Arizona Statewide Truck Parking Plan

Working Paper 2

Truck Parking Implementation Plan

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Acronyms/Abbreviations

AADT	annual average daily traffic
AADTT	annual average daily truck traffic
ADOT	Arizona Department of Transportation
ATA	Arizona Trucking Association
ATRI	American Transportation Research Institute
BCA	Benefit-Cost Analysis
CMV	commercial motor vehicle
DMS	dynamic messaging sign
EB	eastbound
ELD	electronic logging device
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
GPS	global positioning system
HOS	Hours of Service
INDOT	Indiana Department of Transportation
NB	northbound
NDOT	Nebraska Department of Transportation
NHFP	National Highway Freight Program
NHS	National Highway System
O&M	operations and maintenance
ROW	right-of-way
SB	southbound
TI	Traffic Interchange
TAC	Technical Advisory Committee
TPA	Truck Parking Assessment
TPAS	Truck Parking Availability System
TPIMS	Truck Parking Information System
TxDOT	Texas Department of Transportation
VMT	Vehicle miles traveled
VHT	Vehicle hours of travel
WB	westbound
WIM	weigh-in-motion
WYDOT	Wyoming Department of Transportation

1 Introduction

The lack of safe and accessible parking spaces for commercial trucks not only poses significant safety risks but also leads to inefficiencies, increased operational costs, and driver fatigue. Working Paper 1: *Existing Conditions Analysis*, summarized the findings from undesignated parking analysis, utilization of existing parking spaces, and safety related to parked trucks and fatigued drivers.

This paper, Working Paper 2: *Truck Parking Implementation Plan*, presents a systematic approach to identifying solutions for truck parking, establishing a prioritization framework for their implementation, conducting a thorough benefit-cost analysis, and ultimately ranking these improvements based on a rigorous evaluation process.

This paper is organized as follows:

Section 2 outlines summary findings of truck parking solutions that may help the trucking community navigate to safe and secure truck parking throughout the state. These truck parking solutions were discussed in detail in Working Paper 1: *Existing Conditions Analysis* and have been categorized into infrastructure improvements, technology strategies, and policy considerations. A thorough review of peer state truck parking solutions and emerging trends was conducted to determine the possible strategies for increased truck parking capacity and improved truck driver safety.

Section 3 discusses the potential truck parking opportunities at various locations across the state. The truck parking opportunities were determined based on the undesignated truck parking analysis, described in Working Paper 1: *Existing Conditions Analysis*. Areas near large clusters of undesignated parking were evaluated for feasibility of truck parking expansion. Criteria for expansion opportunities included right-of-way availability, constructability, terrain conditions, and cost-effective connectivity options to the freeway mainline system. Initial screening determined if improvements were feasible at nearby rest area locations, and if determined to be infeasible, options for Safe lots were identified. Safe lots are cost-effective alternatives to typical rest areas.

Section 4 includes a discussion on the prioritization framework, benefit-cost analysis and ranking of different sites for implementation.

2 Truck Parking Solutions

Table 2-1 provides the different solutions as a toolbox aimed at improving truck parking in the state. The solutions are categorized into infrastructure improvements, technology solutions, and policy considerations. Table 2-1 also lists benefits and disadvantages of each category of solutions. Detailed descriptions of the solutions follow the table.

Table 2-1. Truck Parking Solutions Toolbox

Category	Location	Tools	Benefits	Challenges
Infrastructure	Existing rest areas	Expand parking within rest area footprint, improve amenities	Faster implementation, standard amenities already available, maintain current O&M	Limited expansion opportunities/Unmet parking demand
	Safe truck-only parking areas	Creative use of ROW, cost-effective solutions (alternate pavement materials, solar LED lights, large dumpsters, vaulted toilets)	Parking needs satisfied, stretch the available budget to meet needs at multiple locations	Need to develop ramp connections, guide signs, higher/newer O&M needs, some security concerns
	Private truck stops	Build new or expand current private stops	Low state investment	Needs coordination with private entities
Technology	Various	TPAS, TPIMS, DMS, Apps, and more	Optimal usage of existing spaces, may reduce uncertainty for truck drivers	Unmet parking demand, new investments in technology
Policy	Various	Public-private partnerships, competitive local grant programs, sponsorship of publicly owned facilities, enforcement, coalitions with neighboring states	Low investment needs, potential to reduce parking needs	Potentially slow to materialize

LED = light-emitting diode; O&M = operations and maintenance

2.1 Infrastructure Solutions

2.1.1 New Spaces at Existing Rest Area Sites

Improving the infrastructure for truck parking is essential to provide more efficient and safe operation for the trucking industry. One solution to address this challenge is the addition of new spaces at existing rest areas. Rest areas are often overcrowded, leading to issues with congestion and limited parking availability. By expanding these existing facilities, more spaces can be created to accommodate the growing number of trucks on the road. One advantage of adding additional spaces at existing rest areas is that standard amenities are readily available. Moreover, creating new spaces at existing rest area facilities results in minimal increase in O&M expenses. However, it is important to note that meeting the parking demand within the existing ROW is not possible at many rest areas. New ROW acquisition will be needed before adding truck spaces. Additionally, it is crucial to strategically plan parking expansion along a corridor at multiple sites to provide a balance between parking availability and HOS duration.

2.1.2 Safe Truck Parking Lots

Another cost-effective approach is to develop alternate sites with basic amenities specifically designed for truck parking. These sites can be strategically located along major transportation routes, offering a convenient and affordable option for truckers. By keeping the amenities basic but essential, costs can be minimized while still providing drivers with necessities like well-lit parking areas, restrooms, and security features to ensure their safety. These alternate sites can alleviate the pressure on rest areas and truck stops, reducing congestion and enhancing the overall experience for truck drivers.

Safe lots will be developed as cost-effective solutions allowing the state to provide more parking at a lower overall cost. Some cost-effective options include:

1. Use of alternate pavement materials: Several pavement materials were considered for parking lot facilities, including gravel, asphalt, concrete, permeable polymer-grid with gravel in-fill, soil cement, and roller-compacted concrete. Opting for gravel as a pavement material would lead to quicker implementation, but it comes with challenges such as susceptibility to shifting under the weight of trucks and difficulty in maintenance. Moreover, using gravel makes it impossible to delineate parking spaces. Although asphalt and concrete pavements avoid the drawbacks associated with gravel, they are comparatively expensive to construct. The ultimate decision on the choice of pavement material will be influenced by factors such as implementation feasibility, longevity, and maintenance requirements in diverse weather conditions. ADOT will conduct a thorough evaluation of these aspects before proceeding with implementation.
2. Waterless vaulted toilet facilities: Waterless vaulted toilet facilities offer a cost-effective alternative to traditional restroom facilities at truck stops. These facilities are designed with simplicity and efficiency in mind, typically consisting of a basic, odor-resistant structure built over a large underground vault to contain waste. Because they do not require a connection to sewage systems or extensive plumbing with running water, they can be installed at locations where running water is not accessible. As a result, the construction and maintenance costs of vault toilets are significantly

lower compared to conventional restrooms. This makes them an adequate choice at safe lots where budgets are limited. Despite their economical construction, vault toilets still provide essential restroom services, promoting sanitation and hygiene for visitors, and their design minimizes environmental impact while offering a sustainable and budget-friendly solution for maintaining public areas. Truck parking guidance from FHWA states that vault toilet systems at truck-only stops will need to be maintained and waste pumped out once a month, keeping the O&M expenses on the low end.

