an annual average of 1.7 percent from 2019 to 2045 in tons and 1.9 percent in value. Highest growth is expected for Chemicals flows to Nevada averaging 2.3 percent annually in terms of weight and 2.1 percent annually in value from 2019 to 2045. Flows to Kansas and Illinois consist of mostly FAK shipments, Motor Vehicles and Small Packaged Freight Shipments and are forecasted to increase at an annual average of 2.2 percent in tons and value for Kansas and 2.1 percent and increase at an annual average of 1.9 percent in tons and value destined for Illinois. Other top outbound state destinations are outlined in Table 24.

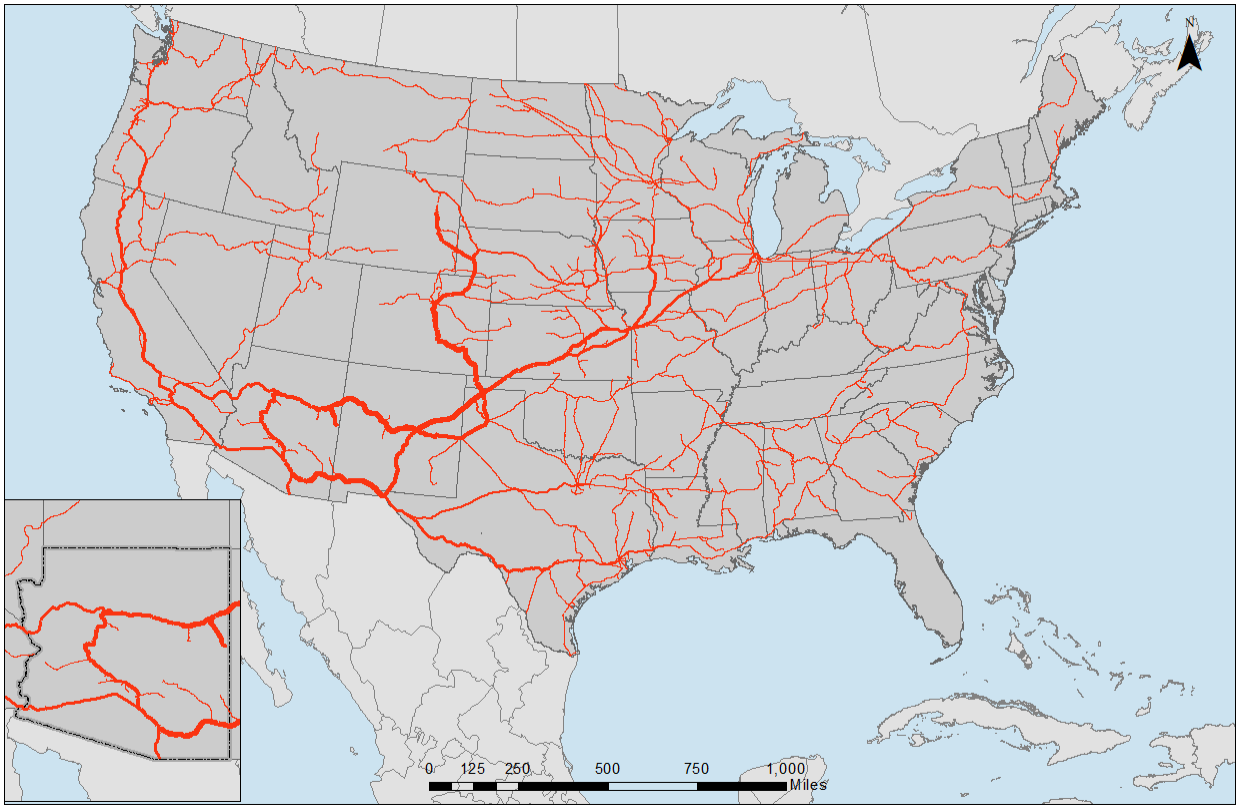
Table 24: Outbound Rail Traffic by Destination, 2019 and 2045

Destination State	2019		2045		CAGR 2019-2045	
	Thousand Tons	Million USD	Thousand Tons	Million USD	Thousand Tons	Million USD
California	1,000	984	1,694	1,598	2.0%	1.9%
Illinois	465	2,907	796	4,803	2.1%	1.9%
Texas	404	655	580	1,133	1.4%	2.1%
New Mexico	180	48	207	60	0.5%	0.9%
Kansas	95	36	162	830	2.2%	2.2%
Colorado	93	473	109	46	0.5%	0.9%
Missouri	70	57	101	83	1.4%	1.5%
Oklahoma	69	629	101	930	1.5%	1.5%
Washington	52	41	70	73	1.1%	2.2%
Tennessee	51	89	66	163	1.0%	2.4%
All Others	381	589	552	882	1.4%	1.6%
Top 10 Share of Total	86.7%	91.0%	87.5%	92.0%		
Total	**2,862**	**6,508**	**4,429**	**10,562**	**1.7%**	**1.9%**

3.4.3 Inbound Rail Freight Flows

Inbound rail into Arizona represents 17 percent of all rail flows in terms of weight and 4.7 percent in terms of value. Inbound rail traffic comprised of Bituminous Coal from Casper, WY and Albuquerque, NM goes to Apache County and Navajo County where it has been used for electricity generation. Grain is shipped by rail from Des Moines Iowa and Kansas to mostly Maricopa and Pinal Counties. Other important inbound rail commodity flows are Petroleum Refining products arriving from Houston, El Paso, Corpus Christy and Dallas, TX to mostly Santa Cruz, Pima and Maricopa counties. Major inbound destination counties are Maricopa and Apache County, and major origins are Albuquerque, NM, Casper, WY, Des Moines, IA and Chicago, IL. Figure 26 illustrates the inbound rail tonnage flows that Arizona receives, which are particularly large from New Mexico, Chicago, Wyoming, and Texas.

Figure 26: Inbound Rail Traffic Flows, 2019



The share of inbound rail traffic from New Mexico is highest (5.2 million tons out of 21.2 million total or 24.6%) and predominately includes Bituminous Coal from the coal producing mines in northwest New Mexico. Another important coal producing region is Wyoming in Campbell County and rail flows from this region are the second highest inbound flows (16.8% of total inbound flows). Rail shipments from Illinois represent 5.7 percent of total inbound rail tons and are mostly FAK shipments shipped using intermodal rail service. Other top 10 inbound originating rail traffic states are outlined in Table 25.

Overall inbound rail traffic tonnage is forecasted to decline at an annual average rate of -0.3 percent from 2019 to 2045. However, overall inbound rail traffic is forecasted to grow at an average annual rate of 1.9 percent in terms of value. The largest tonnage declines are forecasted for Bituminous Coal inbound from New Mexico (-4.9%), Wyoming (-5.8%), and Montana (-3.5%) due to increased use of alternatives to coal for electricity generation (i.e., natural gas, wind, solar) for Arizona. Inbound rail flows from Louisiana are expected to increase at an average of 2.3 percent in tons and 2.9 percent in value, mostly due to growth in Plastics and Chemicals shipments averaging 3.8 percent and 2.5 percent from 2019 to 2045 respectively. Inbound flows from Illinois, mostly from Chicago, are forecasted to grow 2.1 percent in terms of weight and value from 2019 to 2045, mostly due to growth of FAK shipments of 2.6 percent and motor vehicle parts of 1.9 percent. Other inbound flows that are expected to increase are flows of chemicals from Iowa and FAK and Plastics from Texas.

Table 25: Inbound Rail Traffic by Origin, 2019 and 2045

Destination State	2019		2045		CAGR 2019-2045	
	Thousand Tons	Million USD	Thousand Tons	Million USD	Thousand Tons	Million USD
New Mexico	5,215	181	1,413	57	-4.9%	-4.3%
Wyoming	3,551	228	753	144	-5.8%	-1.8%
Texas	1,637	3,279	2,351	5,513	1.4%	2.0%
Iowa	1,356	549	2,060	925	1.6%	2.0%
Illinois	1,200	8,076	2,046	13,689	2.1%	2.1%
California	1,111	535	1,597	898	1.4%	2.0%
Kansas	693	964	854	1,612	0.8%	2.0%
Montana	674	58	267	54	-3.5%	-0.3%
Minnesota	637	405	821	542	1.0%	1.1%
Louisiana	603	705	1,091	1,469	2.3%	2.9%
All Others	4,480	5,209	6,174	8,152	1.2%	1.7%
Top 10 Share of Total	78.8%	74.2%	68.2%	75.3%		
Total	**21,158**	**20,189**	**19,428**	**33,055**	**-0.3%**	**1.9%**

3.5 Arizona Air Cargo Forecasts

Including domestic and international cargo flows, Arizona air freight tonnage totaled 364,000 tons in 2019 (Table 26). Tonnage was split fairly evenly between outbound flows (51%) and inbound flows (49%). By 2045, tonnage split between outbound (52%) and inbound (48%) air cargo is forecasted to remain similar. Air freight tonnage is projected to increase 41 percent, representing an average annual growth rate of 3.4 percent. Outbound tonnage is forecasted to increase 51 percent and inbound tonnage 30 percent, representing average annual growth rates of 3.6 percent and 3.3 percent respectively. In terms of value, inbound flows are expected to increase at average annual rates of 3.1 percent and outbound flows at average annual rates of 3 percent to 2045.

Table 26: Air Flows, 2019 and 2045

Direction	2019		2045		CAGR 2019-2045	
	Thousand Tons	Million USD	Thousand Tons	Million USD	Tons CAGR 2019-2045	Value CAGR 2019-2045
Inbound	178	28,695	409	63,100	3.3%	3.1%
Outbound	186	29,089	466	62,419	3.6%	3.0%
Total	**364**	**57,784**	**875**	**125,519**	**3.4%**	**3.0%**

3.5.1 Outbound Air Freight Flows

Table 27 summarizes the top ten air cargo commodities by weight in 2019 and 2045. Small, packaged freight shipments or mail account for the highest share of all outbound air tons (33.1% in 2019 and 38.3% in 2045) and are forecasted to increase at an average annual rate of 4.2 percent from 2019 to 2045. The total value of this commodity group is unknown as the contents of private mail are not publicly available. Electrical, transportation and Optical equipment are typically high value goods manufactured in Arizona and are often shipped out of the state by air. They are forecasted to increase at average annual rates of 2.8 percent, 2.8 percent, and 2.1 percent respectively over the forecast period. FAK commodities and Mail and Express traffic are forecasted to increase at average annual rates of 4.1 percent and 4.4 percent, respectively, mostly due to forecasted growth from e-commerce retail goods demand growth. Total outbound air tonnage is projected to grow at an average annual growth rate of 3.6 percent.

Table 27. Outbound Air Flows by Commodity, 2019 and 2045

STCC4	Commodity	2019 Thousand Tons	2045 Thousand Tons	CAGR 2019-2045
47 11	Small Packaged Freight Shipments	61	178	4.2%
36	Electrical Equipment	26	54	2.8%
37	Transportation Equipment	23	47	2.8%
38	Instruments, Photo Equipment, Optical Eq	20	34	2.1%
34	Fabricated Metal Products	9	17	2.6%
35	Machinery	8	15	2.6%
46 11	FAK Shipments	7	20	4.1%
43 11	Mail and Express Traffic	5	16	4.4%
39	Misc. Manufacturing Products	5	13	3.6%
32	Clay, Concrete, Glass, or Stone	4	15	4.8%
All Others		17	56	4.7%

The importance of Computer, Transportation, Electrical and Optical equipment manufactured in Arizona becomes more evident when outbound air flows are analyzed in terms of value. Combined share of total value for these commodities accounts for more than 60 percent of all outbound air flows in 2019 and 2045. Over the forecast period these commodities are forecasted to increase at average annual rates of 2.8 percent for Transportation equipment, 2.8 percent for Electrical Equipment, and 2.1 percent for Optical Equipment. Highest growth is forecasted for the FAK commodity category, increasing at an annual average of 4.1 percent from 2019 to 2045, mostly due to higher expected growth for e-commerce retail goods. Another commodity category that is forecasted to increase at higher rate is Chemical or Allied Products, which are projected to grow averaging 5.9 percent annually, mostly due to higher

