



Arizona Truck Parking Study

Final Report

Prepared for:
Arizona Department of Transportation

Prepared by:
CPCS

Acknowledgments

The CPCS Team would like to thank the Arizona Department of Transportation, the Arizona Truck Parking Advisory Group, and other stakeholders consulted in the development of this report.

Disclaimer

This report was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data, and for the use or adaptation of previously published material, presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration, U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation. Trade or manufacturers' names that may appear herein are cited only because they are considered essential to the objectives of the report. The U.S. government and the State of Arizona do not endorse products or manufacturers.

Contact

Questions and comments on the Final Report can be directed to:

Charla Glendening
ADOT Project Manager
T: +1.602.712.7376
E: cglendening@azdot.gov

Alex Marach
CPCS Project Manager
T: +1.920.737.2980
E: amarach@cpctrans.com

Table of Contents

1	Introduction.....	1
1.1	Purpose of the Arizona Truck Parking Study.....	1
1.2	About Truck Parking.....	2
1.2.1	Impacts of Inadequate Truck Parking.....	2
1.3	Truck Parking in Arizona.....	3
2	Supply of Truck Parking.....	5
2.1	Types of Truck Parking.....	5
2.2	Truck Parking Locations.....	5
2.2.1	Public Truck Parking Supply.....	5
2.2.2	Private Truck Parking Supply.....	7
3	Demand for Truck Parking.....	9
3.1	Factors Affecting Demand for Truck Parking.....	9
3.1.1	Hours of Service and the Electronic Logging Device Mandate.....	9
3.1.2	Economic Factors Driving Truck Parking Demand.....	10
3.2	Truck Parking Utilization.....	11
3.3	Undesignated Truck Parking Locations.....	15
3.3.1	Top 15 Locations of Undesignated Truck Parking.....	15
3.4	Prioritizing Truck Parking Locations of Undesignated Truck Parking.....	17
4	Matching Solutions to Issues and Sequencing.....	21
4.1	Identifying Opportunities.....	21
4.2	Implementation Plan.....	26
4.2.1	Phase I: Exploration and Initial Steps.....	28
4.2.2	Phase II: Full Implementation.....	29
4.2.3	Phase III: Future Actions.....	30
5	Conclusion.....	31
5.1	Project Summary.....	31

Table of Figures

Figure 1-1: Inappropriate Parking at Arizona Rest Area Ramps at Texas Canyon Eastbound.....	3
Figure 1-2: Frequency of Reported Parking Difficulty	3
Figure 1-3: Changes in Truck Parking Availability Over the Past Three Years	4
Figure 2-1: Operators of Truck Parking Spaces in Arizona.....	5
Figure 2-2: Public Truck Parking Locations (Rest Areas)	6
Figure 2-3: Private Truck Parking Spaces by Company	7
Figure 2-4: Density of Private Truck Parking Locations in Arizona	8
Figure 3-1: Arizona’s Forecasted Increase in Freight moved by Trucks Between 2013 and 2040	10
Figure 3-2: Locations of Truck Parking Demand	12
Figure 3-3: Top 15 Truck Stops or Rest Areas by Highest Overnight Utilization Rate	14
Figure 3-4: Top 15 Undesignated Truck Parking Locations.....	16
Figure 3-5: Truck Parking Prioritization Process	17
Figure 3-6: Top 15 Locations of Undesignated Truck Parking	19
Figure 4-1: Truck Parking Expansion and Information Opportunities in Arizona	23
Figure 4-2: Arizona Truck Parking Implementation Plan	27

Acronyms / Abbreviations

AADTT	ANNUAL AVERAGE DAILY TRUCK TRAFFIC
ADOT	ARIZONA DEPARTMENT OF TRANSPORTATION
ATRI	AMERICAN TRANSPORTATION RESEARCH INSTITUTE
ELD	ELECTRONIC LOGGING DEVICES
FAC	FREIGHT ADVISORY COMMITTEE
FMCSA	FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION'S
HOS	HOURS OF SERVICE
MAG	MARICOPA ASSOCIATION OF GOVERNMENTS
NHFP	NATIONAL HIGHWAY FREIGHT PROGRAM
P3	PUBLIC-PRIVATE PARTNERSHIPS
TPIMS	TRUCK PARKING INFORMATION SYSTEM
VMS	VARIABLE MESSAGE SIGNS

1 Introduction

1.1 Purpose of the Arizona Truck Parking Study

The Arizona Truck Parking Study is an outgrowth of the Arizona State Freight Plan, which identified inadequate truck parking as a major issue affecting the safety and efficiency of freight movement in Arizona. Inadequate truck parking results in truck drivers parking on highway shoulders, on/off ramps, vacant property, or local surface streets. These parking behaviors can negatively affect highway safety, infrastructure condition, and quality of life.

Current trends, including the Electronic Logging Devices (ELD) mandate and the increasing volume of truck traffic statewide, have exacerbated parking shortages in Arizona. In response to these trends, the Arizona Truck Parking Study provides an in-depth analysis of the truck parking issues in Arizona and a framework for the Arizona Department of Transportation (ADOT) to advance projects and policies that improve truck parking in Arizona. The Final Report of the Arizona Truck Parking Study is a synthesis of four Working Papers that provide additional detail and analysis of truck parking in Arizona (available here:

<https://www.azdot.gov/planning/transportation-programs/arizona-state-freight-plan/truck-parking>).

The Arizona Truck Parking Study identifies gaps between truck parking supply and demand, defines infrastructure and policy needs, and proposes potential capacity and technology solutions to improve truck parking in Arizona.

1.2 About Truck Parking

Truck parking facilities provide a location for truck drivers to take their short- and long-term rest breaks, as required by the Federal Motor Carrier Safety Administration's (FMCSA) Hours of Service (HOS) rules. Truck drivers use truck parking facilities to comply with regulations that promote the safe operation of commercial motor vehicles, making truck parking a factor in both truck driver quality of life and the safety of other roadway users. Truck drivers also use truck parking to stage close to pick-up or delivery locations. Staging is defined as a truck using truck parking to wait for a scheduled pickup or delivery. Truck drivers use truck parking to stage because shippers and receivers will often only allow trucks on-site during a scheduled timeframe. This lack of access and on-site parking forces truck drivers to park elsewhere while they wait for their scheduled appointments.

Hours of Service Regulations

The FMCSA sets limits on how long truck drivers may drive each day. These regulations are intended to improve highway safety by reducing fatigued driving. Drivers must take a break of at least 10 consecutive hours after:

- 11 hours of driving, or
- 14 consecutive hours on duty. On duty work includes driving, as well as inspections, paperwork, fueling, and other work tasks

Additionally, drivers may not drive for more than eight hours without a 30-minute break.

Truck parking has been a concern raised by the trucking industry in all of the American Transportation Research Institute's (ATRI) annual *Critical Issues in the Trucking Industry* publication since truck parking was first included in 2012. Truck drivers ranked truck parking as the second most important issue facing the industry in both the 2017 and 2018 industry survey, only behind the ELD mandate in 2017 and HOS in 2018.^{1,2} The trucking industry in Arizona has highlighted truck parking as an issue during both the Arizona Freight Advisory Committee (FAC).

1.2.1 Impacts of Inadequate Truck Parking

As truck drivers near their HOS limit, they often have to decide between "stopping early" to search for truck parking or continuing to drive. Stopping early reduces driver productivity and costs the average driver about \$6,000 per year.³ Drivers that do not stop early increase their productivity, but risk running out of HOS before they find a truck stop or rest area with available truck parking. Truck drivers nearing the end of the HOS must choose between continuing to look for available truck parking and risk a citation, fine, and increasing the public's exposure to a fatigued driver or parking in an undesignated truck parking location.

Figure 1-1 displays two examples of undesignated truck parking, one of the most visible symptoms of inadequate truck parking. Undesignated truck parking poses an increased collision risk on roadways, which negatively impacts public safety. Additionally, trucks parked

¹ *Critical Issues in the Trucking Industry – 2017*, October 2017. American Transportation Research Institute.

² *Critical Issues in the Trucking Industry – 2018*, October 2018. American Transportation Research Institute.

³ *Truck Parking Report*, July 2018. Trucker Path.

on shoulders and ramps damage unreinforced pavement, which is not intended to regularly support a parked truck for 10 hours or more. On the other hand, parking in unmonitored commercial or industrial areas may expose truck drivers to theft, other crime, and may be a nuisance to local businesses or residents. Whether decreased productivity, fines, or the risk to drivers parked in undesignated truck parking locations, inadequate truck parking affects truck drivers, economic competitiveness, roadway and driver safety, and damages infrastructure.

Figure 1-1: Inappropriate Parking at Arizona Rest Area Ramps at Texas Canyon Eastbound



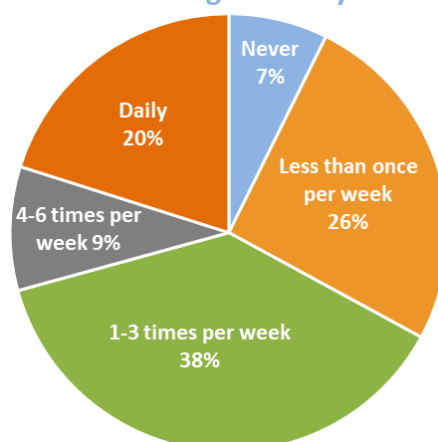
Source: Arizona Department of Transportation

1.3 Truck Parking in Arizona

The project team developed an 18-question online survey to ask truck drivers how they use truck parking in Arizona and to identify truck parking problems and potential solutions. In total, 170 drivers responded to the survey, with 164 confirming they park in Arizona.