3. Solar on-demand LED lighting systems: Solar on-demand LED lighting systems have proven to be remarkably effective in remote areas without power line connectivity. These systems harness solar energy to generate clean and sustainable energy, making them an ideal solution for off-grid locations. By storing solar energy in batteries, these systems can provide reliable lighting during the night, enhancing safety and security in areas that would otherwise remain dark. Moreover, LED technology ensures energy efficiency and a longer lifespan for the lighting units, reducing the need for frequent maintenance or replacements. This not only contributes to cost savings but also minimizes the environmental impact. The adaptability and self-sufficiency of solar on-demand LED lighting systems make them a vital tool in bringing essential illumination to safe lots, improving their safety and security.
4. Large trash dumpsters for trash collection: Large dumpsters for trash collection in truck-only safe lots provide adequate capacity and cost efficiency. Their ability to hold a significant volume of waste reduces the frequency of emptying, lowering overall collection and disposal costs. These dumpsters streamline the collection process, maintain cleanliness by preventing litter and overflow, and accommodate various types of waste. They are also durable and built to withstand environmental conditions, reducing the need for frequent maintenance and replacement. While the initial cost may be higher, the long-term cost savings and effectiveness make large dumpsters a practical choice for managing waste in safe lot areas.

While safe lots can be developed using alternate pavement materials and cost-effective amenities, the ramp connections to the freeway mainline must be developed using traditional materials and designed to federal and state standards. To reduce the overall financial burden on the state, the costs associated with O&M of the safe lots may be shared with the trucking industry.

2.1.3 Private Truck Stops

Privately operated truck stops have become an integral part of the logistics and transportation industry, offering various advantages to public agencies when promoted and managed effectively. First, private truck stops can alleviate the financial burden on public agencies, as they are funded and operated by private entities, reducing the need for public investment in infrastructure development and maintenance. Furthermore, these facilities often provide truckers with a wider range of services, including restaurants, lodging, and maintenance shops, enhancing the overall quality of rest areas for drivers. This, in turn, contributes to improved safety and convenience on the roads. By promoting the expansion and operation of private truck stops, public agencies can optimize the use of available resources, increase economic activity,

and better cater to the needs of the trucking community while relieving some of the financial pressures associated with maintaining public rest areas and truck parking facilities.

2.2 Technology Strategies

In addition to creating new spaces and cost-effective alternate sites, leveraging technology can further optimize truck parking infrastructure. Implementing real-time parking availability systems or apps can provide truckers with real-time information about truck parking availability at various locations, allowing them to plan their stops more efficiently. It is important to note the technology solutions to truck parking will not increase the underlying capacity but will allow for the efficient use of existing parking spaces. ADOT will implement TPAS along I-10 in 2024. The I-10 TPAS will monitor parking availability at four rest area locations: Ehrenberg, Bouse Wash, Texas Canyon, and San Simon. ADOT's 511 system displays rest area status and number of overall spaces available for truck parking. There are several privately developed and maintained apps that provide information on truck parking availability at public and private truck stops; some apps even include the provision of reserving a spot at a specific location.

Figure 2-1. TPAS Implementation

Although technology solutions hold the potential for maximizing the use of current parking facilities, a concrete proof of concept has not yet been established.

2.3 Policy Considerations

2.3.1 Multi-Agency Collaboration

Collaboration between government agencies, private businesses, and industry stakeholders is essential in developing comprehensive solutions for truck parking infrastructure, ensuring that it meets the evolving needs of the trucking industry and enhances safety and efficiency on the road. One key benefit of such collaboration is the pooling of resources. By partnering with neighboring states, regional organizations, and private businesses, states can share the costs of infrastructure development, maintenance, and security, making it more cost effective to provide adequate truck parking. This not only conserves state resources but also promotes a more comprehensive and efficient network of truck parking facilities.

Close coordination with the Maricopa Association of Governments and the Pima Association of Governments will allow ADOT to develop and streamline solutions for truck parking in the Phoenix and Tucson metro areas. Developing adequate solutions in these two metro areas is vital to improving first-mile and last-mile truck parking needs in the state.

2.3.2 Prioritization Method Adjustments

ADOT also could refine the performance metrics outlined in the *State Freight Plan*[1] to reflect the adverse consequences resulting from inadequate truck parking and the advantages related to safety, economic viability, and infrastructure maintenance when adequate parking infrastructure is in place. This adjustment would enhance the competitiveness of truck parking projects when seeking funding against other infrastructure improvement projects.

2.3.3 Public Private Partnerships

Because of federal regulations on commercial activity within the interstate ROW, the use of a P3 mechanism to improve truck parking infrastructure will be limited to urban areas. ADOT can explore P3 opportunities in which private entities develop new truck parking facilities and collect a fee from users for an agreed upon time prior to transferring the facility to the state.

2.4 Truck Parking Solutions Considered

Among the various parking solutions mentioned previously, this study exclusively focused on exploring infrastructure improvements at existing rest areas and safe lots as viable options for enhancing truck parking facilities. While technology and policy-based strategies certainly have the potential to improve truck parking, they tend to have longer implementation timelines and may not fully address the immediate and substantial demand for truck parking on Arizona's extensive interstate system.

Infrastructure enhancements at existing rest areas and designated safe lots present a pragmatic approach. By expanding and modernizing rest areas and providing alternate safe lots, the state can swiftly alleviate some of the parking constraints faced by truckers while simultaneously enhancing the overall driver experience. These improvements encompass adding new parking spaces and updating amenities; Arizona can immediately contribute to safety, driver well-being, and operational efficiency by following through on this strategy, recognizing the immediate challenges that truck drivers face. While technology and policy-based solutions should remain under consideration for the future, infrastructure improvements provide a more tangible and expeditious response to the pressing truck parking needs along the state's vast interstate network.

[1] ADOT Freight Plan Final (azdot.gov)

3 Parking Opportunities

Undesignated parking analysis was conducted across the state to identify major clusters of undesignated truck parking due to parking deficiencies. Undesignated truck parking clusters were a determining factor for the selection of proposed parking expansion sites. Figure 3-1 and Table 3-1 show the top areas of undesignated truck parking across the state. ADOT ROW availability was assessed along the major corridors where the undesignated parking incidents were recorded. Proposed sites were identified within the existing ROW for parking expansion to meet the parking needs.