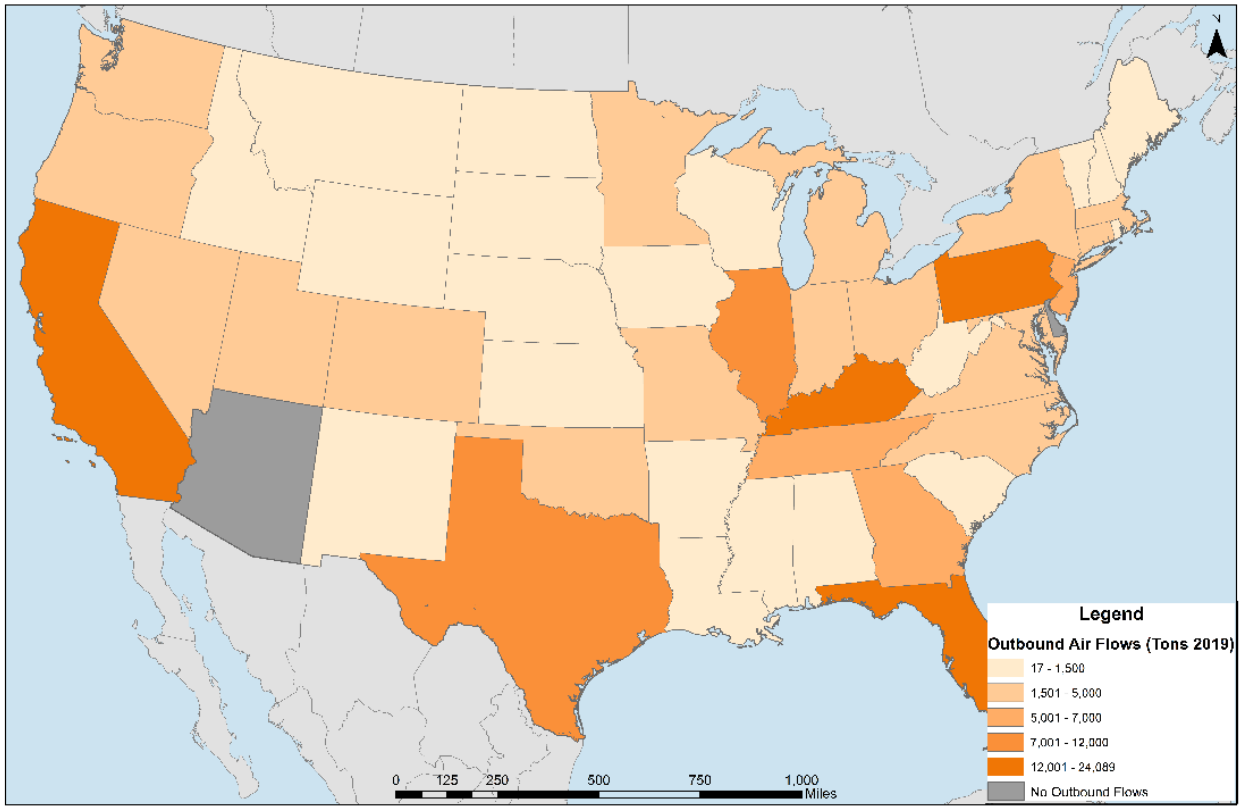
value growth of these commodities, especially pharmaceuticals and hazardous cargo that is licensed to be transported through Phoenix airport. Total outbound air value is projected to grow at an average annual growth rate of 4.9 percent (Table 28).

Table 28: Outbound Air Flows by Commodity (Value), 2019 and 2045

STCC4	Commodity	2019 Million USD	2045 Million USD	CAGR 2019-2045
37	Transportation Equipment	9,174	18,833	2.8%
36	Electrical Equipment	7,013	14,449	2.8%
38	Instruments, Photo Equipment, Optical Eq	4,580	7,881	2.1%
39	Misc. Manufacturing Products	4,261	10,312	3.5%
46 11	FAK Shipments	1,022	2,894	4.1%
35	Machinery	973	1,889	2.6%
34	Fabricated Metal Products	391	768	2.6%
28 31	Drugs	383	838	3.1%
28	Chemicals or Allied Products	234	1,041	5.9%
33	Primary Metal Products	227	621	3.9%
All Others		882	2,894	4.9%

Air freight originating in Arizona is destined for the entire country, with especially high volumes to states with small package delivery shipment hubs. California accounts for 20 percent of outbound air freight since the two largest air cargo carriers operating in Arizona (FedEx and UPS) have hubs there. Kentucky, where UPS has its Worldport hub, accounts for 15 percent of all outbound air, while Florida accounts for 15 percent of all outbound air flows, due to the large air cargo hub in Miami for Latin America and Caribbean trade partners operations (Figure 27).

Figure 27: Destinations of Outbound Air Freight by State and Tonnage, 2019



3.5.2 Inbound Air Freight Flows

Table 29 summarizes the top ten commodities by weight in 2019 and 2045. There is little difference in the commodity composition of inbound and outbound air freight in Arizona. Small Packaged Freight Shipments dominates inbound air flows at 30.2 percent of all inbound air freight in the state in 2019 and 30.8 percent in 2045 and are forecasted to increase at an annual average rate of 3.3 percent to 2045. Machinery is the second highest inbound air commodity category with 14 percent of total inbound air flows in 2019 and 2045 and are forecasted to increase at an average annual rate of 3.1 percent from 2019 to 2045. Highest growth is expected for e-commerce retail goods or FAK shipments and Textile products, at average annual rates of 4.3 percent and 5.3 percent respectively. High value shipments of equipment (electrical, transportation, optical) are forecasted to increase at average annual rates near 3 percent combined over the forecast period. Additional key commodities shipped to Arizona by air include Mail, Miscellaneous Manufacturing Products, and Textile Mill with 3.8 percent, 3.7 percent, and 4.6 percent share of total respectively.

Table 29: Inbound Air Flows by Commodity (Tonnage), 2019 and 2045

STCC4	Commodity	2019 Thousand Tons	2045 Thousand Tons	CAGR 2019-2045
47 11	Small Packaged Freight Shipments	54	126	3.3%
35	Machinery	25	55	3.1%
36	Electrical Equipment	23	52	3.2%
37	Transportation Equipment	16	31	2.7%
43 11	Mail and Express Traffic	9	15	2.0%
39	Misc. Manufacturing Products	8	15	2.4%
38	Instruments, Photo Equipment, Optical Eq	7	14	2.6%
22	Textile Mill Products	6	19	4.3%
46 11	FAK Shipments	5	20	5.3%
33	Primary Metal Products	4	9	3.2%
All Others		20	52	3.7%

Table 30 summarizes the top ten commodities by value in 2019 and 2045. Miscellaneous Manufacturing Products, Transportation and Electrical equipment commodities account for over 60 percent of inbound air flows in terms of value in 2019 and 2045. Miscellaneous Manufacturing products are typically high in value and as such represent much higher share in terms of value (19.6%), compared to 3.7 percent share in terms of weight. From 2019 to 2045 Miscellaneous Manufacturing Equipment is forecasted to increase averaging 2.4 percent growth annually, while Transportation Equipment is forecasted to increase at an average of 2.7 percent and Electrical Equipment is forecasted to increase an average of 3.2 percent annually. Other high value commodities imported to Arizona by air are Pharmaceuticals, Aircraft and

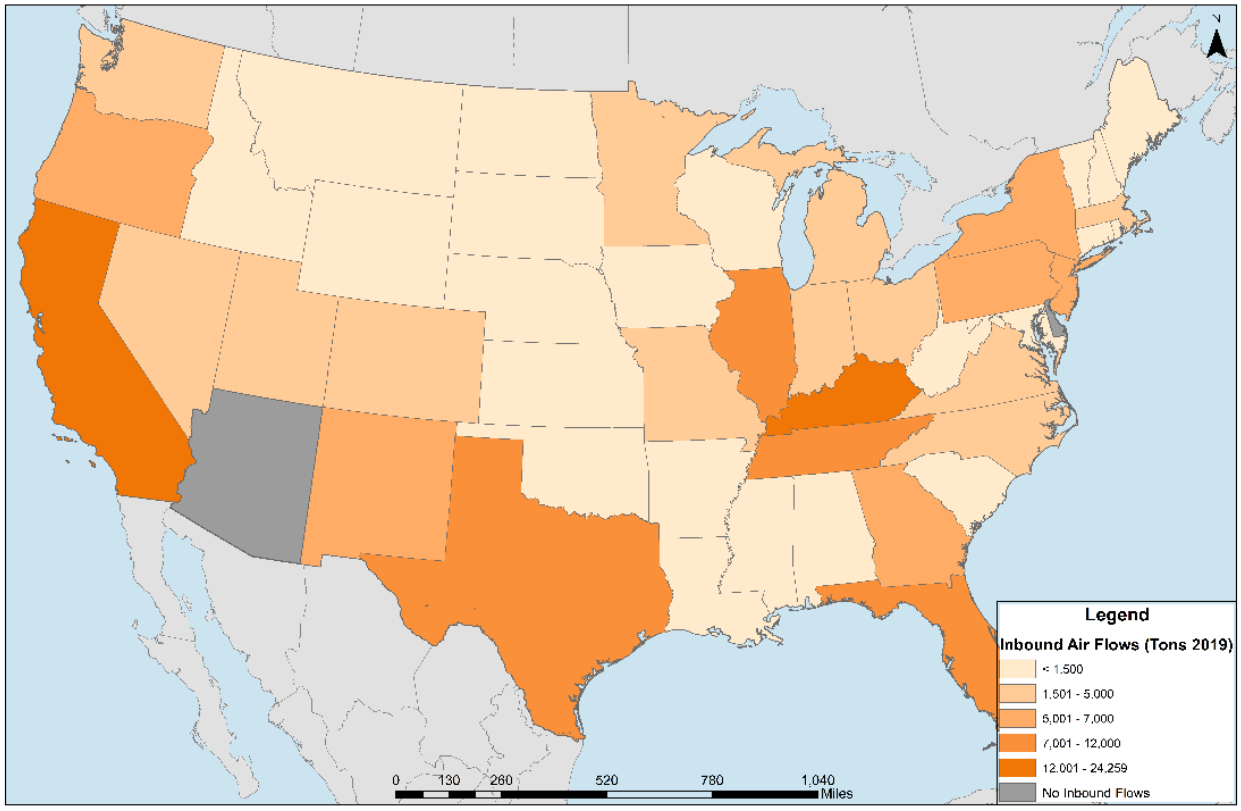
Chemical Products. Pharmaceuticals and Chemicals are expected to increase at the highest rate at average annual rates of 5 percent and 5.8 percent respectively. Top 10 commodities account for over 96 percent of inbound air freight value due to air transport being justified only for time-sensitive, very high-value, and perishable cargoes.

Table 30: Inbound Air Flows by Commodity (Value), 2019 and 2045

STCC4	Commodity	2019 Million USD	2045 Million USD	CAGR 2019-2045
39	Misc. Manufacturing Products	6,621	12,341	2.4%
37	Transportation Equipment	6,341	12,516	2.7%
36	Electrical Equipment	6,090	13,875	3.2%
35	Machinery	3,213	7,038	3.1%
38	Instruments, Photo Equipment, Optical Equipment	1,701	3,345	2.6%
28 31	Drugs	1,544	5,482	5.0%
37 21	Aircraft	1,002	1,830	2.3%
46 11	FAK Shipments	749	2,857	5.3%
33	Primary Metal Products	432	668	1.7%
28	Chemicals or Allied Products	191	819	5.8%
All Others		812	2,331	4.1%

Figure 28 shows the origin states of air cargo shipped to Arizona. The pattern is very similar to that of outbound Arizona air cargo flows, since air cargo commonly is moved through large hubs. California, Kentucky (UPS Louisville hub), Illinois (UPS Rockford hub), and Tennessee (FedEx Memphis hub) represent top inbound states originations for air cargo flows into Arizona. Texas, Florida, and Alaska, all states with UPS and FedEx and international air freight forwarder hubs, add considerable air flows to the state.

Figure 28: Origins of Inbound Air Freight by State and Tonnage, 2019



4 STRATEGIC DIRECTION

4.1 Introduction

The strategic direction focuses on the development of ADOT's freight priorities and their delineation through a vision statement, goals, objectives, and performance measures. This process is illustrated in Figure 29.

The "Visioning Process" refers to the establishment of a preferred future by freight community stakeholders. Regarding the Arizona freight system, the vision statement focuses on working towards national goals while supporting economic development in the state.

Goals are value-based statements that specify what issues a plan will address, but goals typically do not include measurable aspects. Instead, goals are focused on the plan's purpose, scope, and context. Objectives are more specific than goals and include clear ends with measurable aspects that detail how a related goal will be achieved. Both plan components inform the development of performance measures as well as subsequent strategies and policies used to affect changes in the freight system that bring circumstances closer in line with the vision statement.

Performance measures are derived from collected data that describe progress towards the plan's vision, goals, and objectives. A single performance measure may inform reports on progress for multiple goals and objectives.

Figure 29: Flow of Strategic Direction

The Arizona State Freight Plan vision statement, goals, objectives, and performance measures establish a flexible basis for future decisions at ADOT, regional planning organizations, local governments, and the Arizona freight industry.

4.2 Vision Statement

The Arizona State Freight Plan Vision is similar to the 2017 Arizona State Freight Plan Vision with updates to include innovation. This reflects the term's inclusion in national freight strategic goals and represents Arizona's existing innovation-friendly business climate, especially related to emerging freight technology.

The Arizona State Freight Plan Vision is for Arizona's freight transportation system to enhance economic competitiveness and quality growth through innovation and effective system management.

4.3 Goal Development Process

The Arizona State Freight Plan initial draft goals and vision were based on desk research, including existing Arizona planning documents and studies, peer state freight plans, federal freight planning guidance, the Infrastructure Investment and Jobs Act (IIJA), and national freight planning strategic goals. Common themes identified through the review of these plans served as the basis for the initial draft goals, including safety, innovation, mobility and reliability, and economic growth. Special consideration was given to Arizona's long range plan goals, the National Freight Strategic Goals, and the National Performance Goals.

The draft goals were developed to reflect Arizona's regional and statewide priorities, as well as the national freight strategic goals. Draft goals were presented to the Arizona Freight Advisory Committee (FAC) on December 7, 2021. FAC members reviewed the draft goals, provided feedback on how well the goals represented their priorities for Arizona's freight system, and identified priorities that were missing from the draft goals.