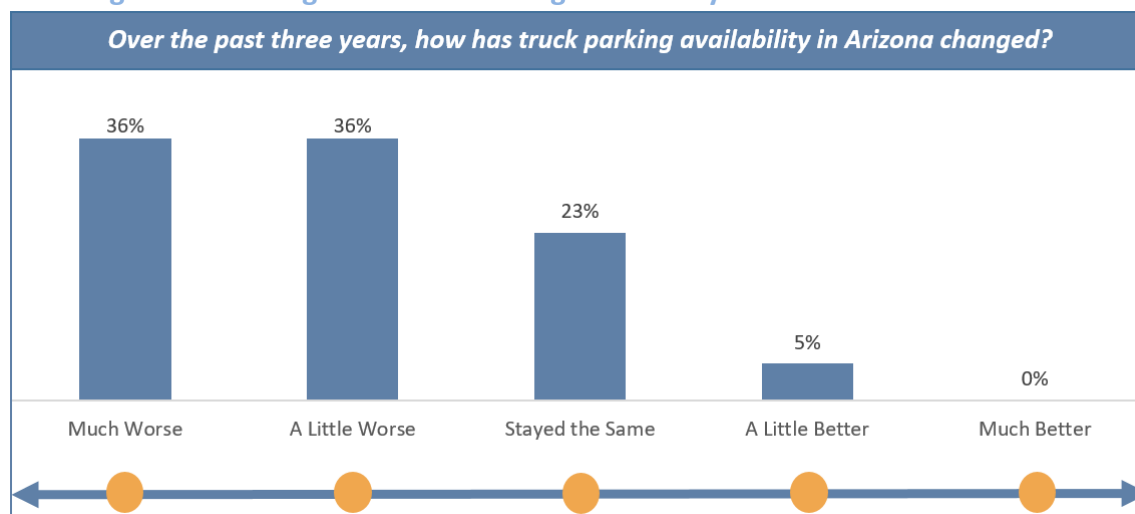
As shown in Figure 1-2, 93 percent of drivers reported some degree of difficulty finding parking in Arizona and 67 percent of drivers reported difficulty finding parking in Arizona at least one to three times per week. When asked how truck parking availability has changed in the last three years, 72 percent of truck drivers said that truck parking availability has gotten worse (Figure 1-3).

Figure 1-2: Frequency of Reported Parking Difficulty



Source: CPCS Survey.

Figure 1-3: Changes in Truck Parking Availability Over the Past Three Years



Source: CPCS Survey.

Truck drivers encounter three major challenges associated with finding truck parking:

- **Spending time searching for parking:** 22 percent of drivers spent 16 to 30 minutes and 29 percent spent over 31 minutes searching for parking in Arizona.
- **Stopping their workday early to find a parking spot:** 63 percent of drivers give up more than 30 minutes to secure a parking space each time they park in Arizona.
- **Parking in undesignated areas:** 50 percent of drivers park in an undesignated space such as a vacant lot, highway ramp, or local street in Arizona at least once a week.

Truck parking issues make trucking in Arizona less efficient, reduce highway safety, degrade infrastructure condition, and decrease the quality of life for truck drivers and local residents.

2 Supply of Truck Parking

2.1 Types of Truck Parking

The Arizona Truck Parking study differentiates truck parking into designated and undesignated locations. Designated truck parking is broken into public and private truck parking locations based on ownership. Both public (rest areas) and private (truck stops) truck parking must be open to the public to be included in the scope of this research. Therefore, parking facilities reserved for a trucking company's vehicles are not included in this study (private-only truck parking). While private-only truck parking is a portion of Arizona's total statewide truck parking spaces, the exclusive nature of private-only truck parking facilities limits their use as a publically available resource.

2.2 Truck Parking Locations

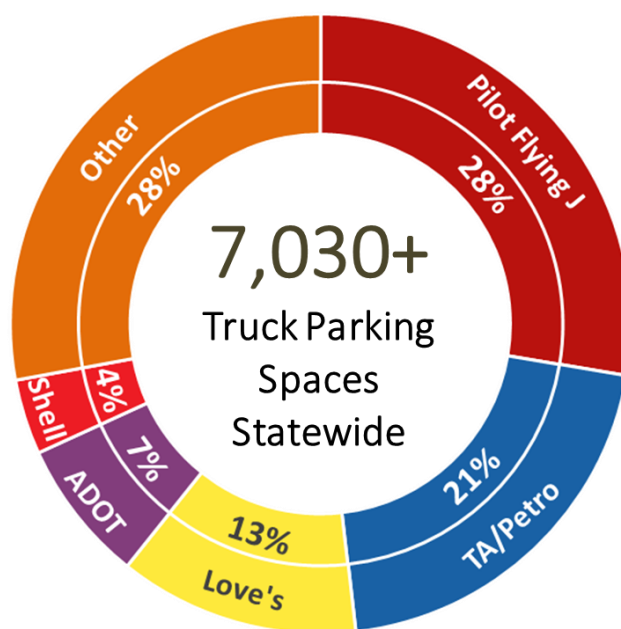
Arizona has 129 public and private truck parking locations providing over 7,030 truck parking spaces statewide. As shown in Figure 2-1, about 93 percent of truck parking spaces in Arizona are provided by the private sector, meaning there are over 12 truck parking spaces provided at private truck parking locations for each space provided by ADOT.

2.2.1 Public Truck Parking Supply

ADOT provides 523 public truck parking spaces (over 7 percent) statewide, split between rest areas, overflow lots at rest areas, and parking only locations that have no amenities. As shown in Figure 2-2, ADOT rest areas are concentrated along Interstates. I-10 has the greatest proportion of truck parking spaces (41 percent), followed by I-40 (21 percent), I-8 (16 percent), I-17 (13 percent), and I-19 (9 percent).

In addition to designated truck parking locations, the project team identified trucks parked at brake check areas, closed rest areas, and other roadside facilities. These are examples of undesignated truck parking that are not included in the total number of truck parking spaces statewide.

Figure 2-1: Operators of Truck Parking Spaces in Arizona



129 Locations in Arizona

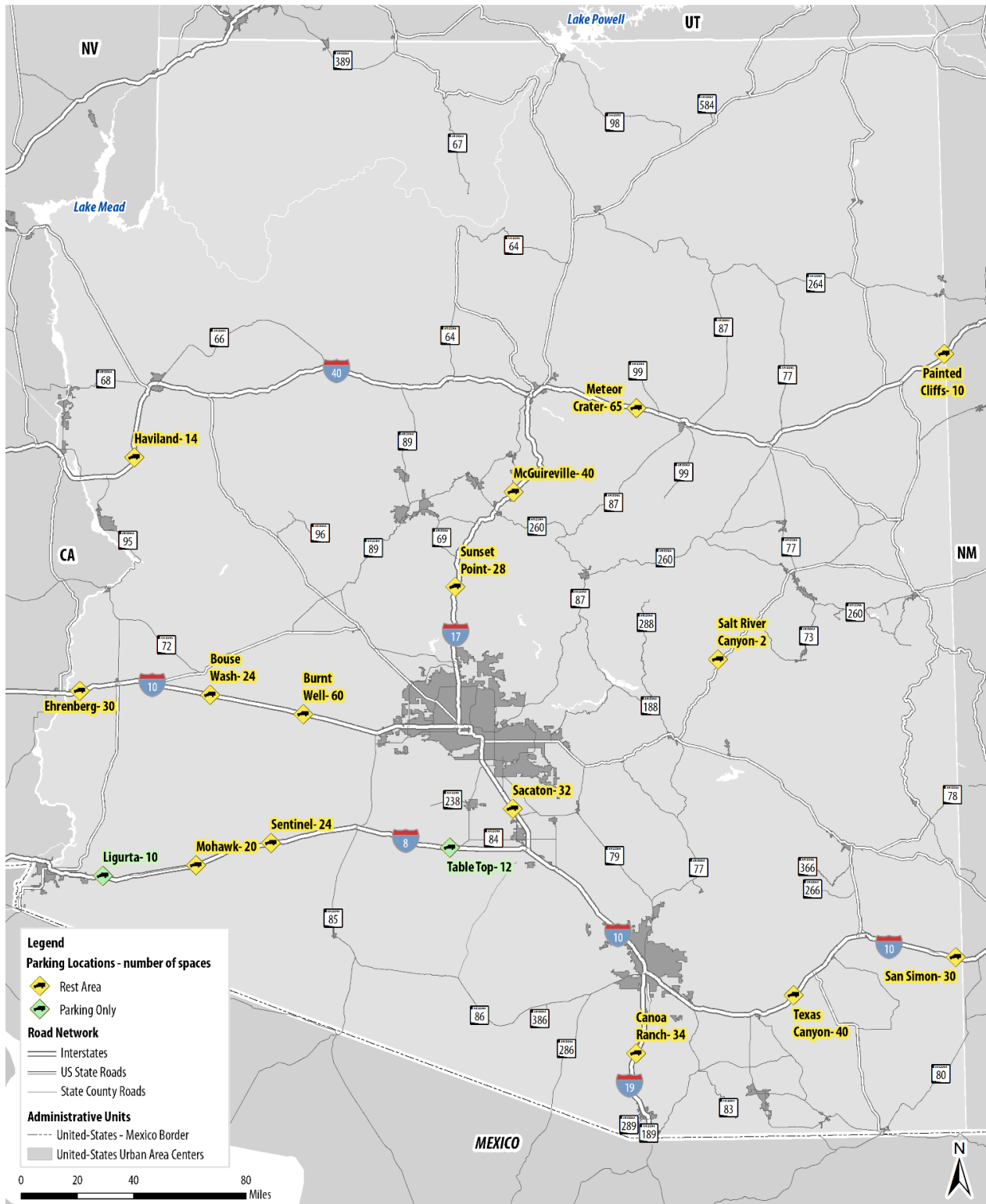
55 Average Spaces per Location

Source: CPCS Analysis of Trucker Path Data

Figure 2-2: Public Truck Parking Locations (Rest Areas)

CPCS Solutions for
growing economies

ADOT Parking Locations
Arizona State Plane Central FIPS 0202 (Feet-Intl)