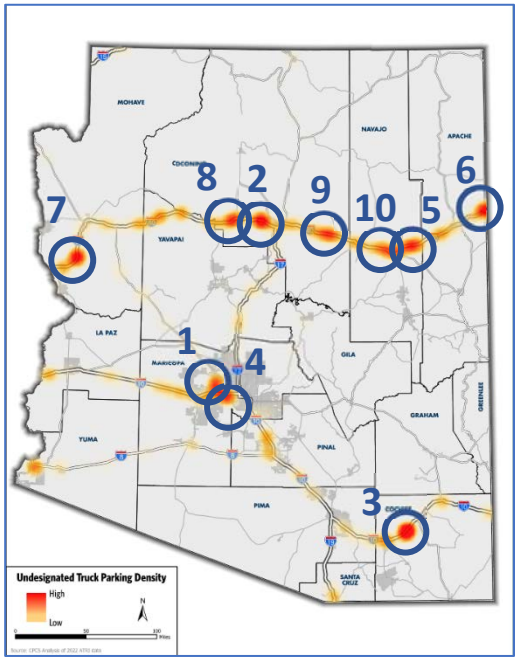

Figure 3-1. Top 10 Undesignated Parking Cluster Locations

Table 3-1. Top 10 Undesignated Parking Cluster Locations

Undesignated Parking Ranking	2022 Cluster Locations
1	I-10 MP 120, last mile west of Phoenix
2	I-40 MP 185, Parks Rest Area on-/off-ramps
3	I-10 MP 320, Texas Canyon Rest Area on-/off-ramps
4	I-10 MP 130, last mile west of Phoenix
5	I-40 MP 285, west of Holbrook
6	I-40 MP 356, west of Painted Cliffs Rest Area
7	I-40 MP 22, Haviland Rest Area on-/ off-ramps
8	I-40 MP 160, on-/off-ramp west of Flagstaff
9	Meteor Crater Rest Area at I-40 MP 236
10	I-40 MP 270, on-/off-ramp west of Winslow

Table 3-1 shows multiple undesignated parking clusters along I-40 and some along I-10. The intensity of undesignated parking was observed to be higher along I-40 (east of Flagstaff), I-10 (west of Phoenix), and I-10 (east of Tucson). While areas of parking deficiencies were observed near Haviland, Parks, Christensen, McGuireville, and Sunset Point Rest Areas, the truck parking expansions for these rest areas are part of an ongoing design-build project.

ADOT has ROW near major undesignated. This makes many options to expand parking viable. Parking expansion opportunities include existing rest areas and safe lots. Amenities such as restrooms, trash receptacles, and lighting are available at existing rest area locations, but new safe lot locations would require installation of amenities and may include solar-powered LED lighting, trash receptacles, and waterless vaulted toilets. The safe lot parking locations are designated for truck parking only, while the rest areas may serve all travelers.

3.1 Parking Expansion Locations

Several parking opportunities are described by location in the following sections. Table 3-2 lists the parking expansion opportunities and their expansion status.

Table 3-2. Truck Parking Expansion Opportunities

Parking Expansion Location	Corridor	Milepost	Traffic Directions Served	Expansion Status
Haviland Rest Area	I-40	23	Both	Ongoing
Parks Rest Area	I-40	185	Both	Ongoing
Sunset Point Rest Area	I-17	252	Both	Ongoing
Christensen Rest Area	I-17	324	Both	Ongoing
McGuireville Rest Area	I-17	296	Both	Ongoing
Ehrenberg Rest Area	I-10	5	Both	Evaluated
Bouse Wash Rest Area	I-10	53	Both	Evaluated
Burnt Well Rest Area	I-10	86	Both	Evaluated
Sacaton Rest Area	I-10	182	Both	Evaluated
Texas Canyon Rest Area	I-10	320	Both	Evaluated
San Simon Rest Area	I-10	388	Both	Evaluated
US 191 TI Safe Lot	I-10	332	WB Only	Evaluated
Sibyl Road TI Safe Lot	I-10	312	EB Only	Evaluated
B-10/SR 186 Safe Lot	I-10	337	Both	Evaluated
City Gate Mall Private Lot	I-10	198	Both	Evaluated
Meteor Crater Rest Area	I-40	235	EB Only	Evaluated
Painted Cliffs Rest Area[a]	I-40	359	WB Only	Improvements Not Possible
Hibbard Safe Lot	I-40	265	Both	Evaluated
Crazy Creek Safe Lot	I-40	320	Both	Evaluated
Dead River Safe Lot	I-40	316	Both	Evaluated
Seligman Safe Lot	I-40	98	Both	Evaluated
Mohawk Rest Area	I-8	56	Both	Evaluated
Sentinel Rest Area	I-8	83	Both	Good Parking Availability
US 93/SR 97 Safe Lot	US 93	155	Both	Evaluated
I-19 MP 30 Safe Lot	I-19	30	Both	Evaluated
Canoa Ranch Rest Area	I-19	32	Both	Good Parking Availability

[a] ROW, roadway geometry, and terrain constraints prevents parking expansion.

3.1.1 Parking Along I-10

The following sections describe the potential for additional parking along I-10. Table 3-3 summarizes these options.

3.1.1.1 Texas Canyon Rest Area, I-10 Milepost 320

Along the I-10 corridor at Milepost 320, Texas Canyon Rest Area was noted as having a major cluster of undesignated truck parking (Figure 3-2). The geography of the surrounding area and the existing ROW limited truck parking expansion at the rest area. Results from the undesignated truck parking analysis showed Texas Canyon may be deficient 135 spaces by 2032 and 186 spaces by 2042. Because of terrain and ROW constraints, an addition of only 17 spaces is possible. The nearest truck parking facilities to Texas Canyon are private truck stops located 15.1 miles east of Texas Canyon at Benson and 19.9 miles east at Wilcox, neither of which can accommodate the truck parking needs of the rest area.