For each of the three draft goals (safety, system management, and competitiveness), 87 percent to 100 percent of FAC members felt that their priorities were "Very Well" or "Mostly" represented. While ADOT has not historically included stewardship at the goal level in its freight and long-range plans, the increased focus at the federal and stakeholder level support the addition of a new goal area. The new Stewardship goal language was drafted to align with principles outlined in the Arizona Department of Transportation Sustainable Transportation Program Final Report. Further detail on the goal development process can be found in the Goals, Objectives, and Performance Measures Working Paper.

FAC members identified missing topic themes including bottlenecks, infrastructure capacity and freight volume growth, climate change and carbon emissions, economic growth, internal processes, multimodal and intermodal considerations, innovative technologies, truck parking, resiliency and redundancy, and supply chain disruptions. This feedback reinforced the IIJA's new emphasis on the environmental impacts of freight.

4.4 Goals

Based on the feedback from the FAC, the draft goals were revised to include a new stewardship goal aligned with ADOT's sustainable transportation program, to specify that the goals cover all freight modes and intermodal activities, and to be more concise. The final Arizona State Freight Plan goals are shown in Figure 30.

Figure 30: Arizona State Freight Plan Goals

4.5 Objectives

The Arizona State Freight Plan objectives were developed based on the goals and reflect how ADOT will make progress toward its four goal areas.

4.5.1 Safety Objectives

The safety objectives reflect how ADOT will make progress toward the goal of maintaining a safe and secure freight transportation system.

Objective 1.1: Reduce the number and severity of freight related crashes and injuries.

Objective 1.2: Coordinate with relevant organizations to implement ADOT's Cross Border Plan as it relates to safe and secure movement at the international border.

Objective 1.3: Identify and address infrastructure and cargo vulnerabilities to environmental and human interference.

4.5.2 System Management and Mobility Objectives

The system management and mobility objectives reflect how ADOT will make progress toward the goal of having a reliable, resilient, future-oriented transportation system that enables efficient multi-modal freight movement.

Objective 2.1: Coordinate with local governments, MPOs, modal operators, and the private sector to manage congestion and freight system reliability.

Objective 2.2: Implement strategies to leverage emerging technologies and support logistics and freight industry innovations.

Objective 2.3: Maintain, preserve, and modernize state freight transportation systems and infrastructure to improve network quality.

Objective 2.4: Improve roadway connections at intermodal facilities, airports, or other modal hubs.

Objective 2.5: Increase the resilience of the freight transportation system by addressing infrastructure vulnerabilities associated with threats from extreme weather and other hazards.

4.5.3 Competitiveness Objectives

The competitiveness objectives reflect how ADOT will make progress toward the goal of utilizing strategic policies, investments, partnerships, and infrastructure that position Arizona to benefit from emerging economic opportunities.

Objective 3.1: Build and maintain a freight network that supports key sectors that drive economic competitiveness and provide high paying jobs to residents.

Objective 3.2: Coordinate with public and private partners to improve connectivity and supply-chain resiliency between Arizona businesses and their trading partners.

Objective 3.3: Develop and advocate for strategies, policies, and investments that help the Arizona freight system adapt quickly and effectively to evolving markets and emerging trends.

Objective 3.4: Utilize and share data resources to facilitate more efficient and effective freight-related decision making.

Objective 3.5: Institute performance- and data-based policies that increase Arizona's economic preparedness and competitiveness.

4.5.4 Stewardship Objectives

The stewardship objectives reflect how ADOT will make progress toward the goal of a developing approaches to freight planning that include economic, social, and environmental stewardship.

Objective 4.1: Provide transparent access to ADOT planning documents, data resources, decision-making processes, and industry coordination to freight partners and the public.

Objective 4.2: Utilize data resources and performance-based decision-making to select fiscally conscientious investments that advance plan goal areas and objectives.

Objective 4.3: Reduce freight's effect on environmental resources including local air quality, noise, water quantity and quality, native habitats, wildlife species, and the global climate by supporting the deployment of advanced vehicle technologies, cleaner fuels, and more efficient freight operations.

Objective 4.4: Reduce inequalities in access to the economic opportunities associated with the freight network and in the distribution of its negative impacts.

Objective 4.5: Effectively engage with public entities, especially those representing vulnerable populations, according to practices outlined in the ADOT Public Involvement Plan.

4.6 Performance Measures

ADOT has identified performance measures to track progress on the plan's goals. These performance measures provide clear connections to plan components, including the current condition of the freight system, the strengths, weaknesses, and needs of the ADOT freight system, and the goals and objectives. The performance measures were developed with consideration to measures identified in the previous freight plan, FAC input, other ADOT planning documents, and metrics applied in other states. Performance measures are associated with freight plan goals and may address one or many objectives. The performance measures for each goal are listed in Table 31.

Table 31: Goals and Performance Measures

Goal	Performance Measure
Safety	Rate of freight-related crashes, fatalities, and serious injuries per 100 million Vehicle Miles Traveled (VMT) by all traffic
	Annual cost of freight-related crashes and injuries
	Annual number of crashes, fatalities, and serious injuries involving large trucks
	Annual number of highway-rail at-grade crashes, fatalities, and serious injuries
	Rates of freight-related crashes and injuries by geographic and sociodemographic factors
	Annual delay hours associated with severe weather events
System Management and Mobility	Truck travel time reliability index
	Truck planning time index
	Annual truck hours of delay
	Percentages of freight miles by infrastructure condition for pavement and bridges
	Percent of system-wide annual delay at identified bottlenecks
	Number of previously identified bottlenecks removed from top bottleneck list due to system investment
	Average distance of freight generators to the nearest intermodal facility
	Average distance of freight facilities to the nearest Key Commerce Corridor
	Number of intelligent transportation system (ITS) sensors per mile on freight network infrastructure

	Percent of truck parking locations within five percent of overnight capacity more than 50 percent of the time
	Annual truck hours of delay due to weather impacts and other hazards
Competitiveness	Sector value and tonnage share and growth, updated every 4 years
	International import and export value and tonnage, updated every 4 years
	Efficiency improvements in performance and condition metrics from the Cross-Border Plan for ports of entry and the facilities that serve them
	Project investment distribution between public, private, and ADOT dollars
	Freight vehicle market shares held by disruptive or innovative technologies, such as autonomous and electric vehicles in Arizona
	Annual cost of freight delays by mode and origin-destination geography
Stewardship	Percent of equity population[2] freight industry workers[3] within 25 miles of their job
	Carbon dioxide (CO_2) emissions from annual freight VMT
	Percent of equity population[4] residing in areas with higher than the 90th percentile of national levels of 2017 Diesel Particulate Matter
	Percent of projects for which ADOT selected the alternative with the lowest environmental impact, other than "no build"
	Annual percent of overall budget invested in supporting advanced vehicle technologies, cleaner fuels, and more efficient freight operations (e.g., Transportation Systems Management and Operations (TSMO), ITS, etc.)
	Share of identified environmental impacts mitigated for major freight investments, including impacts related to air and water quality, noise pollution, native habitats, or wildlife disruption
	Percent of freight-related outreach efforts that are tailored to environmental justice and other underserved or vulnerable communities

The goals, objectives, and performance measures serve as the foundation for ADOT's decision-making processes that rely on the Arizona State Freight Plan for guidance. As data on performance measures is collected, performance-based planning will continue to inform project prioritization for the ADOT investments, the development of specific improvements and implementation strategies, policy formation for future freight efforts, and other general direction for ADOT freight planning over the next four years until the next plan update.

[2] As defined by EPA EJ Screen "demographic index".
[3] Freight industry worker could include any number of industries and we propose trade, transport, manufacturing, utilities, warehouse, and wholesale retail for example. Job data: http://lehd.census.gov/data/#lodes
[4] As defined by EPA EJ Screen "demographic index".

5 STATE FREIGHT SYSTEM NEEDS

5.1 Introduction

Arizona is a nationally crucial crossroad for freight movement, so addressing performance trends, needs, and issues is vital to keeping its freight system efficient and reliable. This section summarizes statewide freight trends, needs, or issues.

5.2 Relationship to Strategic Direction

The strategic goals, objectives, and performance measures outlined in Chapter 4 served as the basis for evaluating Arizona's current and future freight needs. Based on the results of technical analysis and input from stakeholders, a set of freight needs were categorized and aligned with the established freight goals, objectives, and performance measures.

5.3 Future Trends Influencing Freight Flows

Many factors influence the competitiveness and growth of Arizona's freight sectors and associated freight flows. Table 32 outlines some of the key trends that are likely to influence freight flows in Arizona.

Table 32: Key Trends Influencing Freight Flows

Key Trend	Description
Population Growth	• Between 2020 and 2021, Arizona was the fourth fastest growing state, having increased its population by 1.4 percent in a year. By comparison, the overall population growth in the United States for this period was 0.1 percent. • Arizona's population has increased by 11.9 percent since 2010, ranking it among the 10 fastest growing states.
Geographic Distribution of Population	• Since 2020, the town of Queen Creek and the cities of Buckeye, Casa Grande, Maricopa, and Goodyear identified as one of the fastest growing municipalities in the nation by the United States Census Bureau. • Increased population in the Phoenix and Tucson metropolitan area will add additional concentrations of freight flows in and around the urbanized centers, resulting in additional stress on the region's transportation network.
COVID-19 Pandemic Impacts	• International trade is seeing patterns change, following trade policy changes and new trade agreements, with more changes to come as the country and individual businesses work to reduce the risks of such dramatic supply disruptions occurring again.
Climate Change	• The increased frequency of extreme climate events that have the potential to disrupt the freight system are a growing concern to the private sector and agencies from the Federal to the local level.
Technology Trends	• New and emerging technologies have the potential to improve freight transportation safety, reduce emissions, improve mobility, and improve use of data for decision-making. • Arizona has embraced new transportation technologies through studies and pilots like the UPS and TruSimple automated truck testing between Phoenix and Tucson.
Funding Trends	• The IIJA, which was signed into law on November 15, 2021, will provide approximately $5.3 billion over five years for Federal highway formula funding and about $36 million in 402 formula funding for safety, which is over 28 percent more than under FAST Act. Even with increases in federal funding levels, the transportation funding levels outweigh the transportation system needs. (It should be noted that high inflation has been significantly reducing the buying power of these revenues.)

5.4 Strengths and Weaknesses of Arizona State Freight System

A review of the State's competitive advantages and critical challenges helps identify the strengths and problems within Arizona's freight system. To understand the current strengths and weaknesses of Arizona's freight system, ADOT conducted a comprehensive analysis of previous technical memorandums and freight transportation trends and needs outlined in previous chapters. This chapter outlines the findings of that assessment.

5.4.1 Strengths of Arizona's Freight System

Table 33 outlines strengths of Arizona's freight system. These strengths highlight the state's ability to maintain, modernize, and expand the freight system to better support economic development, the growing needs of industries, and the quality of life of its residents.

Table 33: Strengths of Arizona's Freight System

Strength	Description
System Capacity	Arizona has a well-connected freight system for handling highway freight traffic, crucial railroad infrastructure, well established cargo airports, and an extensive network of pipelines. For the most part, Arizona's freight transportation network has ample capacity and performs well. Arizona's freight system often is a key factor for business retention and attraction.
System Reliability	Arizona's network of freight transportation facilities is extensive, robust, and reliable which are essential traits to maintaining Arizona's economic competitiveness.
Safety	ADOT has a strong focus on improving safety conditions and has been a strength of not only the state's freight system, but the state's entire transportation system.
Geographic Connectivity	The State's location is an inherent strength as it offers unmatched access to Mexico and key commerce centers in western United States. Arizona's freight clusters are generally well connected to the multimodal transportation system.
Multinational Connectivity	Arizona and its border crossings serve as critical trade gateways to the US trade with Mexico as well as the rest of Central America. Arizona and US economies depend on efficient and secure freight movements through the border crossings.
Rural Connectivity	Rural portions of Arizona are home to many of the state's most strategic industries and businesses. Arizona has a broad network of state and US highways that support the Interstate system and connect these rural areas to the national highway system.
Intermodal Connectivity	Arizona has an extensive intermodal network that provides connectivity to major freight gateways and generators. Arizona's freight clusters are generally well connected to the multimodal transportation system.
Extensive Rail and Air Cargo Facilities	Although ADOT has no responsibility for state's air cargo facilities or rail network, Arizona's air and freight rail systems are quite extensive and aid in moving large amounts of goods by air and railroad.

5.4.2 Weaknesses of Arizona's Freight System

The strengths of the Arizona's freight system are tempered by its weaknesses. However, ADOT may have little or no control over some of these weaknesses. Table 34 outlines major challenges and weaknesses of Arizona's freight system and ADOT's level of participation in addressing these weaknesses.