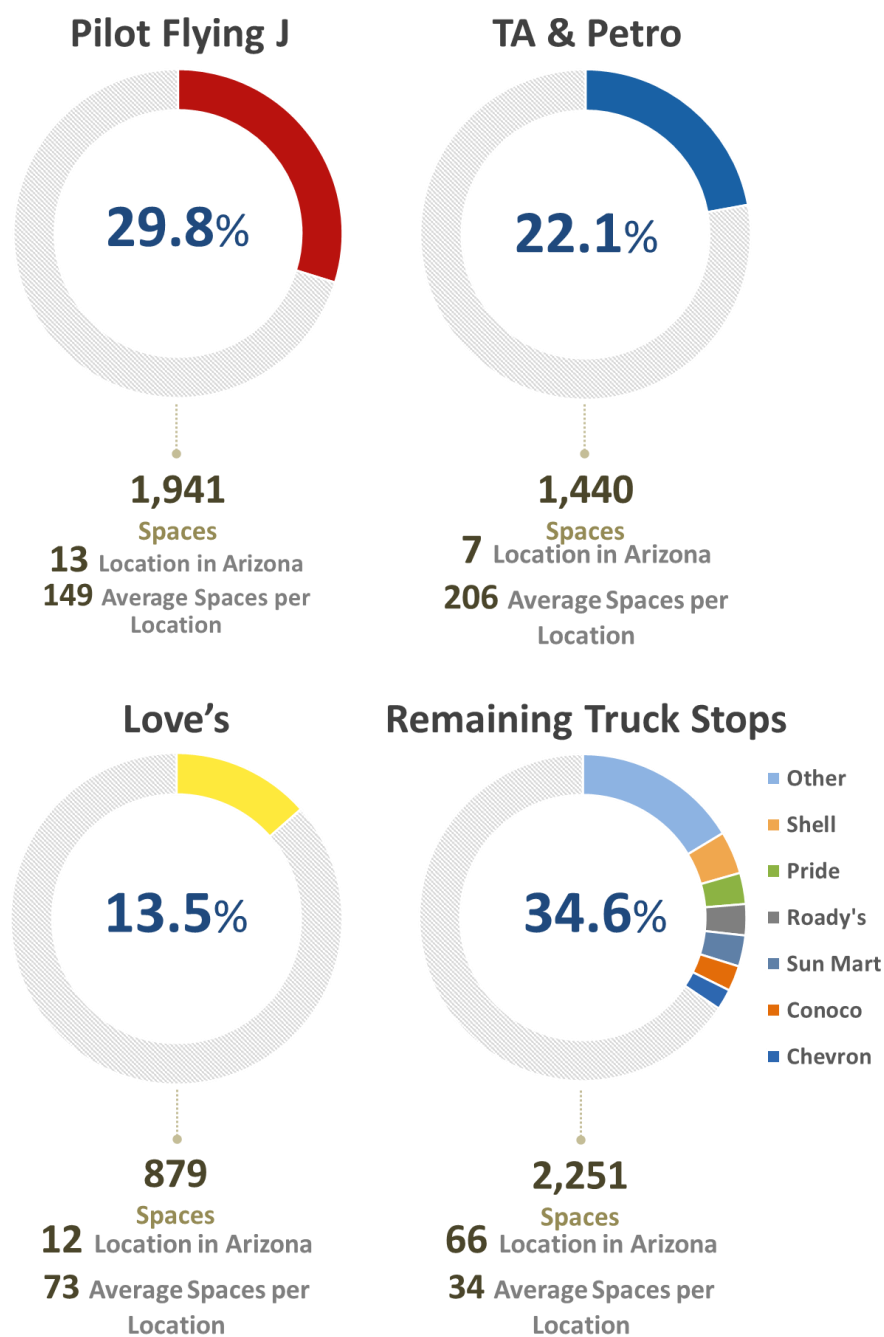
2.2.2 Private Truck Parking Supply

Private truck stops provide 6,511 truck parking spaces at 98 private truck stops in Arizona. As shown in Figure 2-3, Pilot Flying J, TA-Petro, and Loves provide over 65 percent of private truck parking spaces in Arizona. Many different companies provide the remaining 34 percent of truck parking spaces, with Shell being the next largest provider after Love's with a little over 4 percent of the state's private truck parking spaces.

While the top three companies provide over 65 percent of truck parking spaces, they only provide 33 percent of truck parking locations, meaning their average size is large, limiting their geographic coverage in Arizona. In fact, all 65 percent of the Pilot/Flying J, TA-Petro, and Love's locations are located near Interstates, displaying the role of the other parking locations, including rest areas, in providing truck parking in underserved portions of the state.

Figure 2-4 displays the distribution of private truck parking spaces throughout the state, with darker red areas representing greater density in truck parking spaces. The majority of truck parking locations are located on Interstates and are near population centers or state borders. I-10 has the heaviest density of truck parking, especially near the Arizona/California border and in Buckeye, Tolleson, Casa Grande, Tucson,

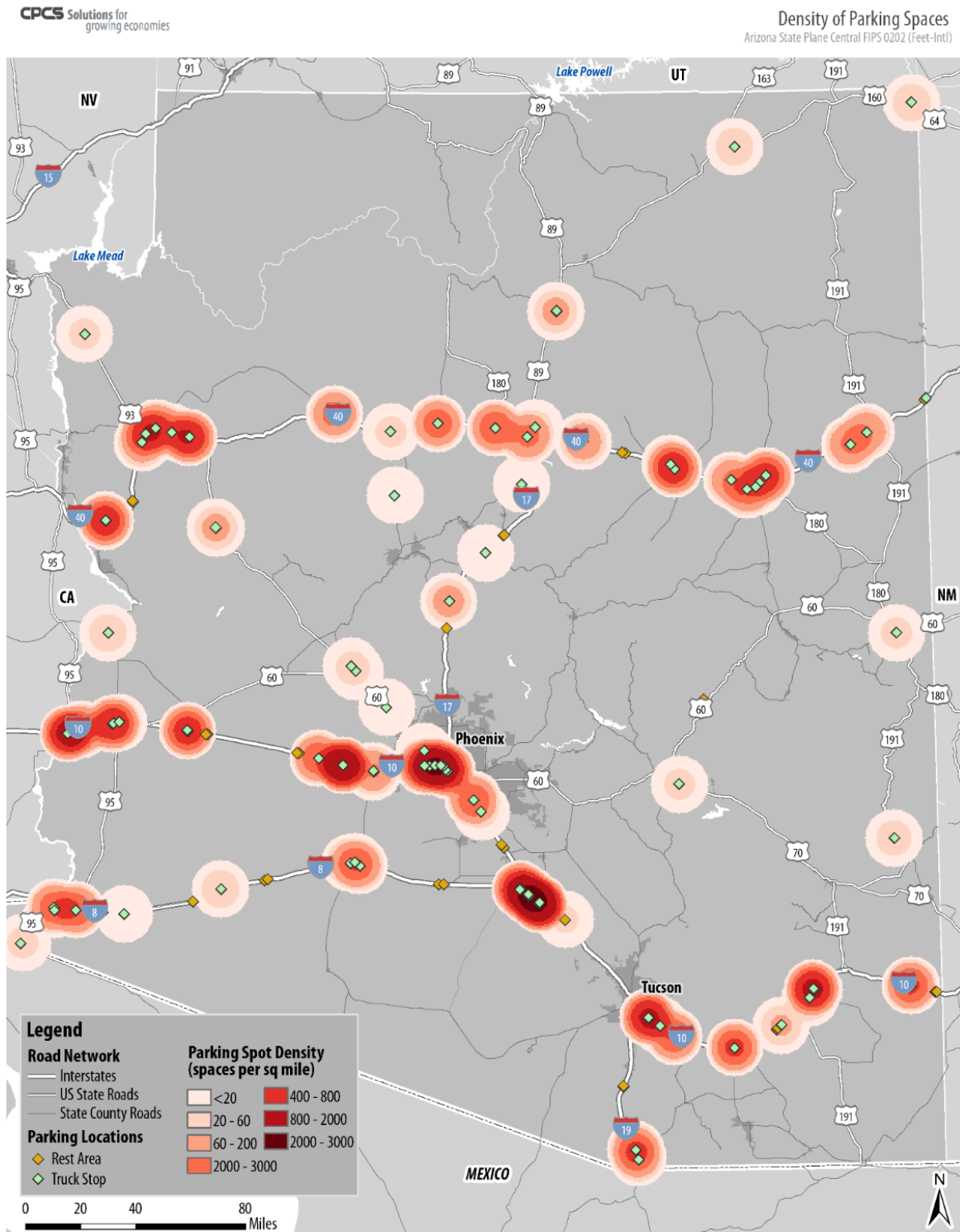
Figure 2-3: Private Truck Parking Spaces by Company



Source: CPCS Analysis of Trucker Path Data

Willcox, and San Simon. Other concentrations of private truck parking spaces are along I-40 in Kingman, Flagstaff, and Holbrook and on I-19 near the Arizona/Mexico border.

Figure 2-4: Density of Private Truck Parking Locations in Arizona



3 Demand for Truck Parking

3.1 Factors Affecting Demand for Truck Parking

Truck parking demand is driven by many factors, including the volume of commodity flows to, from, through, and within Arizona, business practices such as just-in-time inventory, and HOS regulations. In the near-term, enforcement of the ELD mandate is likely the largest generator of additional demand for truck parking in Arizona. On a longer timescale, the continued growth of the state's economy, particularly in retail and consumer goods trade, will increase parking demand.

3.1.1 Hours of Service and the Electronic Logging Device Mandate

Baseline truck parking demand is defined largely by the HOS rules. HOS have broad effects on truck parking. The largest single impact is the requirement to stop for short and long breaks. The recent ELD mandate has not changed HOS rules but did increase the likelihood that a truck driver exceeds his or her HOS. In the past, paper logbooks gave drivers some “wiggle room” in reporting driving times, because paper logbooks monitored and documented driving time using 15 minute time blocks. This allowed truck drivers 15 minutes to look for truck parking even after they had technically run out of drive-time (e.g. 11 hours ends at 7:00 p.m., but the log is good until 7:15 p.m.). Paper logs also allowed for more substantial edits, which truck drivers could use to accommodate the time spent driving over allowed HOS.

85 percent of truck drivers surveyed during the Arizona Truck Parking Study believe the ELD mandate will cause Arizona's truck parking problems to become worse.

However, most drivers are now required to use ELDs to record their HOS. ELDs interface directly with a truck's electrical system and automatically generate HOS records based on truck operations. The automatic recording and tamper-proof nature of ELDs mean that drivers no longer have flexibility when trying to find parking at the end of their day, and must stop earlier to find and secure a parking space.

“As more drivers begin to run legal, this will be a tremendous burden on the available parking spaces because drivers that normally falsify their log to make it to their destination will be forced to stop and take their break on the road.”
—Survey Respondent

3.1.2 Economic Factors Driving Truck Parking Demand

The volume of trucks traveling on Arizona's roads directly influences truck parking demand in both urban and rural areas of the state. Generally speaking, the more trucks on the road, the greater the demand for truck-related services, including parking.

In addition to the volume of trucks, the origins and destinations of freight affect whether a truck driver needs truck parking in Arizona. For example, long-distance truck trips generate demand for long-term parking in both urban and rural areas. In addition to long-term parking, trucks coming from other states may need parking to stage for pick-up or delivery at freight facilities in Arizona. Truck drivers traveling through Arizona to other states, such as California or Texas, also generate truck parking demand. Through trips accounted for 61 percent of Arizona's truck tonnage, and 62 percent of its truck cargo value in 2013.⁴ Figure 3-1 illustrates how truck tonnage is expected to nearly double between 2013 and 2040. This expected increase in truck tonnage means that demand for parking in Arizona will likely continue to increase.