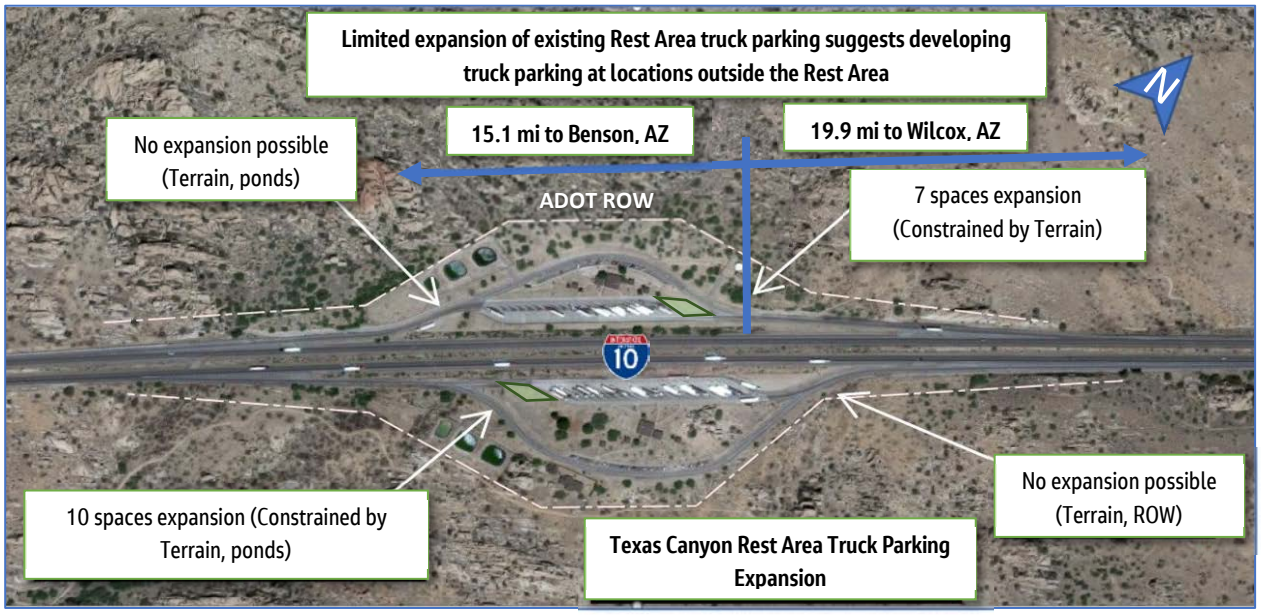

Figure 3-2. Texas Canyon Rest Area Expansion Opportunities

3.1.1.2 Sibyl Road Interchange, I-10 Milepost 312

A potential safe lot for additional truck parking expansion to meet the Texas Canyon Rest Area need was identified along I-10 at Milepost 312.8 and would serve eastbound traffic along I-10 (Figure 3-3). ROW acquisition is needed for this area to support the parking deficiencies since the safe lot can only accommodate 37 spaces. The 2032 truck parking deficiencies are 144 spaces, and 2042 truck parking deficiencies are 200 spaces for both directions. The westbound traffic faces a vertical clearance restriction of 13 feet, 9 inches for the overpass to Sibyl Road; therefore, this site would only alleviate parking deficiencies in the eastbound direction.

Figure 3-3. I-10 Milepost 312.8 Safe Lot Parking Opportunity

3.1.1.3 I-10 and US 191 Interchange, I-10 Milepost 332

Another safe lot location to meet Texas Canyon's deficiencies was identified at the junction of I-10 and US 191 (Figure 3-4). An access point is located along the westbound on-/off-ramps to the location adjacent to I-10. The westbound on-/off-ramps would need to be reconfigured for appropriate truck turning radius into the parking area to accommodate westbound traffic only. The parking area may include up to 85 spaces. The 2032 truck parking deficiencies are 72 spaces and the 2042 truck parking deficiencies are 100 spaces in both directions.

This parking layout would feature a left-in, right-out configuration for westbound truck traffic only. This parking expansion would be coupled with the parking expansion at the Sibyl Road safe lot to meet the anticipated 2042 parking demand at Texas Canyon Rest Area. Combined, the Sibyl safe lot and the I-10/US 191 safe lot would provide 122 truck parking spaces. This leaves a truck parking deficiency of 64 spaces, which may be accounted for by a new private truck parking facility at Love's Travel Center in Wilcox approximately 11 miles east of this potential safe lot. The new Love's Travel Center can accommodate 65 truck parking spaces.

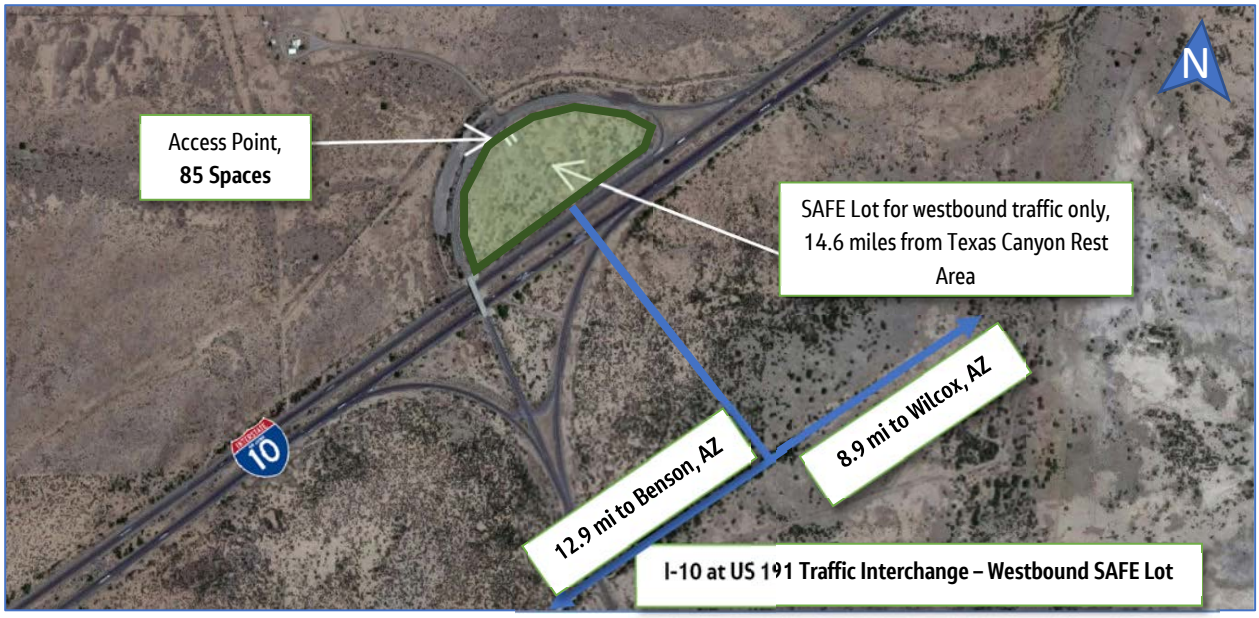

Figure 3-4. I-10 at US 191 Truck Parking Opportunity

3.1.1.4 B-10/SR186 TI, I-10 Milepost 336

A more feasible location to meet the parking needs near the Texas Canyon Rest Area was identified at the junction of I-10 and SR 186, located at I-10 Milepost 336 (Figure 3-5). The location could include safe lot parking inside the TI in the southeast quadrant. This site has the capacity to add 127 new truck parking spaces. The 2032 truck parking deficiencies are 72 spaces, and the 2042 truck parking deficiencies are 100 spaces for both directions. This site is more feasible than the locations at the Sibyl Road TI and US 191 TI because it can serve truck traffic on both directions of I-10.