Table 34: Weaknesses of Arizona's Freight System

Weakness	Description	How can ADOT address?
Highway Congestion and Bottlenecks	Roadway congestion has a substantial impact on cargo movement. For example, vehicles stuck in congestion results in loss of productivity and wasted fuel.	Directly
Urban Phoenix and Tucson Congestion	Congestion and bottlenecks impact economic growth, particularly on main corridors in large metropolitan areas with considerable freight movements. Additionally, Intermodal connectors are located in highly congested urban areas and compete with passenger movements.	Partnerships with other Agencies
Non-Recurring Bottlenecks	Crashes and weather events can hinder truck movement and impact the reliability of Arizona's freight system.	Partnerships with other Agencies
Congestion at Border Crossings	Increasing congestion and wait times at border crossings impede international trade.	Partnerships with other Agencies
Maintaining the System's Infrastructure	The size of Arizona's freight system presents numerous challenges. Maintaining and upgrading numerous miles of highways and bridges can be an issue, especially as funding continues to diminish. Additionally, many rural roadways were not designed or constructed to accommodate repeated heavy truck traffic or oversized vehicles.	Directly, and Partnerships with other Agencies
Load Restrictions	Bridge weight limits and restrictions can result in circuitous detours for heavy trucks, impacting both trucking productivity and the conditions of streets that become alternative routes. These route restrictions can also limit access to current and future industrial and agricultural sites and intermodal terminals.	Partnerships with other Agencies
Passing and Climbing Lane Availability	Limited passing and climbing lanes are present on Arizona's Key Commerce Corridors and the Interstate system. Strategically placing passing and climbing is a cost-effective way to address freight bottlenecks.	Directly
Truck Parking	While the state continues to invest in truck parking, demand often exceeds available parking along Arizona's Key Commerce Corridors and other highways. Limited real-time truck parking information is available.	Directly, and Private Sector solutions
Education and Public Awareness	In general, the freight industry is a mystery for most people, leading to a lack of awareness on laws, safety issues, and the importance of freight movement in their daily lives.	Partnerships with other Agencies
Funding and Financing	Growth in freight volumes, demands, and needs continuously outpaces available ADOT funding.	Partnerships with other Agencies

5.5 Assessment of Needs in Previous Freight Plan

The 2017 Arizona State Freight Plan and the 2019 Arizona Truck Parking Study outlined a set of priority projects to address critical freight transportation issues and needs in Arizona. This section outlines the status of recommended projects in these two plans and if they are still needed today.

5.5.1 Projects Completed Since 2017 Arizona State Freight Plan

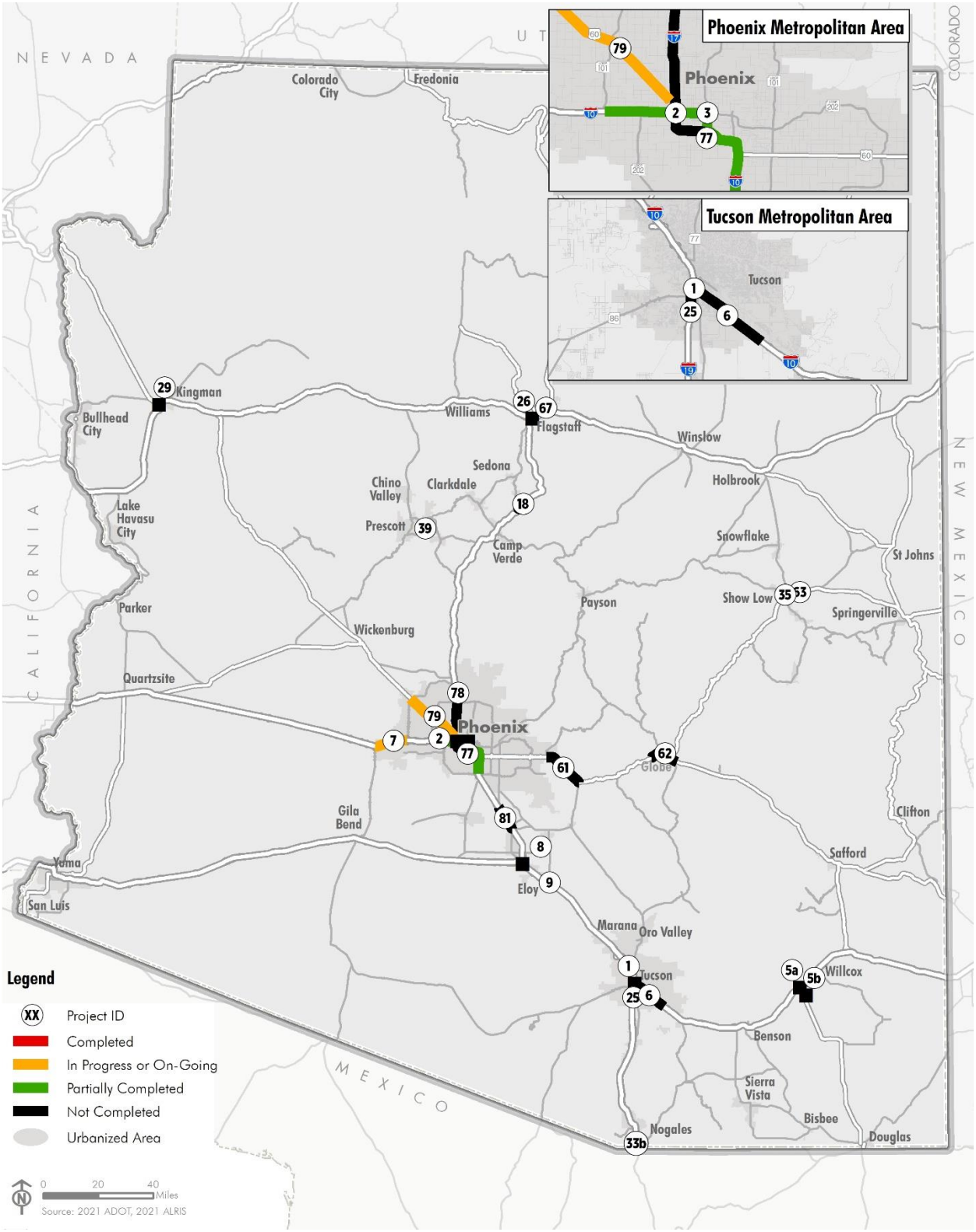
The 2017 Arizona State Freight Plan identified 25 priority freight improvement projects. At an estimated cost of nearly $6 billion, these priority projects far exceed Arizona's apportionment of federal funds for freight improvements. Because there are no other freight dedicated funds outside the National Highway Freight Program funds, completing the identified freight investment priorities meant that projects have competed for general transportation funds. In turn, many of the priorities identified in the Plan have yet to be completed. Table 35 and Figure 31 illustrate the status of priority projects identified in the 2017 Arizona State Freight Plan.

Table 35. Status of Identified Freight Improvement Priority Projects in the 2017 Arizona State Freight Plan and Its Relevance Today

Project Rank	Project ID	Route	Issue Segment	Project Option(s)	Project Complete?
1	29	I-40	I-40 at US 93 Junction within Kingman area	I-40/US 93 System Interchange Improvements	No In Design
2	5a	I-10	I-10 at US 191 (Cochise TI)	I-10/US 191 System Interchange Improvements (interim)	No; partially funded in Program
3	5b	I-10	US 191/Cochise RR Overpass	Reconstruct the US 191/Cochise RR Overpass to accommodate oversize freight	No; in Program
4	26	I-40	I-40 (WB to NB system ramp at I-40/I-17/SR 89 interchange)	I-40/I-17 System Interchange Improvements	No
5	9	I-10	I-10 east of Phoenix	I-10 Picacho Area Roadway Widening	**Yes**
6	7	I-10	I-10 between SR 85 and L303	I-10 West of Phoenix General Purpose Lane	**In Progress**
7	6	I-10	I-10 east of I-19	Tucson Area I-10 Widening Project	No; some projects proposed through MPO
8	81	I-10	From SR 202L to East of SR 387	I-10 Gila River Indian Community Area Widening	No; in EIS stage
9	8	I-10	I-10 Mainline and TI at I-8	Earley Road to I-8 Widening and TI Improvements on I-10	Yes
10	1	I-10	I-10 at I-19 Traffic System	I-10/I-19 System Interchange	No

Project Rank	Project ID	Route	Issue Segment	Project Option(s)	Project Complete?
			Interchange	Improvements	
11	63	US 60	US 60 Passing Lane: Westbound	US 60 Passing Lane	No
12	61	US 60	US 60 between SR 88 and SR 79	US 60 Access Controlled Freeway Extension	No
13	35	SR 260	SR 260, West of Show Low to East of SR 73	SR 260 Show Low Area Intersection Improvements	No
14	18	I-17	I-17 between AZ 179 to Stoneman Lake Road	I-17 Stoneman Lake Area Climbing Lane and ITS	No
15	62	US 60	US 60 within Globe area	Globe Area Freight Improvements	No
16	67	US 89	US 89 Within Flagstaff, north of I-40	SR 89/I-40 System Interchange Improvements	No
17	33a	SR 189	SR 189 between Mariposa LPOE and I-19	SR 189 Traffic Flow Improvements (interim)	**Yes**
18	77	I-10	From L101 to L202 (Santan Freeway) within Phoenix Metro area	I-10 Phoenix Urban Area Improvements	**Partial; more funding need anticipated**
19	33b	SR 189	SR 189 between Mariposa LPOE and I-19	SR 189 Traffic Flow Improvements (ultimate)	**In Progress**
20	79	US 60	Loop 303 to L202 within Phoenix Metro area	US 60 Phoenix Urban Area Improvements	**On going**
21	39	SR 69	SR 69, East of Prescott area	SR 69 East of Prescott ITS Improvements	**Partial**
22	78	I-17	From I-10 to L101 within Phoenix Metro area	I-17 Phoenix Urban Area Improvements	No
23	3	I-10	I-10 at SR 202L and SR 51 Traffic System Interchange (Mini-stack)	I-10 Phoenix Urban Area Improvements	No
24	2	I-10	I-10 at I-17 Traffic System Interchange (The Stack)	I-10 Phoenix Urban Area Improvements	No
25	25	I-19	I-19 between I-10 and Valencia Road (south of Tucson)	I-19 Tucson Area Widening and TI Improvements	No

Figure 31: Status of Identified Freight Improvement Priority Projects in the 2017 Arizona State Freight Plan



5.6 Projects Completed Since 2019 Arizona Truck Parking Study

Truck parking is critical to the safe operation of Arizona's freight system, supply chains, and the economy. Whether based on challenges with truck parking capacity, availability, time, or location, unmet truck parking demand occurs throughout the state. The 2019 Arizona Truck Parking study identified eight cluster areas that experience high levels of trucks parking in undesignated areas. Undesignated areas are where trucks are using on/off ramps, roadway shoulders, or vacant lots for truck parking. Each of these undesignated parking areas were evaluated to determine opportunities to expand parking facilities, which resulted in the identification of four parking expansion projects. Table 36 outlines the status of recommended parking expansion projects from the 2019 Arizona Truck Parking Study. ADOT has completed three of the four truck parking expansion projects recommended in the study. In addition to these expansion projects, however, the study recommended several strategies and policies that may need to be addressed, including:

- Integrating truck parking information into Arizona 511
- Developing design standards, including formalizing Table Tops and Brake Check Areas
- Develop Wyoming-style "truck turnouts" or truck parking only locations along major freight corridors
- Update ADOT Rest Areas Map and develop truck parking version
- Develop Nebraska-style "truck turnouts" that use interchange right-of-way
- Promote truck parking partnerships with private industry

Table 36. Status of Identified Truck Parking Expansion and Information Projects in the 2019 Arizona Truck Parking Study

Rank	Expansion Project Recommendation	Expansion Project Complete?	Information Recommendation
I-40 Arizona/California Border			
1, 3	Haviland Rest Area (MP 23): Expansion Opportunity (14 to 44 Spaces) • Eastbound: 7 existing truck parking spaces and opportunity for: 15 additional spaces (22 total) - $2.8m (~$195k/space + land) • Westbound: 7 existing truck parking spaces and opportunity for: 15 additional spaces (22 total) - $2.8m (~$195k/space)	Completed and open to public. Total trucking parking now includes 29 eastbound and 23 westbound	Interstate Oasis Program with nearby truck stops Truck Parking Information Management System (TPIMS) at Haviland Rest Area.

Rank	Expansion Project Recommendation	Expansion Project Complete?	Information Recommendation
I-10 Arizona/California Border			

4, 5, 6, 10	Bouse Wash Rest Area (MP 53): Expansion Opportunity (24 to 36/47 Spaces)
	• Eastbound: 12 existing truck parking spaces and opportunity for:
	  ○ 6 spaces (18 total) without ramp realignment (funded 2020)
	  ○ 13 spaces (25 total) with ramp realignment - $2m (~$285k/space)
	• Westbound: 12 existing truck parking spaces and opportunity for:
	  ○ 6 spaces (18 total) without ramp realignment (funded 2020)
	10 spaces (22 total) with ramp realignment - $1.5m (~$375k/space)
		Completed and open to public. Total trucking parking now includes 21 eastbound and 22 westbound	Interstate Oasis Program with nearby truck stops.
			
			TPIMS at Ehrenberg and Bouse Wash Rest Areas.

I-40 East of Flagstaff			
2, 7	Meteor Crater Rest Area (MP 235): Formalize Overflow (30 spaces) • Meteor Crater Eastbound and Westbound have overflow lots that are currently covered with millings and are unmarked • Pave and stripe the overflow lots formalizing 15 spaces on each side - $3m (~$100k/space)	Completed and open to public. Total trucking parking includes 57 eastbound and 64 westbound	Limited availability of truck parking within the area limits the opportunity for an information solution
I-10 Near Casa Grande			
11	Sacaton Rest Area (MP 182): Expansion Opportunity (32 to 49 spaces) • Eastbound: 17 truck parking spaces and opportunity for 8 additional spaces • Westbound: 15 truck parking spaces and opportunity for 9 additional spaces The concentration of private truck parking near Sacaton makes the expansion of the rest area a low priority	Not Complete	

In addition to the parking expansions outlined ADOT has added the following truck parking since the 2019 Truck Parking Study:

- I-8 Sentinel Rest Area (MP 85): 2 eastbound and 2 westbound truck parking spaces
- I-17 Sunset Point Rest Area (MP 252): 4 truck parking spaces

5.7 Current Arizona Freight Transportation System Needs and Issues

Based on freight-related trends, strengths, weaknesses, and current and future conditions, ADOT identified a set of specific freight issues and needs.