Figure 3-1: Arizona's Forecasted Increase in Freight moved by Trucks Between 2013 and 2040

Measure	Outbound from AZ	Inbound to AZ	AZ to AZ	Through AZ	Total
Tonnage	89%	114%	75%	119%	99%
Value	247%	200%	130%	149%	161%

Source: HDR analysis of Transearch data, received in November 2015,

The inbound and outbound shipments described above often originate or terminate at warehouses and distribution centers. These facilities rely heavily on truck service and have grown rapidly in the past 15 years. Between 2000 and 2014, firms spent nearly \$2 billion to construct 35 million square feet of warehouse and distribution space in Arizona.⁵ A common complaint from truck drivers was a lack of parking at or near warehouses or distribution centers.

35 million square feet of warehouse and distribution space was built in Arizona between 2000 and 2014.

Looking toward the future, parking for staging at warehouses and distribution centers will continue to be a problem in urban areas for two reasons. First, the continued development of warehouses and distribution centers will continue to create new demand. Second, as congestion increases in urban areas, travel times will become less certain. Therefore, drivers who have fixed appointment windows will need to get closer to their final destination when searching for parking. Drivers staging for pick-ups or deliveries may be able to use the

⁴ HDR Analysis of IHS Transearch data. 2013.

⁵ Arizona State Freight Plan Working Paper: Transportation and Logistics.

decrease in mid-day parking demand to easily find parking, but drivers searching for parking during peak overnight periods will encounter difficulty.

3.2 Truck Parking Utilization

One situation where truck parking issues develop is when there is an insufficient supply of truck parking to meet demand. The 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 (see text box, below).

Analyzing the utilization of truck parking locations enables a comparison of the availability of truck parking spaces against locations where undesignated truck parking occurs.

Comparing utilization and undesignated truck parking provides insight into areas where undesignated truck parking is due to a lack of information, rather than a lack of capacity.

The Trucker Path data were used to assess and map the availability of truck parking in 2017 at 3am, 9am, noon, 3pm, 9pm, and, midnight (Figure 3-2). Figure 3-2 displays the availability of truck parking at the nearest location for Arizona's major freight corridors, with green indicating available truck parking, yellow indicating there is some truck parking available, and red indicating that there is little to no available truck parking. The density of total truck parking spaces is displayed in Figure 3-2 by darkening areas with higher densities of truck spaces.

Trucker Path Data

The project team used data from Trucker Path, a truck parking application that crowdsources information about truck parking availability from over 800,000 users, to identify the utilization of public and private truck parking locations. Using data from truck parking applications is a unique opportunity to identify truck parking utilization in line with what a truck driver would see when they search for truck parking. Trucker Path asks users if there is "lots", "some", or if the truck parking location is "full" when a user is close to the facility.

The overall daily trend is consistent with other study findings—showing that some areas fill up quicker than others. Specifically, Phoenix, Flagstaff, and locations on I-40 near the Arizona/California border beginning to fill up by 9pm. By midnight, Phoenix and I-17 are nearing capacity and Tucson and locations along I-40 starting to fill. Finally, by 3am the majority of the state is in red or yellow, with pockets of available truck parking in rural areas and locations with significant capacity, such as the area from Casa Grande to Eloy on I-10, which has over 1,000 truck parking spaces within ten miles.

Figure 3-2: Locations of Truck Parking Demand

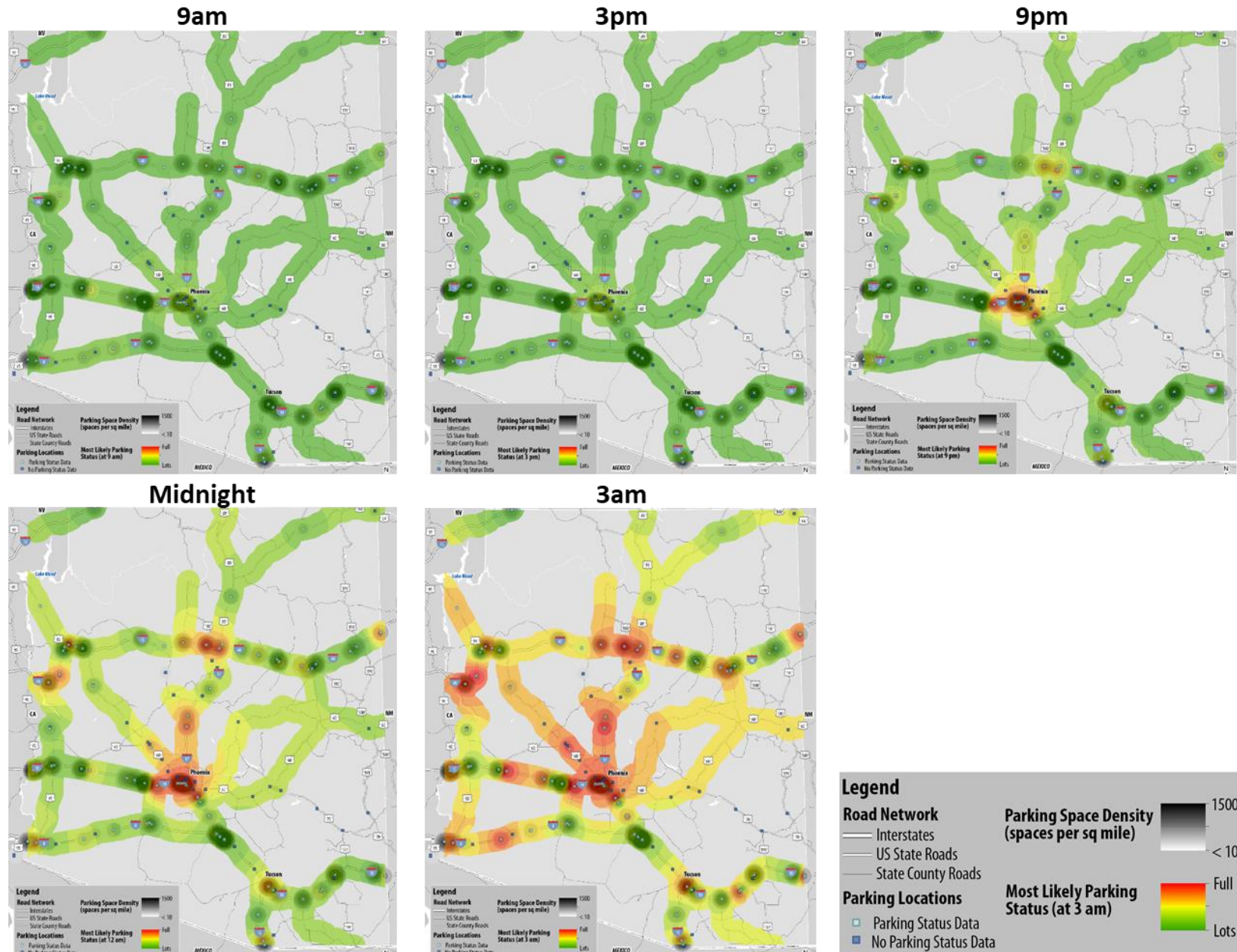
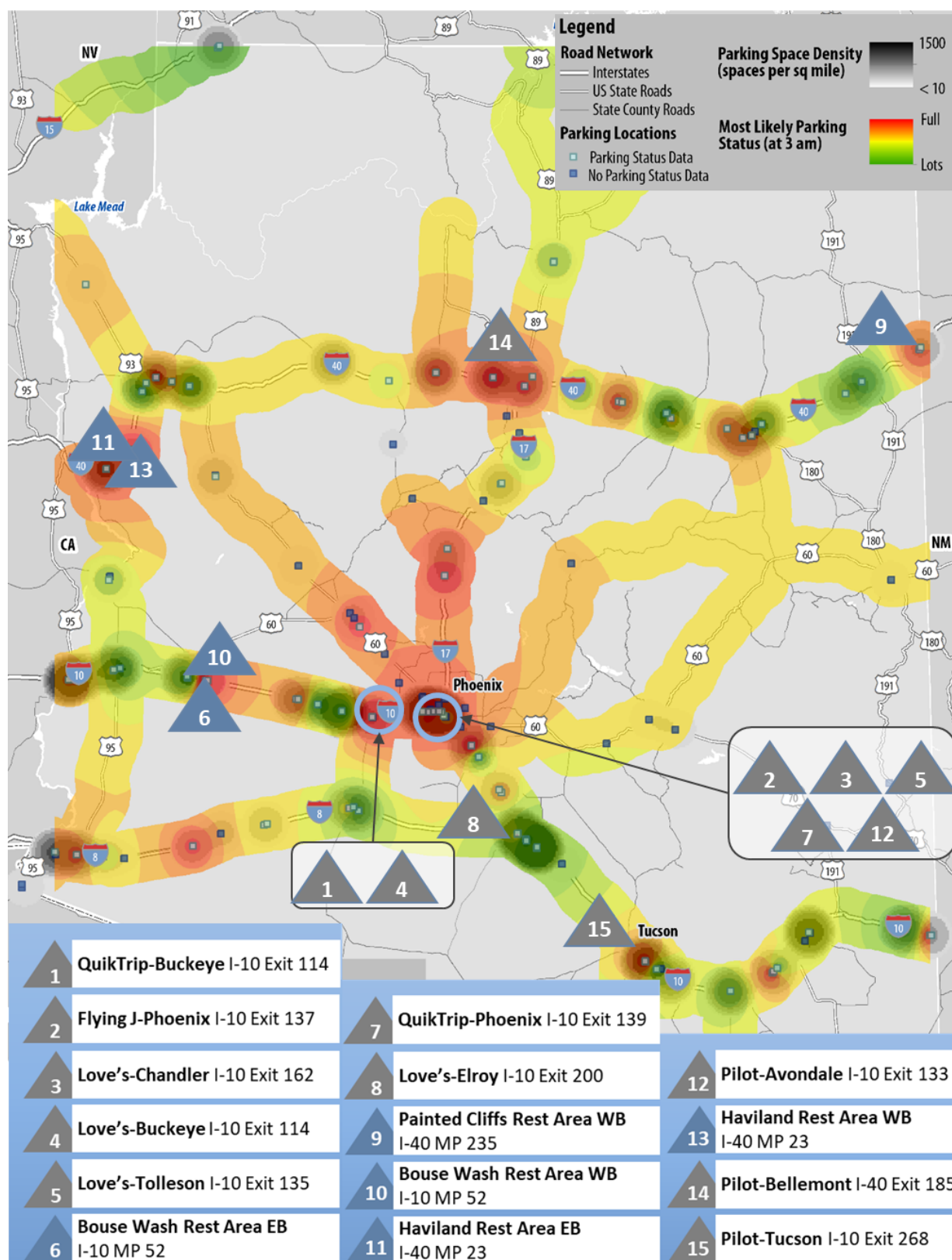


Figure 3-3 displays the truck parking locations with the fifteen heaviest utilization rates from midnight to five am (overnight utilization). Private truck stops are denoted by gray triangles and rest areas are indicated by blue triangle symbols. Figure 3-3 highlights the Phoenix area as the region with the heaviest utilization in Arizona. Maricopa County (the county where Phoenix is located) has seven of the top fifteen truck parking locations with the highest overnight utilization. Outside of Maricopa County, ADOT rest areas make up five of the remaining eight locations with the highest overnight utilization. Specifically, ADOT rest areas at Bouse Wash (Rank 6-eastbound and 10-westbound), Painted Cliffs (Rank 9), and Haviland (Rank 11-eastbound and 13-westbound) are included among the truck parking locations with the highest overnight utilization.