Figure 3-5. B-10/SR 186 TI Truck Parking Opportunity

3.1.1.5 San Simon Rest Area, I-10 Milepost 388

The San Simon Rest Area is located at Milepost 388 along I-10 (Figure 3-6). The rest area is 75.7 miles east of the Texas Canyon Rest Area and 2.6 miles west of the Arizona-New Mexico state border. The San Simon Rest Area is anticipated to experience a truck parking deficiency of 134 spaces by 2032 and 186 spaces by 2042. The site has capacity for an additional 80 spaces within the existing ROW. The nearest truck parking facilities are 13.6 miles west at a private truck stop in San Simon, Arizona, and 8.9 miles east in Roadforks, New Mexico, at a private truck stop.

Figure 3-6. San Simon Rest Area Truck Parking Opportunity

3.1.1.6 Ehrenberg Rest Area, I-10 Milepost 5

At Milepost 5 along I-10, the Ehrenberg Rest Area site is expected to need 55 additional truck parking spaces by 2032 and 80 additional truck parking spaces by 2042 (Figure 3-7). The rest area has capacity to expand the truck parking by 53 spaces. Several private parking stops operate near the California state border, approximately 7 miles west of this site. The nearest parking opportunity east of this site is located in the town of Quartzite, approximately 13 miles to the east.

Figure 3-7. Ehrenberg Rest Area Truck Parking Opportunity

3.1.1.7 Bouse Wash Rest Area, I-10 Milepost 53

Along I-10 at Milepost 53 is the Bouse Wash Rest Area (Figure 3-8), which is expected to need an additional 48 truck parking spaces by 2032 and 74 truck parking spaces by 2042. The rest area has the capacity to expand truck parking by 55 spaces if additional ROW is acquired. The estimated ROW needed for the expansion is 17.0 acres at an approximate cost of $435,700. Truck parking facilities near the rest area include a private truck parking facility 7.6 miles to the west and the Burnt Well Rest Area 33 miles to the east.

Figure 3-8. Bouse Wash Rest Area Truck Parking Opportunity

3.1.1.8 Burnt Well Rest Area, I-10 Milepost 86

The Burnt Well Rest Area is located along I-10 at Milepost 86 (Figure 3-9). The rest area is expected to need an additional 74 truck parking spaces by 2032 and 125 truck parking spaces by 2042. With the acquisition of additional ROW, this location can accommodate an extra 103 parking spaces. The estimated ROW needed for the expansion is 12.0 acres at an approximate cost of $285,350. The Burnt Well Rest Area has parking facilities to the west at the Bouse Wash Rest Area 33 miles away, and a private truck parking facility 8.1 miles to the east in Tonopah.

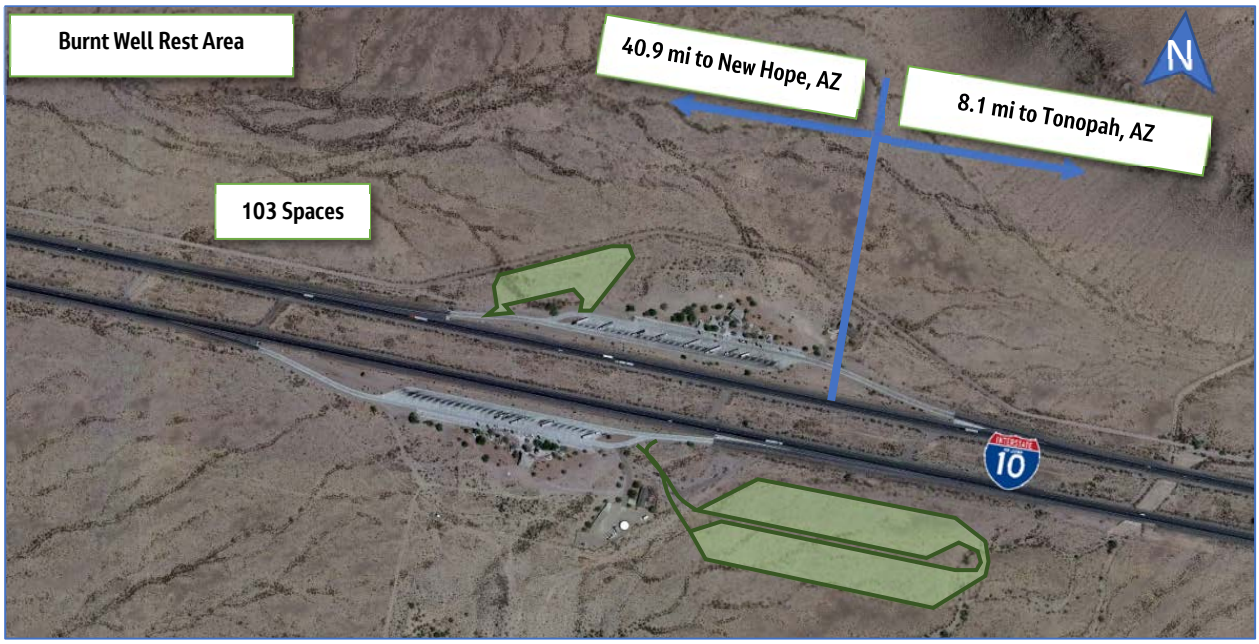

Figure 3-9. Burnt Well Rest Area Truck Parking Opportunity

3.1.1.9 Sacaton Rest Area, I-10 Milepost 182

Along I-10 at Milepost 182 is the Sacaton Rest Area (Figure 3-10). The rest area is expected to be deficient by 33 truck parking spaces by 2032 and 38 truck parking spaces by 2042. The site has area within the existing right of way to add 20 spaces. Nearby parking facilities include private truck stops 26.7 miles west of the rest area and private truck stops 18.6 miles to the east.