5.7.1 Highway System Needs and Issues

Bottlenecks occur on Truck Freight Economic Corridors, affecting trucks and general traffic. These bottlenecks result in highway and road congestion that delay the movement of freight. ADOT recognizes that there is a wide array of other regional and local freight bottlenecks throughout the state which can be categorized as:

- **Recurring Bottlenecks:** Occurs when traffic demand during peak periods exceeds roadway capacity and occurs at predictable times of the day and at specific locations.
- **Non-recurring Bottlenecks:** Happens when incidents related to extreme weather, crashes, special events, and work zones result in reduced roadway capacity.

To identify and evaluate bottlenecks in Arizona's freight system, ADOT used a screening process that included:

- **Recurring Bottlenecks**
  - **Step 1 – Data Assessment.** Using National Performance Management Research Data Set (NPMRDS), the study network was analyzed to determine locations with reduced travel time reliability.
  - **Step 2 – Validated Bottlenecks.** ADOT coordinated with the Freight Advisory Committee (FAC), local MPOs, COGs and other local stakeholders and experts to help validate and expand the bottleneck locations list.
- **Non-recurring Bottlenecks:**
  - **Step 1 – Collect Non-Rampable Bridge Locations.** ADOT special permits group provided a comprehensive list of non-rampable bridges that served as the baseline for non-recurring bottlenecks.
  - **Step 2 – Identify Locations with Freight Movement Restrictions.** Coordinated with ADOT, the Freight Advisory Committee (FAC), and local stakeholders to identify locations with freight restrictions.
  - **Step 3 – Safety Issues.** Conducted an assessment of areas with historically high freight-related crash issues that may limit freight movement.
  - **Step 4 – Validated Bottlenecks.** Coordinated with the Freight Advisory Committee (FAC) and other local stakeholders and experts to help validate the bottleneck locations list.

Based on the above framework, bottlenecks on the NHS were identified and ranked based on the total delay per mile per segment. Most of the high-ranking bottlenecks are located in the urbanized Phoenix metropolitan area. Table 37, Table 38 and Figure 32 outline the bottleneck locations and their related priority.

Figure 32: Priority Bottleneck Locations

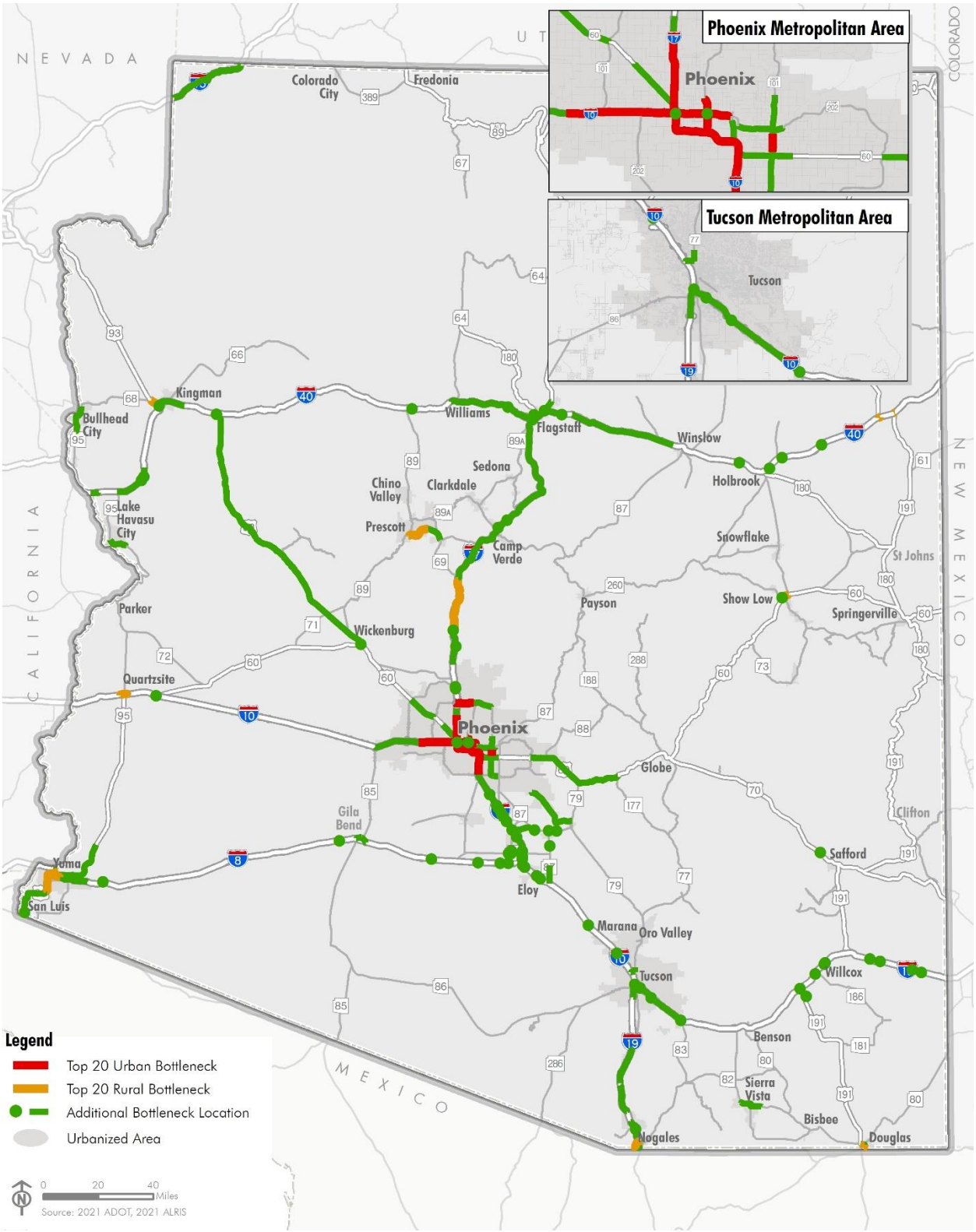


Table 37. Priority Bottleneck Locations – Top 20 Urban Bottlenecks

Bottleneck Location	Potential Cause for Bottleneck	TTTR (Worst Condition)	Delay Per Mile Per Segment	Total Delay Per Segment (Hours Per Year)	Bottleneck Rank (Delay/Mile)
I 10 WB: 27th Ave to 51st Ave	Congestion	5.56	48,254	160,526	1
I 10 WB: Buckeye Rd to 19th Ave	Congestion	3.39	47,936	290,415	2
I 10 WB: 19th Ave to 27th Ave	Congestion	4.45	43,630	57,272	3
I 10 EB: I 17 to SR 143	Congestion	3.12	42,909	171,914	4
I 10 EB: 51st Ave to 27th Ave	Congestion	2.5	41,962	140,269	5
I 10 EB: 19th Ave to 16th St	Congestion	2.88	36,289	116,398	6
I 10 EB: 27th Ave to 19th Ave	Congestion	2.85	30,556	30,997	7
I 10 WB: SR 143 to I 17	Congestion	3.6	25,999	107,375	8
I 10 EB: Litchfield Rd to 51st Ave	Congestion	2.64	25,185	259,089	9
I 10 WB: SR 202 to US 60	Congestion	3.31	25,171	163,490	10
SR 202 WB: SR 143 to I 10	Congestion	3.81	23,373	71,146	11
I 10 EB: Sky Harbor Cir to 24th St	Congestion	5.88	22,421	28,325	12
I 10 EB: US 60 to Elliot Rd	Congestion	1.79	19,237	33,238	13
I 10 WB: US 60 to SR 143	Congestion	2.56	17,567	35,195	14
SR 101 SB: Southern Ave to SR 202	Congestion	2.64	16,869	39,921	15
I 17 NB: I 10 to Indian School Rd	Congestion	2.81	16,238	48,528	16
SR 101 NB: SR 51 to I 17	Congestion	2.45	15,795	107,909	17
SR 51 SB: I 10 to Indian School Rd	Congestion	3.17	15,438	28,858	18
I 17 NB: I 10 to 24th St	Congestion	2.34	14,880	105,952	19
I 17 SB: Thunderbird Rd to Indian School Rd	Congestion	2.64	14,696	117,941	20

Table 38: Priority Bottleneck Locations – Top 20 Rural Bottlenecks

Bottleneck Location	Potential Cause for Bottleneck	TTTR (Worst Condition)	Delay per Mile per Segment	Total Delay per Segment (Hours/ Year)	Bottleneck Rank (Delay/ Mile)
US 191 at I 40: EB On-Ramp at West US 191/I 40 TI; EB Off-Ramp at East US 191/I 40 TI	Congestion	3.86	52,991	30,815	1
US 93 NB: SR 68 to I 40	Congestion	4.49	11,549	42,560	2
I 10/Riggles Ave TI and I 10/Quartzsite Ave TI @ Quartzsite - EB	Congestion	2.35	7,407	21,057	3
I-10/Riggles Ave TI and I-10/Quartzsite Ave TI @ Quartzsite - WB	Congestion	2.33	7,246	20,597	4
US 95 SB: I 8 to Avenue 3E	Congestion	2.49	7,165	10,406	5
US 93 NB: SR 68 to I 40	Terrain, Congestion	2.06	7,018	24,188	6
US 95 SB: County 15th St to I 8	Congestion	1.88	5,065	43,585	7
US 95 NB: County 15th St to I 8	Congestion	1.99	5,003	42,437	8
SR 69 NB: Prescott Lake Pkwy to Glassford Hill Rd	Congestion	1.76	4,918	24,875	9
SR 69 SB: SR 89 to Robert Rd	Congestion	1.84	4,115	34,412	10
I 8 EB: CA State Line to US 95	Congestion	2.74	4,012	7,562	11
SR 69 NB: SR 89 to Prescott Lakes Pkwy	Congestion	1.71	3,974	8,370	12
SR 189 NB: Nogales LPOE to I 19	LPOE, Congestion	2.99	3,906	11,897	13
I 10 EB: I 10 EB to SR 101 NB Ramp	Congestion	1.73	3,056	3,117	14
I 17 NB: Black Canyon City to SR 69	Terrain, Congestion	1.19	3,005	60,124	15
US 191 SB: SR 80 to Douglas LPOE	LPOE, Congestion	2.22	2,882	3,322	16
I 8 WB: US 95 to Avenue 3E	Congestion	1.22	2,755	4,756	17
US 60 WB: SR 77 to SR 260	Congestion	1.98	2,726	7,109	18
SR 189 SB: Nogales LPOE to I 19	LPOE, Congestion	2.5	2,649	8,105	19
I 8 EB: US 95 to Avenue 3E	Congestion	1.22	2,612	6,347	20

Critical Freight Corridors

Corridors located on the NHFN are eligible for NHFP funds that are distributed to the states annually. Newer provisions in the 2021 Infrastructure Investment and Jobs Act (IIJA) increases the state's mileage caps for CRFCs and CUFCs, allowing the state to expand their system. IIJA guidance for identifying and expanding CRFCs and CUFCs is still evolving. It is recommended that ADOT evaluate the CRFCs and CUFCs once the IIJA guidance and regulations are final to determine if additional corridors quality for designation.

Truck Parking

There is a critical need for long-term parking along major freight corridors. A common concern voiced during this study's Freight Advisory Committee meetings was the need for expanded and enhanced truck parking facilities and information. Lack of parking impacts the efficiency of goods movement by causing drivers to end their hours of operation early to ensure a legal truck parking location is secured. This leads to undesirable truck parking activities or drivers having to find other solutions to avoid operating beyond their maximum hours of service.

ADOT plans to update their Statewide Truck Parking Study in the near-term, which will provide the State with an updated assessment of prioritization of truck parking needs and projects throughout the State.

Other Road Needs and Issues

Beyond the condition and performance of Arizona's Key Commerce Corridors, several ADOT policies and regulations and/or standard work should be reviewed, including:

- Review Intermodal Connector designations on the NHS, PHFS, or other facilities to leverage opportunities that support critical first/ last-mile links, including potential refinement or expansion of Arizona's designated connections.
- Develop frameworks and guidance to manage impacts or opportunities related to new, evolving, innovative, and disruptive technologies that influence freight transportation, such as truck platooning, freight connected and autonomous vehicles (CAV), personal delivery devices, or drone/UAV deliveries.
- Low axle-load restrictions in the State may limit certain industries. In 2021, in response to high demand for trucks hauling critical supplies and goods during the COVID-19 pandemic, ADOT temporarily raised the gross weight limit for commercial vehicles operating without the need for overweight permits to 90,000 pounds.
- ADOT should consider developing a truck routing and guidance system to aid in moving goods throughout Arizona, particularly in areas where major roadway junctions, freight hubs, background congestion, or nearby communities require extra attention. The guidance could include: bridge clearance postings, special barrier delineations, and over size/overweight considerations.
- Hazardous material release incidents can pose freight related safety issues, as well as environmental, community, or supply chain impacts. ADOT should evaluate and consider formally designating hazardous material routes throughout the State.