Figure 3-3: Top 15 Truck Stops or Rest Areas by Highest Overnight Utilization Rate

CPCS Solutions for
growing economies

3.3 Undesignated Truck Parking Locations

Truck GPS data from ATRI were used to identify and map the location and total duration of trucks stopping in Arizona during four separate two-week periods in 2017. The project team identified and clustered almost 810,000 stops over a half hour in duration totaling almost five million hours of parking. Clusters of truck parking were validated to identify undesignated truck parking. Undesignated stops are areas where trucks are using on/off ramps, roadway shoulders, or vacant lots for truck parking.

Using the cluster analysis of undesignated truck parking, the project team made the following observations:

- **Undesignated parking near designated truck parking:** Trucks parked around designated truck parking locations, such as the on/off ramps for rest areas.
- **Undesignated truck parking using on/off ramps at interchanges:** Trucks used the on and off ramps at traffic interchanges for truck parking.
- **Undesignated truck parking at gravel lots:** Trucks parked at locations alongside major roadways, as well as lots located near off ramps.
- **Undesignated truck parking at closed or limited access facilities:** Trucks parking at closed rest areas, weigh stations, brake areas, and emergency pull offs, among others. Most of the closed or limited access facilities do not have on or off ramps, making exiting or entering the traffic stream unsafe.

3.3.1 Top 15 Locations of Undesignated Truck Parking

Figure 3-4 displays the top 15 locations of undesignated truck parking based on the number of trucks. Of note, the following undesignated truck parking locations occur at ADOT rest areas:

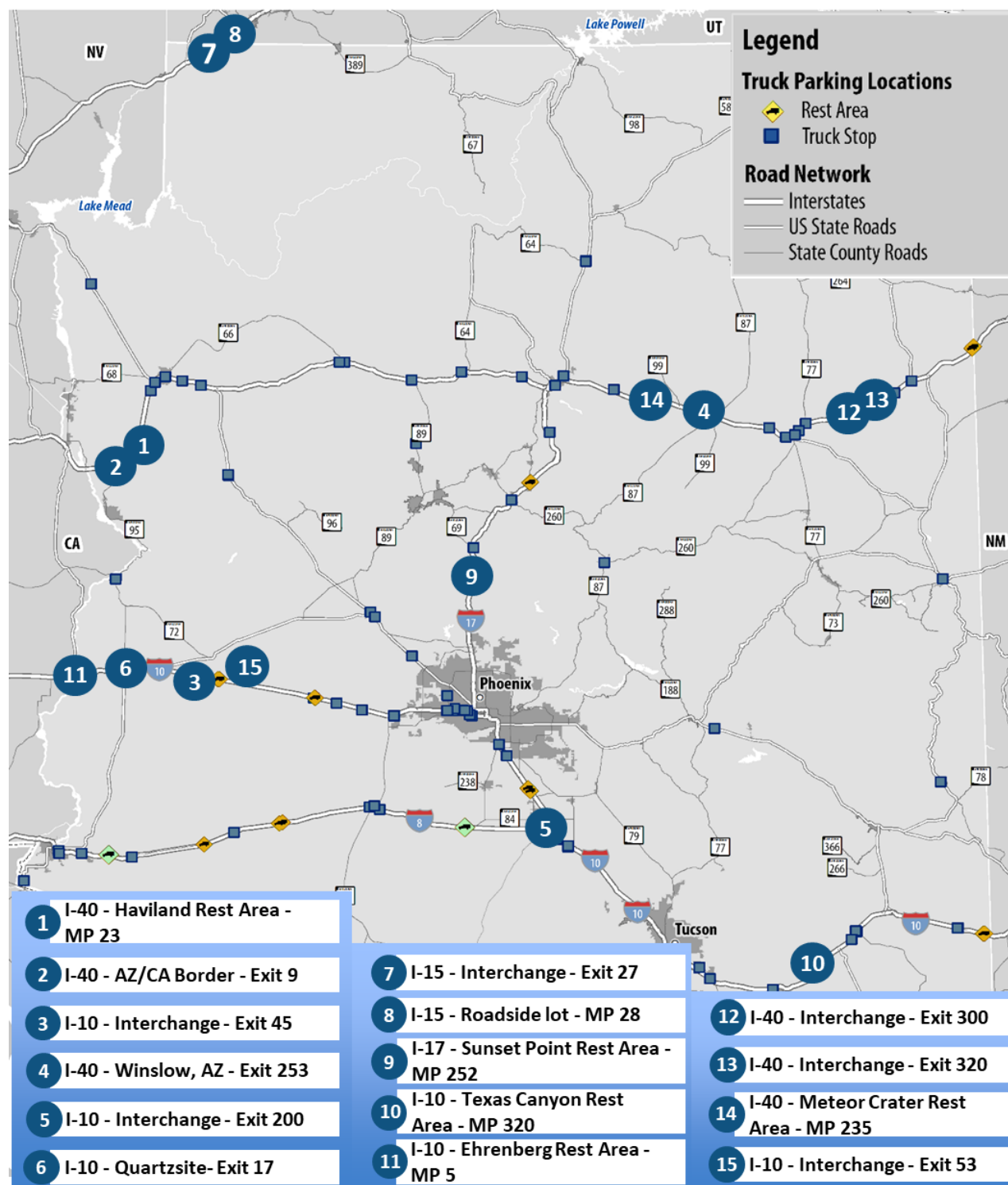
- **Reference #1 Haviland Rest Area:** over 1,000 trucks parked in undesignated areas for over a half hour, 225 of which parked for over eight hours. Most trucks parked along the on/off ramps and in areas not designated for trucks, including the side of I-10.
- **Reference #9 Sunset Point Rest Area:** over 350 trucks parked in the entrance and exit to the rest area, as well as the on/off ramps used to access the Sunset Point Rest Area. About 21 percent of undesignated trucks parked over eight hours.
- **Reference #10 Texas Canyon Rest Area:** almost 340 trucks used the on/off ramps for truck parking during the eight weeks of GPS data. Of the trucks parking in undesignated portions of the rest area, 96 of the trucks parked over eight hours.
- **Reference #11 Ehrenberg Rest Area:** 330 trucks parked in undesignated locations during the eight-week GPS sample, more than half of which were parked longer than eight hours.
- **Reference #14 Meteor Crater Rest Area:** 289 stops were in undesignated locations. About 32 percent of undesignated stops were over eight hours.

While not at an ADOT rest area, reference numbers 3 and 15 represent undesignated truck parking activity at on and off ramps near the Bouse Wash Rest Area. Bouse Wash also had

undesignated truck parking at the rest area, but the magnitude did not reach the top 15 locations.

Figure 3-4: Top 15 Undesignated Truck Parking Locations

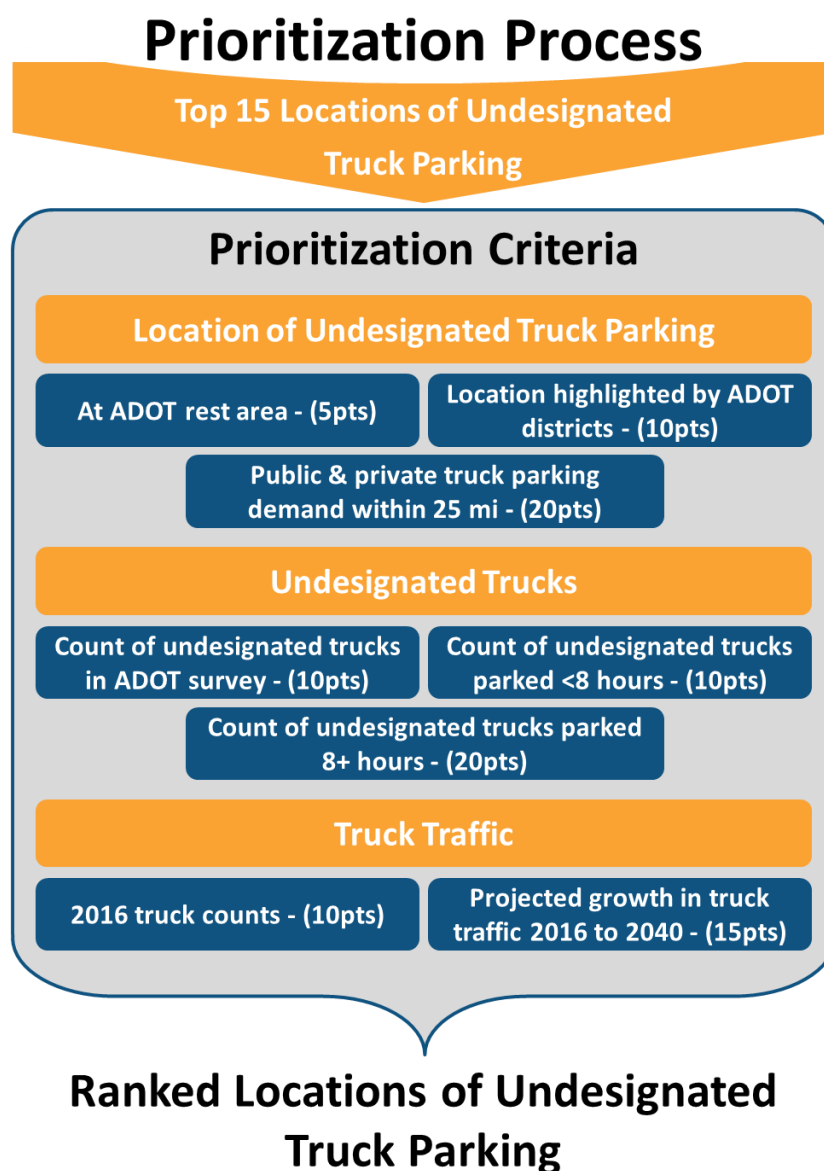
CPCS Solutions for
growing economies



3.4 Prioritizing Truck Parking Locations of Undesignated Truck Parking

Before identifying solutions to truck parking challenges, the top 15 locations of undesignated truck parking were identified and prioritized using the criteria displayed in Figure 3-5. The output of the prioritization process is a ranked list of locations with undesignated truck parking that will help guide where ADOT applies the \$10 million in National Highway Freight Program (NHFP) funding it allocated in the Arizona State Freight Plan to improve truck parking.