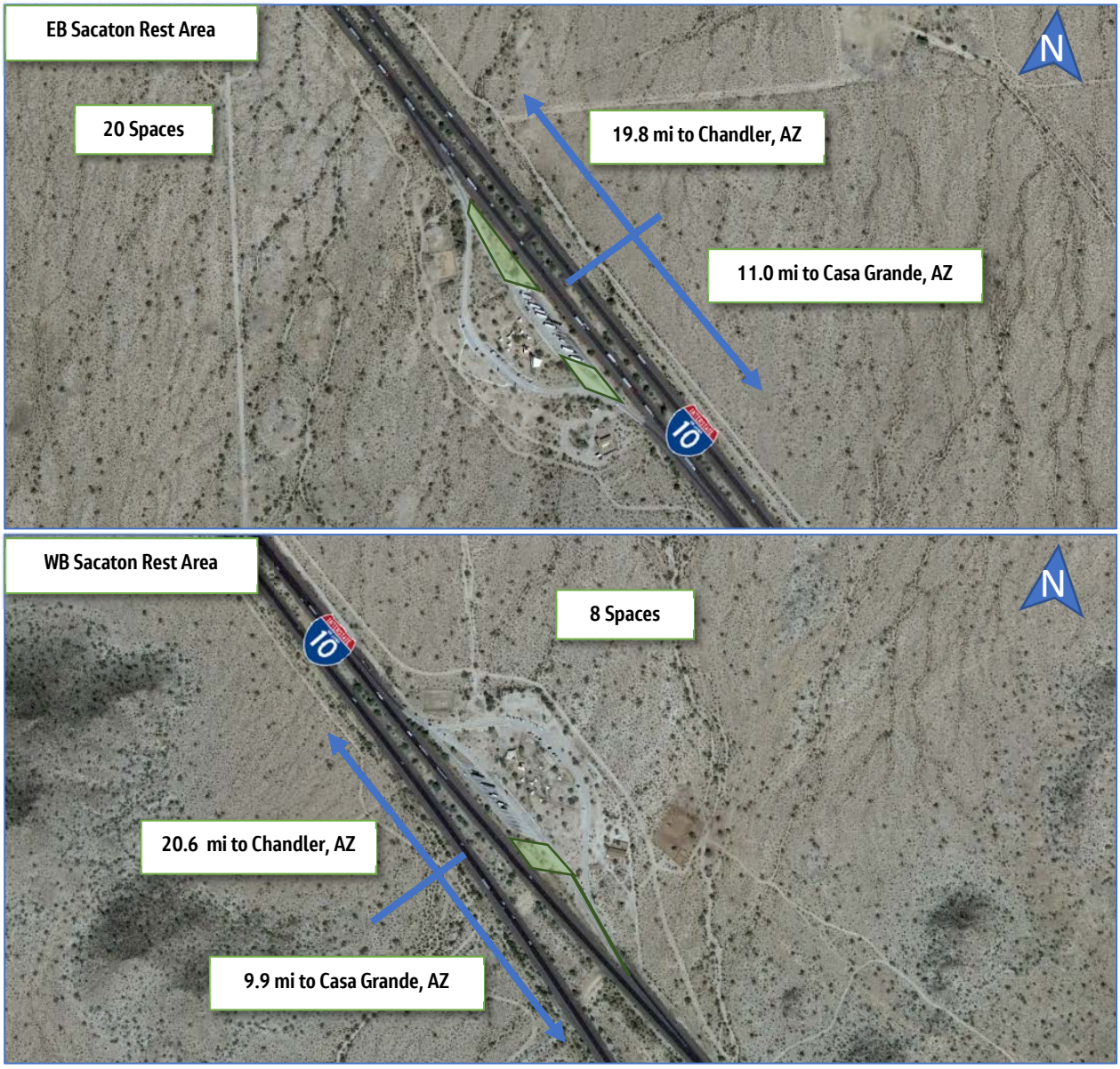

Figure 3-10. Sacaton Rest Area Truck Parking Opportunity

3.1.1.10 City Gate Mall Commercial Parking Opportunity, I-10 Milepost 198

A potential commercial truck parking P3 opportunity is present at the City Gate Mall at I-10 Milepost 198 (Figure 3-11). The site is currently for sale for $15 million and is 2.8 miles north of the I-8 connection to I-10. The site is connected to utilities and amenities of lighting, restrooms, and trash receptacles may be available. This site may be a viable P3 option for additional parking provided a detailed agreement between the site owners and ADOT could be developed. Based on the policy restraints at this private lot, expansion at this site is a future consideration not detailed in the parking expansion analysis.

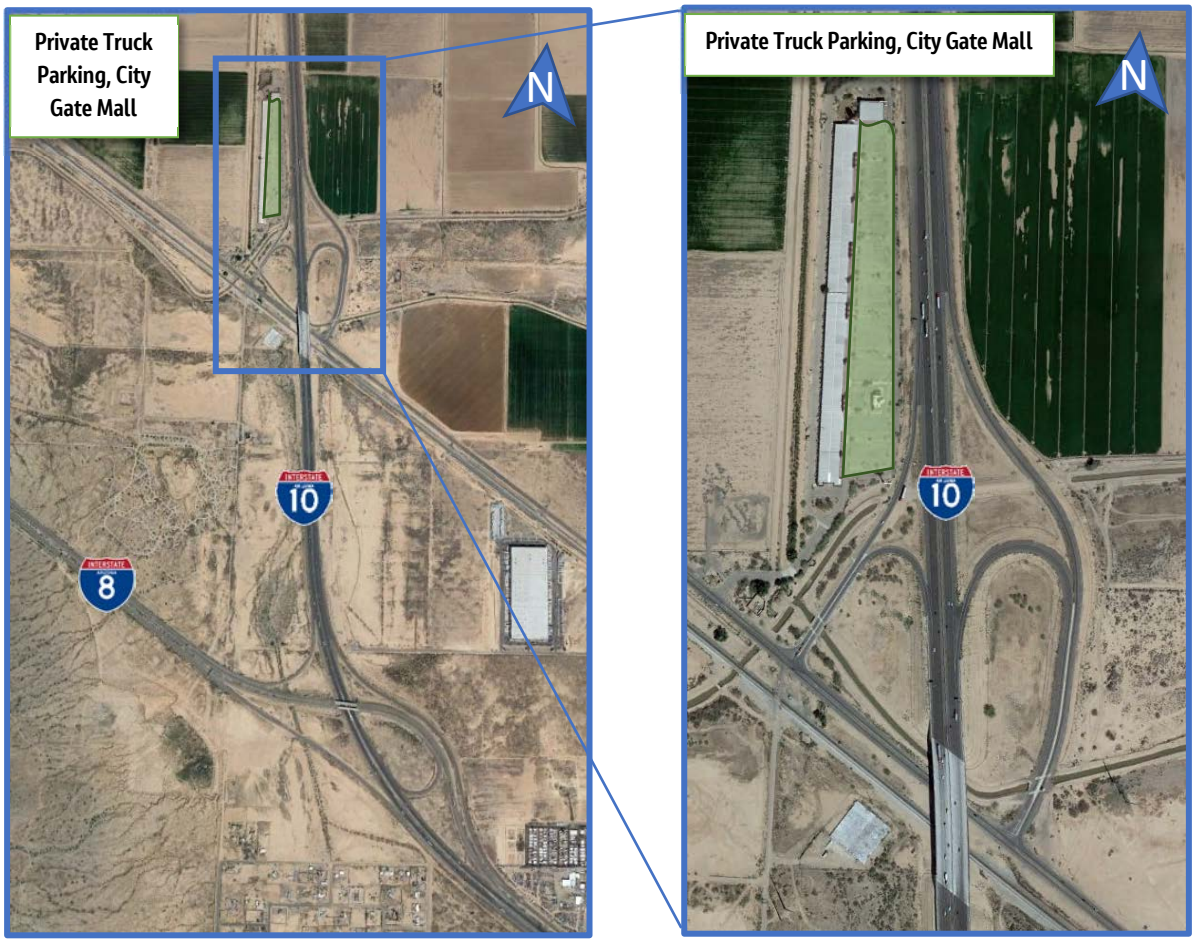

Figure 3-11. Casa Grande City Gate Mall Private Truck Parking Opportunity

Table 3-3. Truck Parking Expansion Opportunities Along I-10

	Location Along I-10	Milepost	Traffic Directions Served	Potential Truck Spaces	Truck Spaces Needed
Rest Areas	Ehrenberg	5	Both	53	80
	Bouse Wash[a]	53	Both	55	48
	Burnt Well[a]	86	Both	103	125
	Sacaton	182	Both	20	38
	Texas Canyon	320	Both	17	186
	San Simon[a]	388	Both	80	120
Safe lots	US 191 TI	332	WB Only	85	100
	Sibyl Road TI	312	EB Only	37	86
	B-10/SR186 TI	337	Both	127	186
Private Lot	City Gate Mall[b]	198	Both	N/A	N/A