5.7.2 Freight Rail System Needs and Issues

To create a safe, secure, efficient, and cost-effective freight rail network in Arizona, the 2019 Arizona State Rail Plan recommended potential future freight rail infrastructure expansions. These improvements, if implemented, will enhance the movement of goods by rail, relieve freight rail bottleneck conflicts, and expand freight movement capacities through public private partnerships. Recommended projects in the 2019 State Rail Plan include:

- **BNSF Crossing Improvements –** Improving crossings on the BNSF railroad at Milton Road (widening underpass), Florence-Walnut (pedestrian underpass), Lone Tree (overpass), and Beaver St/San Francisco St (grade crossing safety improvements);
- **BNSF Third Track –** Constructing third main line track in Flagstaff;
- **UPRR Border Inspection Track –** Installing 8,500 ft. border inspection track to improve efficiency of trains moving across the US-Mexico border in Rio Rico;
- **Apache Railway Transload Track –** Construct transload track;
- **Arizona and California R Interchange –** Construct Matthie interchange track; and
- **Arizona Eastern Railway Upgrades –** Upgrade AZER to 286,000-pound rail upgrades, turnouts.

Highway-Rail Grade Crossings Needs and Issues

In 2022, ADOT completed the Arizona State Highway-Rail Grade Crossing Action Plan (SHRCAP) to identify and develop strategic approaches to improve safety and reduce fatal and other incidents at highway-rail grade crossings. The study evaluated and ranked all 698 open and active public at-grade crossings within Arizona, resulting in the identification of 75 urban and 75 rural crossings in need of improvement. Top 5 Urban and Rural Highway-Rail crossings are illustrated in Table 39.

Table 39. Top 5 Urban and Rural Highway-Rail Crossings at Greatest Risk

Rank	Greatest Risk Urban Highway-rail Crossings	Greatest Risk Rural Highway-rail Crossings
1	Thomas Road, west of 27th Avenue (Phoenix)	Navajo Boulevard/Apache Avenue, South of Joy Nevin Avenue (Holbrook)
2	43rd Avenue and Camelback Road (Phoenix)	Obed Road, South of Richards Avenue (Joseph City/Navajo County)
3	27th Avenue, south of Thomas Road (Phoenix)	Unnamed Roadway, South of Old Highway 66 (Hackberry/Mohave County)
4	Bethany Home Road, west of 51st Avenue (Glendale)	San Pedro Street, North of 4th Street (Benson)
5	San Francisco Street, South of Historic Route 66 (Flagstaff)	Sherwood Access Road, South of Historic Route 66 (Williams)

5.7.3 Air Cargo System Needs and Issues

Air cargo (including freight and mail) is important in moving high value, time-sensitive shipments. Air cargo hubs in Arizona are typically located in major metropolitan areas with access to aviation facilities that have sufficient capacity to handle large cargo aircraft, a large population base for customers and employees, and access to nearby industrial properties for cargo-handling. With the expansive growth of e-commerce and online shopping, Phoenix Sky Harbor Airport has become an important hub for small package sorting and distribution to last-mile delivery service. Several needs and issues with respect to Arizona's air cargo system include:

- **Increased Connections:** minimal service to Europe and Asia results in heightened complexity, risk, and cost for manufacturers.
- **Limited Customs Services:** customs operations are lacking on the weekends and during off-hours and is otherwise oriented to passenger operations.
- **First and Last Mile Connectivity:** air cargo arriving/departing Phoenix Sky Harbor Airport can experience substantial roadway congestion and delay. As noted in previous sections, there are numerous bottleneck locations on critical routes to Arizona's airports. As e-commerce demands continue to grow, there must be an efficient means of being able to distribute and deliver goods locally to their final destinations to support that growth.

5.7.4 Pipeline System Needs and Issues

Pipelines play a critical role in moving oil, natural gas, petroleum products, carbon dioxide, water, and a variety of other fluid commodities. There are two major pipelines – both operated by Kinder Morgan – that supply Arizona with petroleum products. The "West Line" supplies products from the Los Angeles basin to Phoenix while the "East Line" originates in El Paso, Texas and connects to both Tucson and Phoenix. Critical variables that influence the issues and needs for Arizona's pipelines include:

- Instate-Consumption – as individual and business consumption increases so does the increased demand on the state's pipeline system.
- Impact on Other Modes of Transportation - crude oil, natural gas, and petroleum products may travel via non-pipeline modes, which has the potential to increase congestion.

Key needs and issues related to Arizona's pipeline system include:

- **Lack of Storage Capacity:** provides little inventory and/or options to redistribute product in the event of system disruptions. In addition, capacity constraints with petroleum pipelines may result in additional shipments by rail and/or truck, which burdens the highway and rail systems and introduces safety concerns, especially with the potential shift of the movement of highly flammable materials to either truck or freight rail.

5.7.5 Border Infrastructure Needs and Issues

Arizona and the state of Sonora, Mexico share approximately 360 miles of international border and host six border crossing locations. These six locations are the gateways through which land-based travel and tourism, as well as international trade, between Arizona and Mexico occurs. It is important for these locations to feature competitive gateways to facilitate the movement of goods and to help generate the economic output that can improve the living conditions of residents of the border areas. Key needs and issues related to Arizona's border crossings includes:

- **Poor Travel Time Reliability:** due to unpredictable crossing times at the US/Mexico border, particularly at Arizona's busiest Land Port-of-Entry (LPOE) Nogales.
- **Limited LPOE Capacity:** caused by insufficient infrastructure, facility design, and even staffing constraints limits the capacity of a LPOE and can create congestion issues.

ADOT is currently updating their Arizona-Sonora Border Infrastructure Master Plan, which will develop a list of prioritized Arizona-Sonora border-related infrastructure projects or studies, and their readiness for funding and implementation. This plan will be used by the cities in the border region, the states of Arizona and Sonora, and the federal governments in the United States and Mexico for planning, funding, and development of necessary infrastructure or operational improvements for the border region.

6 IMPROVEMENT AND IMPLEMENTATION PLAN

6.1 Federal Policies and Initiatives Informing Arizona State Freight Plan Implementation

ADOT is required by the FAST Act to address Arizona's freight planning activities and investments, both immediate and long term. This includes developing a fiscally constrained freight investment plan with a list of priority projects to describe how ADOT will invest and match its NHFP funding. The IIJA continues this requirement and expanded the planning and investment forecast period for freight plans from five to eight years. This chapter details ADOT's freight investment plan and describes the federally compliant policies and strategies that ADOT will follow to achieve its freight plan goals and objectives.

6.2 Freight Investment Plan

6.2.1 Prioritization Framework and Project Ranking

For this plan update, ADOT applied the 2017 Arizona State Freight Plan prioritization framework with updated data and expanded consideration of truck parking.

Only a single truck parking expansion project had not been completed from the 2019 Truck Parking Study. However, in recognition that truck parking remains a concern at various locations throughout the state, ADOT continues devoting attention to issue. ADOT also focused on differentiating the remaining 19 freight plan bottleneck projects from the 2017 Arizona State Freight Plan.

ADOT held an open call for additional projects or alternative phasing of existing projects from the FAC. FAC members recognized the need to specifically develop truck parking projects through an updated truck parking study. To account for the desired level of funding for future truck parking projects, ADOT added a new allocation decision point to the framework.

Of the previously identified Arizona freight projects…

1 out of 4 Viable 2019 Truck Parking Study projects have not been completed

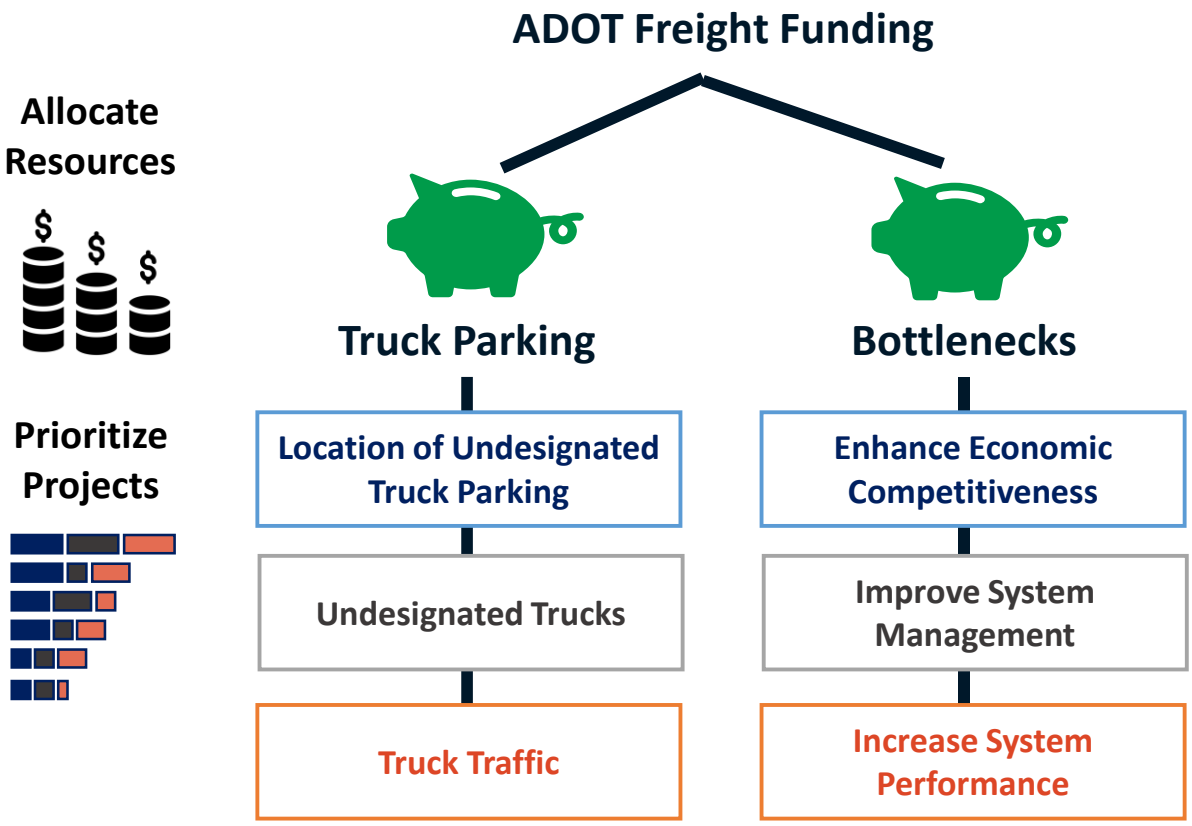
19 out of 25 2017 Arizona State Freight Plan projects have been only partially or not completed

Truck Parking Set Aside

Deciding between funding additional truck parking and addressing highway bottlenecks can be like picking apples and oranges. While both project types are critical to state freight operations, they have vastly different cost magnitudes and purposes. Given the difficulty in comparing the project types directly against one another, ADOT layered a new, higher level tradeoff decision point on top of the existing prioritization framework. FAC members were asked how much funding should be allocated to truck parking given an understanding of typical project costs – ranging from $100,000 to $375,000 per additional space in 2019 USD. The FAC completed allocation exercises and decided on an average set aside of $11.5 M annually (or 46%) for truck

parking. Figure 33 illustrates the process by which resources are allocated to both truck parking and bottleneck projects, as well as the project prioritization criteria for each type of project.

Figure 33: ADOT Freight Funding



Bottleneck Project Prioritization

Smooth freight operations are essential for strengthening the economy by efficiently connecting people and goods. Whether due to congestion, lack of connectivity, operational restrictions, or other reasons, freight bottlenecks hinder the reliability of transportation operations and can act as a barrier to transportation system performance and sector competitiveness. ADOT has established a robust, data and stakeholder informed approach to not only identifying bottlenecks but also recommending candidate projects to best relieve key issues (Figure 34).