Figure 3-5: Truck Parking Prioritization Process



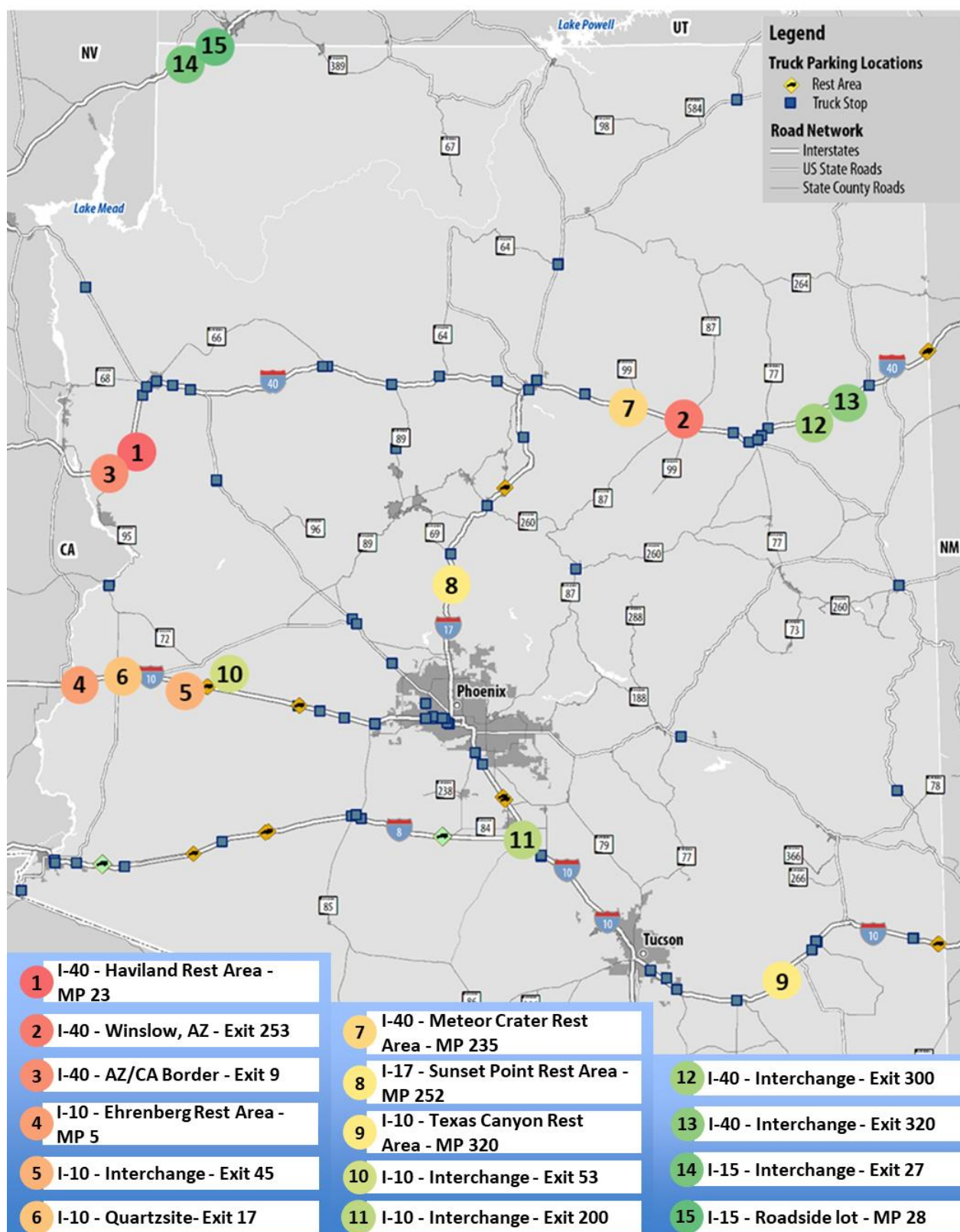
The prioritization process used eight criteria to prioritize undesignated truck parking locations in Arizona. The majority of criteria are scaled between the highest and the lowest value for each criterion. Practically, scaling means the location with the highest value for a specific

criterion receives all potential points and the lowest value receives zero points. Values falling between the lowest and highest values receive points based on their score for the criterion relative to the minimum and the maximum. The following variables and scoring criteria were used to prioritize the top 15 undesignated truck parking locations:

- **Location is at an ADOT rest area:** The location identified occurs at an ADOT rest area
 - **Scoring:** 5 points assigned for locations at ADOT rest areas and zero for all others
- **Mentioned in District outreach:** The location was mentioned in outreach with ADOT districts. Values were assigned based on how the location was identified in district consultations:
 - Not mentioned: 0 points
 - Corridor only: 3 points
 - Corridor and infrastructure type: 5 points
 - Area and infrastructure type: 7 points
 - Specific location: 10 points
- **Demand for truck parking at nearby truck parking locations:** The weighted average, based on the number of spaces, of the overnight utilization for truck parking at locations within 25 miles of each location.
 - **Scoring:** 20 points max scaled based on the utilization within 25 miles of each location
- **Undesignated truck parking identified in ADOT survey:** The number of undesignated trucks parked at ADOT rest areas in ADOT’s March 2017 survey
 - **Scoring:** 10 points max based on the average number of trucks parked along shoulders of rest areas
- **Number of Undesignated trucks parked for less than eight hours:** The count of trucks parked for less than eight hours at each location.
 - **Scoring:** 10 points max scaled based on the number of trucks parked less than eight hours
- **Number of Undesignated trucks parked eight-plus hours:** The count of trucks parked for more than eight hours at each location.
 - **Scoring:** 20 points max scaled value based on the number of trucks parked over eight hours
- **Annual Average Daily Truck Traffic (AADTT)-2016:** The number of trucks traveling on the nearest major roadway adjacent to the location of the truck parking location.
 - **Scoring:** 10 points max value based on the 2016 AADTT
- **Projected AADTT Growth (2016-2040):** The forecasted growth in truck travel on the nearest major roadway adjacent to the location from 2016 to 2040.
 - **Scoring:** 15 points max value based on the projected growth in AADTT from 2016-2040

Figure 3-6 shows the results of the prioritization process for each of the top 15 locations of undesignated truck parking.

Figure 3-6: Top 15 Locations of Undesignated Truck Parking

CPCS Solutions for
growing economies

Following the prioritization process, the project team grouped undesignated truck parking locations geographically. Grouping undesignated truck parking locations geographically provides context and sets the stage to identify solutions that address a lack of capacity or information at all locations. For example, increasing truck parking at one location could reduce undesignated truck parking nearby.

The locations of undesignated truck parking are grouped into the following clusters, which will be used to identify the cause and potential solutions to improve truck parking in each of these areas:

- **I-40 Arizona/California Border:** Locations ranked 1 and 3
- **I-10 Arizona/California Border:** Locations ranked 4, 5, 6, and 10
- **I-40 East of Flagstaff:** Locations ranked 2 and 7
- **I-17 North of Phoenix:** Location ranked 8
- **I-10 at Texas Canyon:** Location ranked 9
- **I-10 Near Casa Grande:** Location ranked 11
- **I-40 East Arizona:** Locations ranked 12 and 13
- **I-15 Arizona/Utah/Nevada Border:** Locations ranked 14 and 15

4 Matching Solutions to Issues and Sequencing

4.1 Identifying Opportunities

The Arizona Truck Parking Study used the data from the prioritization process to identify the cause of undesignated truck parking in a particular geographic areas and potential opportunities. For example, the project team used the utilization of truck stops and rest areas within 25 miles of each ranked undesignated truck parking location to identify whether an information solution could be used to redirect trucks parked in undesignated locations to another parking location.

Figure 4-1 summarizes the clusters of undesignated truck parking locations and synthesizes capacity and information solutions applicable to each cluster. The project team identified the following findings when identifying truck parking opportunities:

- Both information and capacity solutions are needed to address undesignated truck parking and the most appropriate solution to specific undesignated truck parking problems will vary based on the location.
- Available capacity/parking spaces are concentrated at truck stops, but not at rest areas, suggesting an information solution must incorporate truck stops. For example, an information solution could include capacity at a truck stop or signage could be placed to account for the location of truck stops with available capacity.
- There may be locations with potential opportunities for a P3 to expand capacity. While P3s may hold some potential for saving ADOT money in the long-term through reduced operation and maintenance costs, developing these agreements will take time and may or may not be feasible.
- The projects identified Figure 4-1 exceed the \$10 million in NHFP funding allocated to improving truck parking in Arizona.

Using the opportunities identified in Figure 4-1, the project team solicited the following input from the Truck Parking Advisory Group:

- The allocation of funding between capacity and information projects
- The rank of capacity and information projects
- The rank of truck parking policy priorities. Seven responses to the survey were received, three from ADOT stakeholders and four from the trucking industry

On average, the public sector felt capacity and information solutions should each receive half of the funding, whereas the trucking industry indicated 77 percent of funds should be spent on capacity solutions and 23 percent on information solutions. The preferences of the

trucking industry matched the results of a survey of truck drivers conducted during Phase 1 of the Arizona Truck Parking Study, where 79 percent of truck drivers indicated a lack of capacity was the primary cause of truck parking problems in Arizona and 21 percent indicated a lack of information was the primary cause.