[a] ROW is needed for parking expansion
[b] Public-Private Partnership to be determined

3.1.2 Parking Along I-40

The I-40 corridor experiences major truck parking deficiencies and large clusters of undesignated parking. The eastern stretch of I-40 includes many incidents of undesignated parking for more than 123 miles, starting at the Meteor Crater Rest Area and extending east to the state border with New Mexico. There are several private truck stops along this area but the parking needs are still not met. Potential truck parking expansion opportunities along I-40 are described in the following sections. Table 3-4 summarizes the expansion opportunities along I-40.

3.1.2.1 Painted Cliffs Rest Area, I-40 Milepost 359

Major parking deficiencies were recorded at the westbound Painted Cliffs Rest Area at Milepost 359 (Figure 3-12). The truck parking expansion at this location is infeasible based on terrain and ROW constraints at the existing rest area, as well as vertical clearance restrictions from an overpass over I-40. Truck parking is needed for both eastbound and westbound directions. The Painted Cliffs Rest Area is expected to need an additional 100 truck parking spaces by 2032 and 162 truck parking spaces by 2042. The nearest truck parking facilities are 4.5 miles east at the New Mexico eastbound rest area and 25.6 miles west at a private truck stop at the junction of I-40 and US 191.

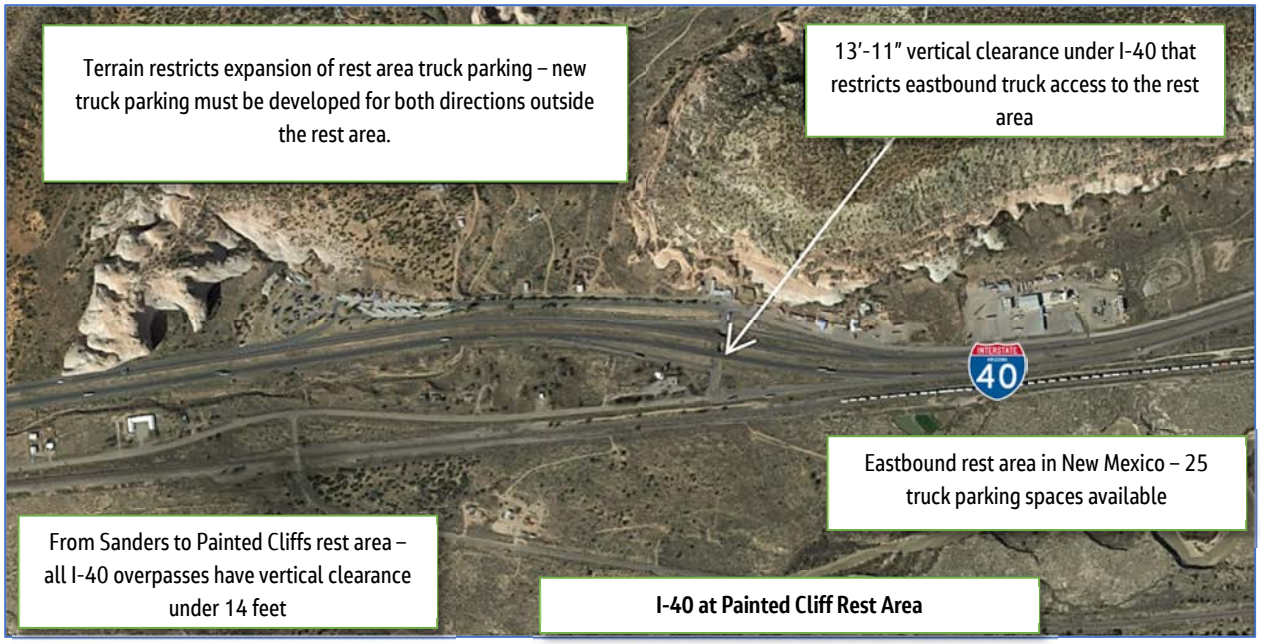

Figure 3-12. Painted Cliffs Rest Area Limited Expansion Opportunities

3.1.2.2 Meteor Crater Rest Area, I-40 Milepost 235

The Meteor Crater Rest Area marks the beginning of a notable increase in undesignated parking. Multiple undesignated parking clusters were identified in the vicinity of this rest area. It is anticipated that there will be a shortage of 68 truck parking spaces by 2032, and this deficiency is projected to grow to 122 spaces by 2042. The rest area is along I-40 at Milepost 235 and is 38.9 miles from Flagstaff to the west and 18.6 miles from Winslow in the east (Figure 3-13). Parking at this site can be expanded by developing overflow rights. With the acquisition of additional ROW, this location can accommodate an extra 70 spaces in each direction through such overflow lots.

Figure 3-13. Meteor Crater Rest Area Expansion Opportunity

3.1.2.3 Hibbard Safe Lot, I-40 Milepost 266

There is an opportunity to expand truck parking in the eastbound and westbound directions near the Meteor Crater Rest Area at the Hibbard safe lot location (Figure 3-14). The Meteor Crater Rest Area and surrounding location is expected to be deficient 88 truck parking spaces by 2032 and 158 truck parking spaces by 2042. This unutilized parking area can accommodate up to 158 spaces to meet parking needs. The area is 30.6 miles east of Meteor Crater Rest Area and 20 miles west of Holbrook, Arizona.

Figure 3-14. Hibbard Safe lot Expansion Opportunity

3.1.2.4 Joseph City Power Plant, I-40 Milepost 278

The Joseph City Power Plant, known as the Cholla Power Plant, was identified as a potential location for truck parking expansion along I-40 at Milepost 278. Arizona Public Service is considering closing the power plant in the future and Arizona State University, the owner of the land, has expressed interest in converting the land into a truck parking safe lot. Further investigation into the feasibility of this location for truck parking is needed; thus, this location was not considered for evaluation as part of this project.