Figure 34: Types of Freight Bottlenecks Addressed by Candidate Projects in the 2017 Arizona State Freight Plan

Identify Bottlenecks

- Recurring Congestion Bottleneck
- Non-Recurring Bottleneck (Safety/Weather)
- Restrictions (Bridge, Haz Mat)
- Connectivity (non-rampable/requires detour)
- Accessibility (Border/Port of Entry)
- Other
  - Inconsistent Lane Configuration
  - Crossing issue
  - Terrain

Score Projects

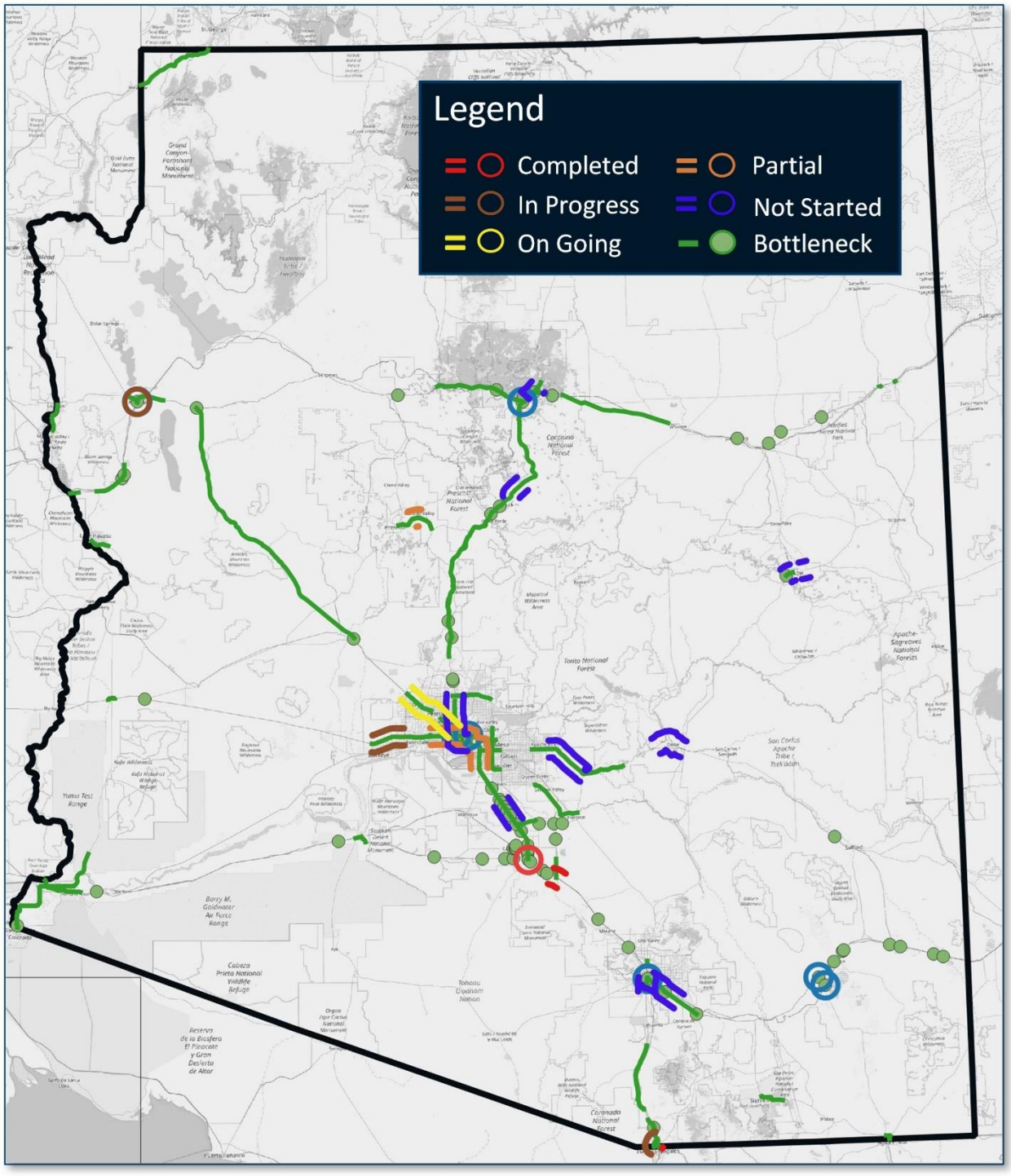
Enhance Economic Competitiveness

Improve System Management

Increase System Performance

Of the 25 candidate projects identified in the 2017 Arizona State Freight Plan, six have since been completed, are in progress, or are pending. This leaves a mature pipeline of 19 projects that have either not been completed or have only been partially completed (Figure 35).

Figure 35: Status of Projects Identified in the 2017 Arizona State Freight Plan



After ensuring the remaining 19 projects aligned with an updated set of bottlenecks, ADOT scored the projects using the freight bottleneck project prioritization process identified in the 2017 Arizona State Freight Plan. This involved scoring projects against 15 criteria spanning three goal areas (Table 40).

Table 40: Freight Prioritization Criteria and Weights

Criterion	Measure	Weight	Updated Weight (FAC Input)
Goal 1 Enhance Economic Competitiveness Criteria			
Is the Issue on a Key Commerce Corridor (KCC)?	Issue is either 'on'; 'directly connected to'; or 'unrelated' to KCC	10% overall (29% of goal)	9.38%
Are the Flows Impacted by the Issue Significant?	Truck Volume (AADTT) through the issue segment	8% overall (24% of goal)	9.38%
Do Future Scenarios Aggravate this Significance?	AADTT significance (over 1000) on each issue segment that are common on all future Travel Demand Model Scenarios	8% overall (24% of goal)	7.59%
Is the Issue an Impediment to Trade?	Volumes of Arizona's commodity flows relating to manufacturing and natural resources (excl. aggregate intra AZ flows)	8% overall (24% of goal)	7.96%
Goal 2 Increase System Performance Criteria			
Would Addressing the Issue Improve Multimodal Access?	Is Issue a barrier to modal connectivity (e.g. access to airport or rail intermodal terminal)?	2% overall (6% of goal)	1.79%
Does the Issue Hinder Mobility?	Truck Travel Time Index (TTTI)	7% overall (21% of goal)	6.61%
Does the Issue Hinder Freight Transportation System Reliability?	Issue segment's Truck Planning Time Index (TPTI)	7% overall (21% of goal)	6.84%
Does the Issue Increase Transportation Cost of Freight Transportation?	Total truck delay per day (hours)	7% overall (21% of goal)	6.64%
Does the Issue Affect Transportation System Safety?	Truck Related Crashes per 100 million vehicle miles traveled (MVMT)	9% overall (27% of goal)	10.07%
Does the Issue Result in Negative Social and Environmental Impacts?	CO2 Emissions for a peak-hour volume of traffic	1% overall (3% of goal)	0.95%

Goal 3 Improve System Management Criteria			
Does the Project Prioritize Good Management of Assets?	Project is characterized as preservation vs. modernization vs. expansion	3% overall (10% of goal)	2.85%
Is the Project Appropriately Linked to Local Land Use/Regional Plans?	Project identified in Building a Quality Arizona (BQAZ) Statewide Transportation Framework Studies and/or regional transportation plans	5% overall (15% of goal)	4.59%
Would the Project be expected to Receive Freight Stakeholder Support?	Evaluation of Project with input form the Freight Advisory Committee (FAC)	5% overall (15% of goal)	4.72%
Would the Project be Likely to Attract Funding/Financing Partners?	Project's potential to attract project funding	5% overall (15% of goal)	6.23%
Does the Project Have Positive Benefit-Cost Analysis?	Actual project benefit cost analysis	15% overall (45% of goal)	14.40%

ADOT used updated data to re-score its freight bottleneck projects. While more recent data years were available, ADOT selected the 2019 data year as it represented the most recent year prior to the COVID-19 related disruption of traditional transportation patterns. Data updates included commodity tonnage information from Transearch, truck traffic volumes from the Highway Performance Monitoring System (HPMS), truck travel speeds from the National Performance Management Research Dataset (NPMRDS), and truck-involved crashes. The FAC provided input on the "Stakeholder Support" criteria. Figure 36 shows the affected criteria by data update and the criteria updated by FAC.

Figure 36: Freight Bottleneck Criteria with Updated Project Evaluation Ratings

Goal 1 Criteria	Goal 2 Criteria	Goal 3 Criteria
Is the Issue on a Key Commerce Corridor (KCC)?	Would Addressing the Issue Improve Multimodal Access?	Does the Project Prioritize Good Management of Assets?
Are the Flows Impacted by the Issue Significant?	Does the Issue Hinder Mobility?	Is the Project Appropriately Linked to Local Land Use/Regional Plans?
Do Future Scenarios Aggravate this Significance?	Does the Issue Hinder Freight Transportation System Reliability?	Would the Project be expected to Receive Freight Stakeholder Support?
Is the Issue an Impediment to Trade?	Does the Issue Increase Transportation Cost of Freight Transportation?	Would the Project be Likely to Attract Funding/Financing Partners?
	Does the Issue Affect Transportation System Safety?	Does the Project Have Positive Benefit-Cost Analysis?
	Does the Issue Result in Negative Social/Environmental Impacts?	

Legend

Data Updates | FAC Updates

Data not updated

Project Scores

The overall project scores in Table 41 were found using 2019 data with the average FAC stakeholder ratings and priority weights. The top 5 projects overall are:

Reference ID 2) (Phoenix) I-10 Phoenix Urban Area Improvements

Reference ID 77) (Phoenix) I-10 Phoenix Urban Area Improvements

Reference ID 29) (Kingman) I-40/US 93 System Interchange Improvements

Reference ID 3) (Phoenix) I-10 Phoenix Urban Area Improvements

Reference ID 81) (Gila River) I-10 Gila River Indian Community Area Widening

Table 41: Overall Freight Bottleneck Project Scores

REF ID	Issue Segment	Cost in $M	Overall Score	Goal 1 Score	Goal 2 Score	Goal 3 Score
2	I-10 at I-17 Traffic System Interchange (The Stack)	234.4	57.8	80.4	58.6	33.3
77	From L101 to L202 (Santan Freeway) within Phoenix Metro area	908.1	56.2	96.7	32.5	37.5
29	I-40 at US 93 Junction within Kingman area	101.4	53.0	59.3	69.9	29.4
3	I-10 at SR 202L and SR 51 TrafficSystem Interchange (The Mini-Stack)	351.5	51.3	81.3	38.3	33.0
81	From SR 202L to East of SR 387	221.5	50.4	82.0	13.0	54.8
78	From I-10 to L101 within PhoenixMetro area	703.1	49.2	62.8	45.7	38.4
26	I-40 (EB to NB system ramp at I-40/I- 17/SR 89 interchange)	96.1	48.2	71.1	45.0	27.5
6	I-10 east of I-19	2179.5	45.3	82.4	21.4	30.6
1	I-10 at I-19 Traffic System Interchange	97.3	43.4	78.6	20.6	29.4
25	I-19 between I-10 and Valencia Road (south of Tucson)	732.4	41.8	67.7	25.5	31.1
67	US 89 Within Flagstaff, north of I-40	34.0	40.4	44.6	36.7	39.8
39	SR 69, East of Prescott area	3.9	39.6	14.0	31.8	74.3
5a	I-10 at US 191 (Cochise TI)	1.8	36.3	33.5	8.7	67.0
62	US 60 within Globe area	8.0	24.0	2.6	16.0	54.3
5b	US 191/Cochise RR Overpass	19.3	23.9	33.5	8.7	29.2
35	SR 260, West of Show Low to East of SR 73	9.4	23.0	2.6	37.4	29.9
18	I-17 between SR 179 to Stoneman Lake Road	27.1	20.0	37.3	9.9	12.2
61	US 60 between SR 88 and SR 79	287.1	17.7	26.8	17.4	8.6
63	US 60 Passing Lane: Westbound	6.0	8.3	1.4	12.8	11.0

6.2.2 Investment Plan

ADOT proposes that the most prudent use of Arizona's apportionment of dedicated IIJA freight funds under the NHFP (approximately $125 million over 5 years) is to advance the freight improvement shown in Table 42. The selection of these projects is informed by their overall priority scores, benefits to freight relative to passenger vehicles, stakeholder input, ADOT planning/funding cycles, emerging issues, and the readiness of the project to be advanced.

Table 42: Selected Freight Improvement Projects

Ref.	Overall Rank *	Freight Benefit Share	Route	Issue Segment	Project	NHFP Funds ($ million)
NA		NA			Truck Parking	50.00
NA		NA			Planning/Research	2.00
77	2	14.8%	I-10	MP 149-159	Broadway Curve	27.00
6	8	22.4%	I-10	MP 260-274	Country Club T.I. or Kino T.I.	4.50
25	10	8.8%	I-19	MP 92-102	Irvington T.I.	5.00
39	12	13.1%	SR 69	MP 287-290	ITS Improvements & Raised Median	3.90
5a	13	54.0%	I-10	MP 331	I-10 at US191 Cochise T.I. (2017 Freight Plan)	24.75
62	14	16.0%	US 60	MP 243-255	Passing lane & freight deceleration/turning lane	8.00
					TOTAL **	125.15

*Projects with overall rank of 3, 4, 5, 6 and 15 (not shown above) are funded in current 5-Year Program.

**Refinements to scopes, schedules and budgets produced during the project development process will result in a fiscally constrained set of projects.

In anticipation of the Arizona State Freight Plan's fiscally constrained project list, ADOT has not begun to expend its newly apportioned IIJA NHFP funds, so the Arizona State Freight Plan accounts for all $125 million in NHFP funding and is minimally overprogrammed. Table 43 is a table displaying how the projects and associated funding are currently preliminarily anticipated to be programmed by fiscal year (FY). As noted in the table above, Refinements to scopes, schedules and budgets produced during the project development process ***will result in a fiscally constrained set of projects***. Federal freight funding will normally be "matched" with Arizona Highway User Revenue Fund dollars, partner funding or other non-federal sources, depending on the specific project.

Table 43 Potential Project Programming Years

Ref.	Route	Project	NHFP Funding Amount ($ million)	Fiscal Year(s) Programmed/ Authorized
NA		Planning (incl. Parking Study)	2.00	2023
77	I-10	Broadway Curve - Constr	27.00	2023
		Truck Parking – Design	5.00	2024
25	I-19	Irvington T.I.	5.00	2024
5a	I-10	I-10 at US191 Cochise T.I. (2017 Freight Plan) - Constr	24.75	2024
6	I-10	Country Club T.I. or Kino T.I.	4.50	2024/2025
		Truck Parking – Design / Constr	15.00	2025
		Truck Parking – Constr	30.00	2026
39	SR 69	ITS Improvements & Raised Median	3.90	2027/2028
62	US 60	Passing lane & freight deceleration/turning lane	8.00	2027/2028
		TOTAL **	125.15	

6.3 Potential Implementation Strategies to Address Trends, Needs, and Issues

Achieving positive and systematic change is challenging in organizations as complex as a state department of transportation, but strategies that reflect an agency's most up-to-date vision and goals may be useful in effecting such changes. Successful changes to strategies should be backed by leadership, broadly supported by relevant staff, and easily interpreted.