When asked to rank specific projects, the survey respondents ranked the projects in the following order:

- 1.) Eastbound Haviland Rest Area - \$2.8m plus the cost of land
- 2.) Eastbound Bouse Wash Rest Area - \$2m
- 3.) TPIMS – \$2m minimum for TPIMS pilot
- 4.) Tie: Westbound Bouse Wash Rest Area – \$1.5m
Tie: Westbound Haviland Rest Area – \$2.8m
- 6.) Eastbound Meteor Crater Rest Area – \$1.5m
- 7.) Westbound Meteor Crater Rest Area – \$1.5m

When asked about specific policies to advance, the survey respondents ranked the policies in the following order:

- 1.) Integrate Truck Parking Information into Arizona 511
- 2.) Formalize Table Tops and Brake Check Areas
- 3.) Develop Wyoming-Style “Truck Turnouts” or Truck Parking only Locations along Major Freight Corridors
- 4.) Update ADOT Rest Areas Map and Develop Truck Parking Version
- 5.) Develop Nebraska-Style Truck Parking Areas using Interchange Right-of-Way

The implementation plan presented in section 4.2, incorporates the findings of the prioritization process and the survey of the Truck Parking Advisory Group, in conjunction with project readiness to develop an actionable set of truck parking solutions.

Figure 4-1: Truck Parking Expansion and Information Opportunities in Arizona

Rank	Location (Milepost)	Truck Parking Spaces within 25mi (Number of Spaces)	Expansion Opportunities	Information Solutions
I-40 Arizona/California Border				
1	Haviland Rest Area Ramps: I-40 (MP 23)	360+ spaces at 6 locations. Truck stops at exits 9, 44, and 48. Availability at:	Haviland Rest Area (MP 23): Expansion Opportunity (14 to 44 Spaces) <ul style="list-style-type: none">Eastbound: 7 existing truck parking spaces and opportunity for:<ul style="list-style-type: none">15 additional spaces (22 total) - \$2.8m (~\$195k/space + land)Westbound: 7 existing truck parking spaces and opportunity for:<ul style="list-style-type: none">15 additional spaces (22 total) - \$2.8m (~\$195k/space)	Interstate Oasis Program with nearby truck stops.
3	I-40 Exit 9: Ramps & Vacant Lot	<ul style="list-style-type: none">Exit 44: Crazy Fred's Truck Stop (50)Exit 48: TA (115)-limited availability		TPIMS at Haviland Rest Area.
I-10 Arizona/California Border				
4	Ehrenberg Rest Area Ramps: I-10 (MP 5)	800+ spaces at 11 locations. Truck stops at exits 1, 5, 17 19, and 45. Availability at: <ul style="list-style-type: none">Exit 5: Sunmart (100)Exit 19: Arco Truck Stop (25)Exit 45: Pride Travel Stop (150)Exit 45: Zip Travel Center (20)	Ehrenberg Rest Area (MP 5): Unsuitable for Expansion <ul style="list-style-type: none">Land surrounding the rest area is unsuitable for expansion Bouse Wash Rest Area (MP 53): Expansion Opportunity (24 to 36/47 Spaces) <ul style="list-style-type: none">Eastbound: 12 existing truck parking spaces and opportunity for:<ul style="list-style-type: none">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:<ul style="list-style-type: none">6 spaces (18 total) without ramp realignment (funded 2020)10 spaces (22 total) with ramp realignment - \$1.5m (~\$375k/space) Exit 17: Facilitate discussion and provide data for the consideration of a new TA truck stop in Quartzsite (NATSO highlighted a members interest in developing a truck stop in Quartzsite) Exit 45: Explore the use of a construction staging area within the interchange as a parking only location	Interstate Oasis Program with nearby truck stops. TPIMS at Ehrenberg and Bouse Wash Rest Areas.
5	I-10 Exit 45: Ramps & Vacant Lot			
6	I-10 Exit 17: Ramps near Quartzsite			
10	I-10 Exit 53: Ramps & Vacant Lot			
I-40 East of Flagstaff				
2	I-40 Exit 253: Parking in Vacant Lots in Winslow	310+ spaces at 5 locations. Limited availability at nearby truck parking locations.	Meteor Crater Rest Area (MP 235): Formalize Overflow (30 spaces) <ul style="list-style-type: none">Meteor Crater Eastbound and Westbound have overflow lots that are currently covered with millings and are unmarked<ul style="list-style-type: none">Pave and stripe the overflow lots formalizing 15 spaces on each side - \$3m (~\$100k/space) Exit 253: Facilitate discussion and provide data about the redevelopment of a vacant truck stop in Winslow	Limited availability of truck parking within the area limits the opportunity for an information solution
7	Meteor Crater Rest Area Ramps: I-40 (MP 235)			

I-17 North of Phoenix				
8	Sunset Point Rest Area Ramps: I-17 (MP 252)	Almost 60 spaces at 2 locations. Limited availability at nearby truck parking locations.	Sunset Point Rest Area (MP 252): Unsuitable for Expansion <ul style="list-style-type: none"> Land surrounding the rest area is unsuitable for expansion Facilitate discussion and provide data for private truck stop (NATSO highlighted a members interest in developing a truck stop on I-17) 	Limited truck parking availability nearby limits the opportunity for an information solution
I-10 at Texas Canyon				
9	Texas Canyon Rest Area Ramps: I-10 (MP 320)	410+ spaces at 5 locations. Truck stops at exits 302, 322, and 340. Availability at: <ul style="list-style-type: none"> Exit 322: Shell (20) Exit 302: Loves (125) 	Texas Canyon Rest Area (MP 320): Unsuitable for Expansion <ul style="list-style-type: none"> Land surrounding the rest area is unsuitable for expansion Facilitate discussion and provide data for private truck stop (NATSO highlighted a members interest in developing a truck stop on I-10 west of Tucson) 	Interstate Oasis Program with nearby truck stops. TPIMS at Texas Canyon Rest Area.
I-10 Near Casa Grande				
11	I-10 Exit 200: On/Off Ramps Near Casa Grande	1,040+ spaces at 9 locations. Truck stops at exits 200, 203, and 208. Availability at: <ul style="list-style-type: none"> Exit 200: Pride (50) & Petro (175) Exit 203: TA (234) & Circle K (25) Exit 208: Flying J (350) & Pilot (145) 	Sacaton Rest Area (MP 182): Expansion Opportunity (32 to 49 spaces) <ul style="list-style-type: none"> 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	Interstate Oasis Program with nearby truck stops.
I-40 East Arizona				
12	I-40 Exit 300: Ramps	390+ spaces at 5 locations. Truck stops at exits 277, 283, 292, 325, and 333. Availability at: <ul style="list-style-type: none"> Exit 292: Hopi Travel Center (150) Exit 325: Navajo Travel Center (60) Exit 333: Mobil (50) 	No ADOT rest areas within 25 miles of Exit 300 and 320	Interstate Oasis Program with nearby truck stops.
13	I-40 Exit 320: Ramps			

I-15 Arizona/Utah Border				
14	I-15 Exit 27: Ramps & Vacant Lot	There are no truck parking locations on I-15 in Arizona.	ADOT could formalize roadside truck parking that occurs at milepost 28 (Westbound on I-15) Additional study would be required to assess the right-of-way and identify the cost of developing a parking only location	Work with Nevada and Utah to inform drivers about truck parking locations on I-15 near the Arizona border, such as notifying truck drivers that no truck services or parking are available on I-15 in Arizona
15	I-15 (MP 28): Roadside Gravel Lot			

4.2 Implementation Plan

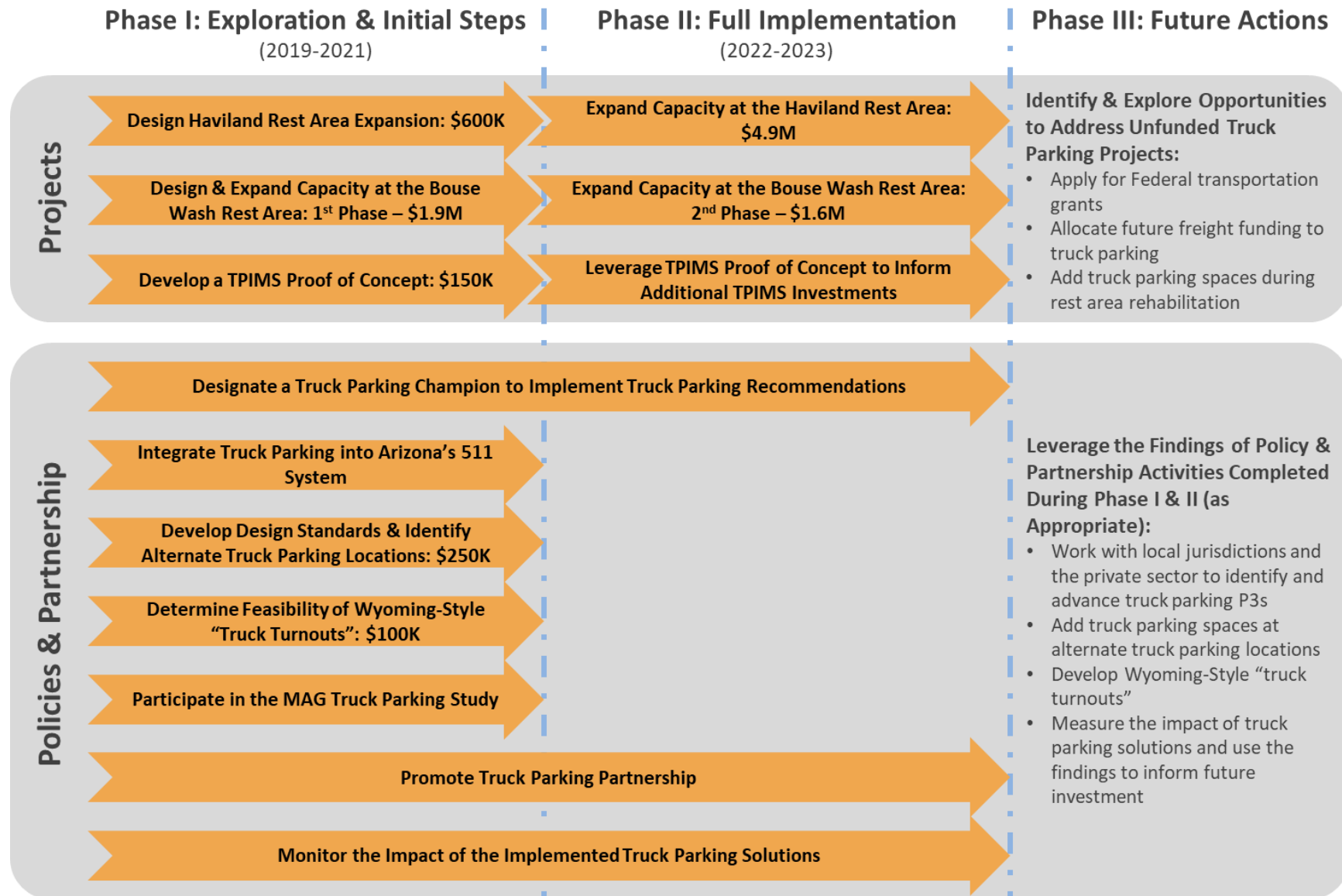
The implementation plan was developed using input from the Truck Parking Advisory Group, project readiness, and the prioritization process. Input from the Truck Parking Advisory Group and truck drivers indicated a preference for capacity solutions and the projects selected in the implementation plan reflect this priority in combination with a strategic project focusing on an information solution.

An additional consideration for the implementation plan was project readiness, which focused on matching the implementation timeline of truck parking solutions with the statutory requirement to spend the NHFP funds by 2023 (approximately \$3 million allocated in 2020 and \$7 million allocated in 2022). The resulting implementation plan is structured using three phases:

- **Phase I: Exploration and Initial Steps** – Phase I will quickly begin implementation where projects and policies allow and to set the stage for Phase II: Full Implementation. Phase I coincides with the 2020 allocation of \$3 million in NHFP funding.
- **Phase II: Full Implementation** – Using the findings from Phase I, ADOT will continue implementation of truck parking projects and policies. Phase II coincides with the allocation of \$7 million in NHFP funding.
- **Phase III: Future Actions** – Using the information, performance measures, and opportunities identified in Phase I and II, ADOT should explore opportunities to address locations of undesignated truck parking that exceeded the NHFP funding currently allocated to truck parking. Phase III is associated with long-term activities that would require funding beyond what has been allocated by the NHFP.

Phasing the implementation plan will allow ADOT to make incremental improvements to truck parking while developing projects, implementing policies, and soliciting private sector interest in partnership. Figure 4-2 is a synthesis of the implementation plan's three phases and the associated projects and policies that will be completed during each phase. Phases I and II allocate \$9.5 million of the \$10 million in NHFP funds. The remaining \$500,000 in funding is expected to be available as a contingency or to acquire land needed at Haviland, cover additional costs identified in the project design phase, and/or monitor project outcomes.

Figure 4-2: Arizona Truck Parking Implementation Plan



Note: \$9.5 million of the \$10 million in NHFP funding is allocated above. The remaining \$500,000 in funding is expected to be available as a contingency or to acquire land needed at Haviland, cover additional costs identified in the project design phase, and/or monitor project outcomes

4.2.1 Phase I: Exploration and Initial Steps

Phase I: Exploration and Initial Steps utilizes up to \$3 million in NHFP funding to advance truck parking projects and policies in advance of Phase II funding. The following policies and projects are included in Phase I:

Policies

- **Designate a truck parking champion:** The champion will be the primary leader and point of contact for the implementation plan.
- **Participate in the Maricopa Association of Governments (MAG) truck parking study:** The MAG truck parking study focuses specifically on urban truck parking needs, which was outside of the scope of this study. Therefore, ADOT should participate in the MAG truck parking study to foster collaboration on truck parking issues and solutions in the Phoenix region.
- **Integrate truck parking information into Arizona's 511 system:** Integrating truck parking in Arizona's 511 system will improve access to truck parking information online and over the phone.
- **Develop design standards and identify alternate truck parking locations:** The Arizona Truck Parking Study identified an opportunity to upgrade roadside table tops, brake check areas, and safety pullouts to provide parking only locations (no amenities), where feasible and safe. Developing design standards and potential locations to upgrade will position ADOT to make future improvements, potentially adding parking-only truck parking spaces. Explore the potential for an "adopt-a-highway" approach for private entities to adopt roadside parking areas for trash pick-up and potentially for partial amenities – \$250,000.
- **Determine feasibility of Wyoming-Style "Truck Turnouts":** Determine if developing new Wyoming-Style Truck Turnouts is possible in Arizona and identify safe locations along major freight corridors (long and flat sections on I-8, I-10, and I-40) – \$100,000.
- **Monitor the impact of implementation:** Monitor truck parking as solutions are implemented, such as conducting industry outreach to identify new and emerging truck parking issues or establish annual performance measures to assess changes to truck parking.
- **Promote truck parking partnership:** Assist public and private stakeholders, as appropriate and allowed under law, to assess the construction and expansion of truck stops by supporting cities and local governments with data and guidance to advance opportunities for P3s and to inform cities and local governments about truck parking.

Projects

- **Design the Haviland Rest Area expansion:** Undertake design and explore the acquisition of land for the expansion of truck parking at the eastbound and westbound Haviland Rest Areas – \$600,000.
 - Expanding both sides of the Haviland Rest Area has a planning level cost of \$5.5 million (design and construction) plus the cost of land for the eastbound expansion.

- **Design and expand capacity at the Bouse Wash Rest Area:** Undertake design for ramp realignment and truck parking expansion of the eastbound and westbound Bouse Wash Rest Areas. Expand truck parking spaces at the eastbound (priority) or westbound side of the Bouse Wash Rest Area, as project timelines and funding allow – \$1.9 million.
 - Bouse Wash is scheduled for rehabilitation in 2020. As timing and funding allow, ADOT will leverage the scheduled rehabilitation project to develop the design and add truck parking spaces. The remaining truck parking spaces will be funded in 2022 during Phase II. Expanding both sides of the Bouse Wash Rest Area has a planning level cost of \$3.5 million (design and construction).
- **Develop a TPIMS Proof of Concept:** A TPIMS proof of concept will compare and assess the pros and cons of the various technologies used to implement a TPIMS, positioning ADOT to implement a TPIMS in the future – \$150,000.

The projects identified in Phase I address clusters of undesignated truck parking at the I-40 Arizona/California Border (locations ranked 1st and 3rd) and I-10 Arizona/California Border (locations ranked 4th, 5th, 6th, and 10th). Additionally, the policies implemented in Phase I will form the basis for ADOT to explore projects throughout the state during Phase II and Phase III.

4.2.2 Phase II: Full Implementation

Using \$7 million in funding allocated in 2022, Phase II continues the projects initiated during Phase I, namely expanding the Bouse Wash Rest Areas and Haviland Rest Areas, as well as, continuing to advance truck parking policies and partnerships.

Policies

- **Continue the work of the truck parking champion:** The champion will be the primary leader and point of contact for the implementation plan.
- **Continue to monitor the impact of implementation:** Continue to monitor truck parking as solutions are implemented and incorporate findings into the implementation plan.

Projects

- **Expand capacity at the Haviland Rest Area:** Phase II supplements the \$600,000 allocated in 2020 for design to complete the Haviland expansion – \$4.9 million.
- **Expand capacity at the Bouse Wash Rest Area:** Phase II supplements the \$1.9 million allocated to design and expand eastbound and westbound Bouse Wash Rest Areas in 2020 to complete the expansion – \$1.6 million.
- **Leverage TPIMS proof of concept:** Use the findings of the TPIMS proof of concept to identify additional sources of funding, such as State funding or Federal Grants, for implementing a TPIMS on a corridor or statewide basis.
- **Promote truck parking partnership:** Continue to assist public and private stakeholders, as appropriate and allowed under law, to assess the construction and expansion of truck stops by supporting cities and local governments with data and guidance to advance opportunities for P3s and to inform cities and local governments about truck parking.

Phases I and II allocate \$9.5 million of the \$10 million in NHFP funds and positions ADOT to advance truck parking in the future, as resources are available.

4.2.3 Phase III: Future Actions

Phase III: Future Actions leverages the findings of Phases I and II to identify and explore opportunities to address locations of undesignated truck parking that exceeded the NHFP funding currently allocated to truck parking. Therefore, Phase III activities could run concurrently with Phases I and II, depending on funding availability and the results of implementation, such as promoting truck parking partnership.

An example of potential future actions includes ADOT working with cities, local governments, truck stop operators, and industry associations such as NATSO to identify and advance P3s, as appropriate and legally feasible. Specific locations highlighted by NATSO and the project team include US 93 Northwest of Phoenix, I-10 West of Phoenix, I-10 West of Tucson, and I-17 North of Phoenix. Similarly, Quartzsite and Winslow both had truck stops interested in establishing a truck parking location. The results of ADOT's outreach in Phases I and II will identify next steps and ADOT's role, in the development of new and expanded truck stops in the future.

Similarly, the output of the Phase I policy that develops design standards and identifies alternate truck parking locations may position ADOT to provide parking only locations at roadside table tops, brake check areas, safety pullouts, and Wyoming-Style "Truck Turnouts," where feasible and safe. Specifically, ADOT could allocate funding to upgrade roadside table tops, brake check areas, and safety pullouts or develop Wyoming-Style "Truck Turnouts" independent of or in conjunction with projects on the roadways adjacent to these locations.

ADOT's TPIMS proof of concept is another source of Phase III implementation actions. Specifically, ADOT should examine its overall grants strategy and determine the levels of priority of possible truck parking related grant pursuits. If truck parking rises to a high enough priority level, ADOT could consider continuing to apply for grants to expand the TPIMS to additional locations, as appropriate. ADOT should implement sensors at rest stops where the data could warn truck drivers to stop early. Maps and data developed during the Arizona Truck Parking Study should guide the prioritization of static or dynamic signs.

Similarly, monitoring the impacts of implemented truck parking solutions in Phases I and II will provide ADOT with lessons learned and best practices to inform future project selection and design.

5 Conclusion

5.1 Project Summary

The Arizona Truck Parking Study provides ADOT with actionable short-term solutions to improve truck parking statewide and positions the state to identify and advance truck parking policies and projects in the future. Specifically, the Arizona Truck Parking Study identifies projects that expand truck parking capacity in the short-term and lays the groundwork for future truck parking projects through exploratory analysis and pilot projects.

The findings of the Arizona Truck Parking Study demonstrate that truck parking needs, opportunities, and solutions vary by location and may include capacity expansion, information solutions, policies, and/or partnership. The Arizona Truck Parking Study provides the Department with the data, opportunities, and potential solutions to improve truck parking in the near-term and in the future.

Perhaps most importantly, ADOT will continue to value and maintain the partnerships with public and private stakeholders that were so fundamental to the success of this study. We will achieve our greatest success together.