In the context of the Arizona State Freight Plan, "strategies" represent specific courses of action which can be taken by ADOT and partner agency staff and representatives to make progress towards freight plan goals and objectives. They should be specific enough for relevant individuals or groups to achieve and be guided by documented agency policies. Work to accomplish strategies should also require minimal input from higher levels of management while meaningfully impacting progress towards vision statements, goals, and objectives.

Strategies can target individual objectives or be applicable to a wide range of goal areas. They may also be recurrent or singular efforts depending on underlying circumstances. Therefore, ADOT must conduct regular evaluations to determine if updates to processes or frequency are required.

According to ADOT's 2016-2040 Long Range Transportation Plan, "What Moves You Arizona 2040" (WMYA), ADOT's overall policy direction is to "transition to more data-driven and performance-based decision-making about future transportation investment." The plan groups these initiatives into four areas: resource allocation, performance measurement, target setting, and project selection. In this document, strategies are arranged according to these categories.

The following sections describe the Arizona State Freight Plan goals and objectives and detail the strategies that ADOT will seek to implement to make progress towards them. While this section intends to identify the strategies and projects, it does not include specific timelines for implementation of the strategies. Following the release of the Arizona State Freight Plan, ADOT will work toward implementing the strategies and completing the projects.

ADOT's overall implementation strategy is an ongoing process and will be evaluated through target setting, performance measurement, and consultation with freight partners. These subsequently form the basis for resource allocation and project selection.

6.3.1 Resource Allocation

As freight demand changes and shifts, it is crucial for ADOT to make the most of its investments. In addition to integrating data in decisions related to investments and resource allocation, the agency considers various corridor designations such as its Key Commerce Corridors (KCC), Nationally Designated Truck Routes, the National Highway Freight Network (NHFN), and FHWA High Priority Corridors. The combination of these networks represents primary freight routes and their connectivity, condition, and efficient operation help make Arizona a competitive business market (Table 44).

Table 44: Related Objectives by Goal Area for Resource Allocation

Arizona State Freight Plan Goal Areas			
1. Safety	2. System Management & Mobility	3. Competitiveness	4. Stewardship
Objectives			
1.1 1.3	2.1 2.3 2.4 2.5	3.1 3.2 3.4 3.5	4.1 4.2 4.5

Guiding Principles (May take the form of Policies)

- Modernization and preservation of existing freight system infrastructure should be prioritized over the expansion or development of new facilities.
- Share ADOT-developed data resources as broadly as possible with MPOs, COGs, and local governments to aid in their investment decision-making, while still protecting privacy or proprietary information.
- When prioritizing ADOT freight investments, seek to improve quality of life for Arizona residents and consider ways in which freight system impacts on the natural environment may be minimized, mitigated or reduced. Factors to consider in scoping projects are improvement of storm water quality, reduction of storm water runoff, protection or mitigation of impacts to wildlife habitats, or incorporation of wildlife linkage zones in accordance with Arizona's Wildlife Linkages.
- Appropriately scope projects to best serve the needs of the freight system by leveraging stakeholder input and data to identify differences between underlying issues and surface-level indicators.

Potential Strategies

- Regularly evaluate Critical Rural and Urban Freight Corridor (CRFC, CUFC) designations to determine if allocation efficacy and efficiency are optimal or can be improved.
    - Analyze the relationship between the spatial distribution of freight needs and the current National Highway Freight Network traffic capacity to determine if there are high freight volume facilities that are not on the network.

  - Determine the criteria for identifying critical freight corridors, and analyze the network based on those criteria with the development of each state freight plan.
  - Compare network criteria scores with the redesignated Primary Highway Freight System (PHFS) currently under ongoing redesignation by US Department of Transportation (USDOT).
  - Review anticipated USDOT guidance and regulations on the IIJA freight elements including the CRFCs and CUFCs
  - Review results of the network analysis with the FAC, MPOs, COGs, and Tribal Governments.
- Consult with organizations such as MPOs, Tribal Governments, and COGs before, during, and after planning processes that impact their jurisdictions to solicit input and expert opinion related to their territory.
- Coordinate with stakeholders at multi-modal facilities to identify pain points that may be mitigated through improvements to the multimodal freight system with ADOT partnership.
- Prepare for future truck parking needs by
  - identifying potential funding sources such as public-private partnerships and discretionary funds,
  - tracking bills such as H.R. 2187 (117th Congress) that are related to truck parking,
  - comparing current parking and employment against projected employment for industries highly reliant on transportation services, and
  - updating processes related to truck parking expansion or conversion projects.

6.3.2 Performance Measurement

To effectively evaluate system performance and subsequently gauge progress, ADOT and its partner organizations utilize a wide variety of data sources (Table 45). However, increasing complexity in both the freight system and the populations it serves means that performance-based decision-making requires greater quality and quantities of information. Good stewardship of fiscal, environmental, and social resources can only be achieved when ADOT has an accurate picture of conditions on the ground.

Table 45: Related Objectives by Goal Area for Performance Measurement

Arizona State Freight Plan Goal Areas			
1. Safety	2. System Management & Mobility	3. Competitiveness	4. Stewardship
Objectives			
1.1	2.3	3.1	4.3
1.2	2.4	3.5	4.4
1.3			4.5

Guiding Principles

- Diligently seek or engage partner agencies, stakeholders, and the public during the scoping of freight project development, especially when Environmental Justice (EJ) communities may be impacted.
- Encourage regional coordination between municipalities, state entities, and federal agencies through relevant networks or committees for project selection and other planning processes.

Potential Strategies

- Complete updates to the ADOT truck parking study to guide project identification associated with implementation of the 2022 state freight plan. Review the truck parking study update and the status of truck parking project implementation ahead of the development of the next state freight plan. This may include a freight plan gap assessment process, including evaluating regional benefits of truck parking and identifying needs for alternative truck fueling or charging.
- Evaluate opportunities to relieve import pressures through ADOT or partner investments in inland ports and airports.
- Develop a geospatial dataset that defines the extents of EJ communities and integrate it into the project selection process. This may include use of Justice40 information available through federal agencies.
- Maintain datasets that show the relationship between EJ communities and the freight industry, including information such as air quality, employment rates, wages, and accessibility.
- Identify engineering design elements that may enhance safety related to heavy trucks. Develop appropriate systematic or project-specific improvements designed to help reduce crashes in coordination with the Strategic Traffic Safety Plan (STSP) Administrator and the Safety Communication Group.
- Analyze the freight network to identify areas with no redundancy, long detours, or lack of connectivity to alternate routes.
- Support inter-regional coordination within the state and with regions outside the state that are major freight origins or destinations by facilitating regular meetings between the regions' relevant MPO, COG, and DOT staff.

6.3.3 Target Setting

Targets can be grouped into two broad categories: attainable and aspirational. Regardless of what timescale is associated with a target, it can help set ADOT's vision and allow tracking over time. This is most prominent in efforts to improve safety, reliability, and infrastructure condition. ADOT can also benefit from identifying attainable or aspirational targets for performance measures aligning with the Arizona State Freight Plan goal areas and objectives. Ultimately, understanding gaps between current conditions and the agency's vision drives the development of better strategies (Table 46).

Table 46: Related Objectives by Goal Area for Target Setting

Arizona State Freight Plan Goal Areas			
1. Safety	2. System Management & Mobility	3. Competitiveness	4. Stewardship
Objectives			
1.1 1.3	2.1 2.3 2.4 2.5	3.2 3.5	4.1 4.2 4.3 4.4 4.5

Guiding Principles

- Develop targets that are meaningful, data-driven, and help ADOT improve the decision-making process through investment impact forecasts.
- Clearly communicate targets' data sources, rationale, purpose, and timescale to partner agencies, stakeholders, and the public.

Potential Strategies

- Incorporate data-driven scenario planning and robust decision-making frameworks into long-range and freight transportation planning processes to be better prepared for future uncertainties and how they will impact ADOT practices and investments.
- Integrate triggering circumstances into agency strategies to account for future uncertainties and develop an established process for responding to situations outside of the forecasted or projected conditions.
- Produce recurrent reports on progress towards targets and distribute to relevant stakeholders, staff, and agency leadership.
- Solicit input from industry stakeholders and relevant regional and local organization on performance measures and targets.
- Evaluate projects' impact on progress towards targets and integrate findings into project selection and decision-making processes.

6.3.4 Project Selection

ADOT staff collaborate with local partners and subject matter experts to choose a well-balanced set of investments that are most likely to maximize progress towards agency goals and objectives while minimizing costs and negative externalities. As the freight environment evolves and changes, ADOT aims to remain adaptable and responsive to unforeseen events. This means that the project selection process must be updated accordingly to remain resilient and future oriented. ADOT uses a documented Planning to Programming (P2P) process which utilizes stakeholder, technical, and engineering district feedback to nominate, scope, and prioritize projects, taking into consideration performance driven evaluation criteria related to preservation, modernization, and expansion (Table 47).

Table 47: Related Objectives by Goal Area for Project Selection

Arizona State Freight Plan Goal Areas			
1. Safety	2. System Management & Mobility	3. Competitiveness	4. Stewardship
Objectives			
1.1 1.2 1.3	2.1 2.2 2.3 2.4 2.5	3.1 3.2 3.5	4.2 4.3 4.4 4.5

Guiding Principles

- Ensure prioritization criteria are aligned to strategic goals, objectives, and measures.
- Enhance tools and information shared with stakeholders to gauge preferences and desired distribution of possible funding.
- Identify data roles and responsibilities for updating scoring.
- Prepare for emerging technology scenarios, including automation and demand for alternative freight fuel.

Potential Strategies

- When new data sources become available or strategic initiatives begin, adjust project prioritization processes and scoring criteria accordingly with the aims of improving safety, increasing efficiency, and reducing negative impacts.
- Develop automated tools to regularly evaluate projects' impacts on natural environments, freight emissions, and local communities.
- Research emerging technologies to assess how they will impact freight demand and what changes to project selection may be necessary.
- Enhance tools and information shared with stakeholders to gauge preferences and desired distribution of possible funding.

6.4 Conclusion

In the years ahead, ADOT will work towards completing the projects outlined in the STIP, optimizing NHFP funds, and coordinating with freight planning partners and stakeholders in Arizona to implement the strategies outlined in the Arizona State Freight Plan. Throughout this process, ADOT will examine trends, monitor needs, and look for opportunities related to the freight system.

It is ADOT's intention to create standard work related to enhanced interaction with and involvement of freight stakeholders through the freight advisory committee. Until now, the freight advisory committee has been involved in freight plan development every five years and the truck parking study, but has not been regularly called upon in the interim. ADOT intends to initiate more regular FAC interaction to help proactively mainstream freight planning more robustly into the overall statewide planning process. This will help us address freight issues together and help us move more seamlessly into freight plan updates with an improved understanding of mutual needs and goals.

The implementation of the 2022 Arizona State Freight Plan, as well as more regular FAC involvement in statewide planning, will ultimately enhance economic competitiveness and quality growth through innovation and effective system management.

7 APPENDICES

7.1 Appendix A – FAST Act Content Requirements

Requirement	Location in Freight Plan
An identification of significant freight system trends, needs, and issues	2 Arizona Freight transportation System 3 Freight Transportation Forecasts 5 State Freight System Needs
A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state	1.4 Goals Overview 4 Strategic Direction 6 Improvement and Implementation Plan
A list of multimodal critical rural freight facilities and corridors	2.6.2 Statewide Freight Infrastructure – Highway Network
A list of critical rural and urban freight corridors	2.6.2 Statewide Freight Infrastructure – Highway Network
A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals and the national highway freight program goals	4 Strategic Direction 6 Improvement and Implementation Plan
A description of how innovative technologies and operational strategies that improve the safety and efficiency of the freight movement were incorporated.	4 Strategic Direction 6 Improvement and Implementation Plan
An inventory of facilities with freight mobility issues, as well as a description of the strategies the state is employing to address those freight mobility issues for facilities that are state- owned and operated.	2 Arizona Freight Transportation System 5 State Freight System Needs 6 Improvement and Implementation Plan
Consider any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.	5 State Freight System Needs 6 Improvement and Implementation Plan
A freight investment plan that includes a list of priority projects and describes how funds made available would be invested and matched	6.2 Freight Investment Plan
Consultation with the State FAC, if applicable	1.5 Stakeholder Engagement

7.2 Appendix B – Federal Freight Planning Guidance – IIJA Content Requirements

Requirement	Location in Freight Plan
An inventory of supply chain cargo flows	3 Freight Transportation Forecasts
An inventory of commercial ports	2.6 Inventory and Assessment
A description of the impacts of e-commerce on freight infrastructure	3 Freight Transportation Forecasts
Military freight consideration	3 Freight Transportation Forecasts* * While not separately identified, all commercial systems use military freight, and is included in both the commodity analysis and mode-specific freight demand analysis)
Strategies and goals to address extreme weather, air pollution, flooding, and wildlife and habitat loss	4.6 Performance Measures
Truck parking facilities	5.7 Current Arizona Freight Transportation System Needs and Issues 6.2 Freight Investment Plan
A priority either to enhance reliability and redundancy of freight transportation or how to improve the ability to rapidly restore access to freight transportation	4 Strategic Direction