3.1.2.5 Dead River Safe Lot, I-40 Milepost 315

Along I-40 at Milepost 315.5 is the Dead River safe lot (Figure 3-15). This area may be developed to provide parking in the eastbound direction for up to 31 spaces and in the westbound direction for up to 34 spaces. The location is 26 miles east of Holbrook and 24 miles west of Sanders.

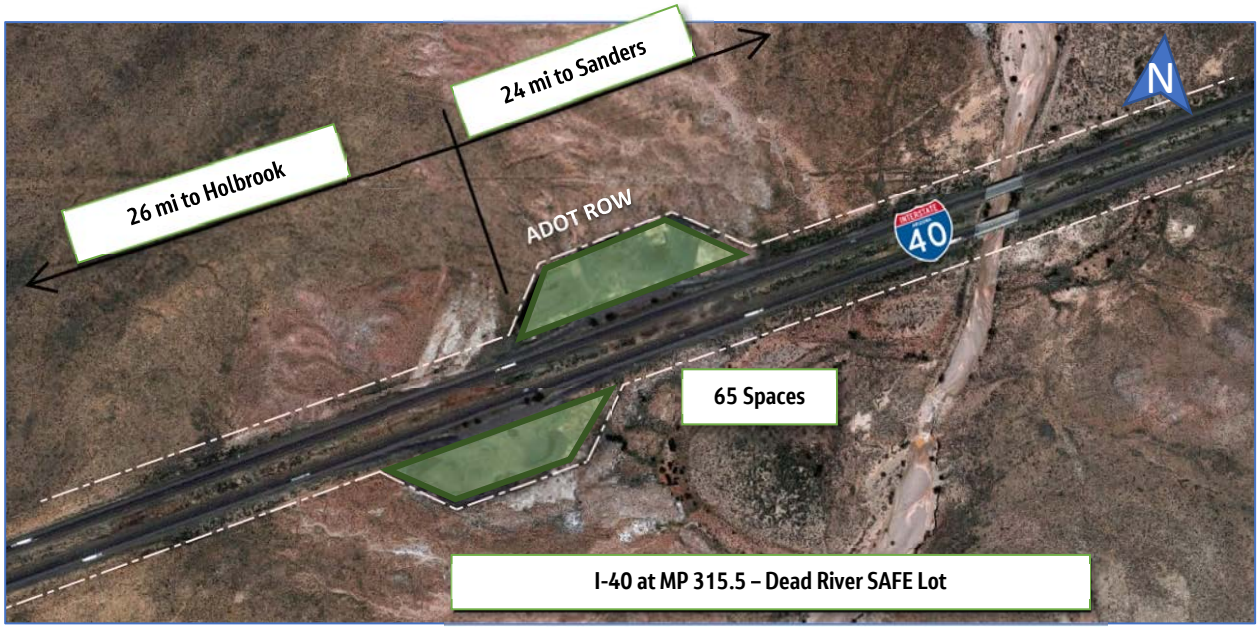

Figure 3-15. Dead River Safe lot Expansion Opportunity

There is an additional site 4 miles east of the Dead River site that has a much larger capacity for parking expansion and can accommodate the parking deficiencies at Painted Cliffs Rest Area. This site is the Crazy Creek safe lot at Milepost 320. Because of the more effective parking expansion possibilities at the Crazy Creek Site, the Dead River site was not considered for parking expansion in this study.

3.1.2.6 Crazy Creek Safe Lot, I-40 Milepost 320

East of the Dead River site is another potential parking site along I-40 at Milepost 320 (Figure 3-16). The 2032 truck parking need is 122 spaces, and the 2042 truck parking need is 162 spaces in both directions. The site is 4.5 miles east of the Pinta TI and can accommodate 176 spaces, which serves most parking deficiencies at Painted Cliffs Rest Area.

Figure 3-16. Crazy Creek Safe Lot Expansion Opportunity

3.1.2.7 Future Rest Area near Seligman, I-40 Milepost 98

Along I-40 at Milepost 98, a parking expansion opportunity is available near Seligman (Figure 3-17). ADOT obtained ROW at the site for a future rest area. The 2032 truck parking need is 78 spaces, and the 2042 truck parking need is 87 spaces in both directions The site can accommodate 72 truck parking spaces to serve the eastbound and westbound directions. The site is located 72.5 miles east of Kingman and 68.1 miles west of the Parks Rest Area. This site was examined for a future safe lot, but not considered for near-term improvements.

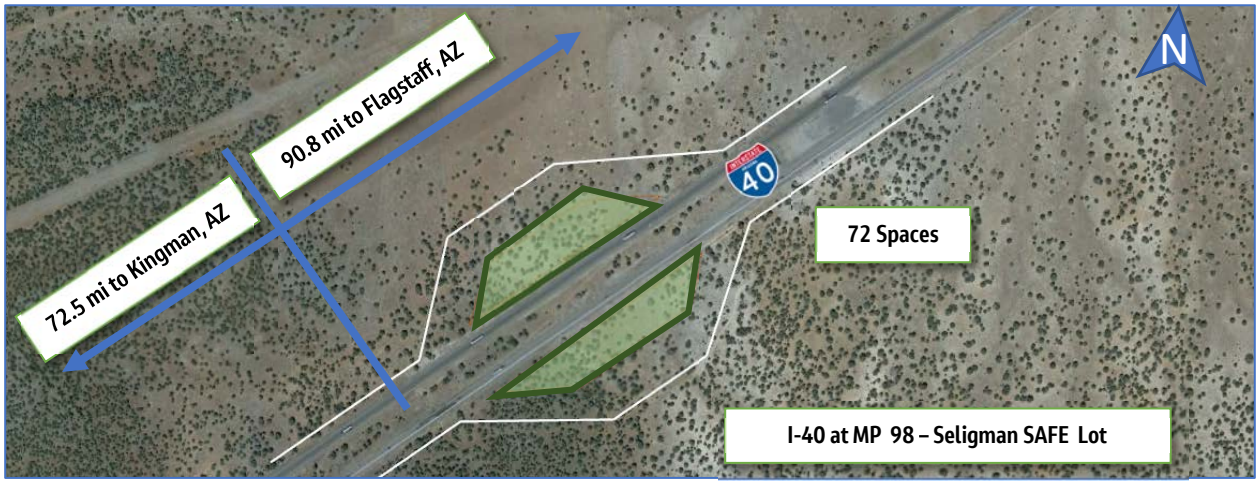

Figure 3-17. Seligman Safe Lot Expansion Opportunity

Table 3-4. Truck Parking Expansion Opportunities Along I-40

	Location Along I-40	Milepost	Traffic Directions Served	Potential Truck Spaces to be Added	Truck Spaces Needed
Rest Areas	Meteor Crater	235	Both	140	122
	Painted Cliffs[a]	359	WB Only	0	162
Safe lots	Hibbard	265	Both	158	158
	Crazy Creek	320	Both	176	162
	Dead River	316	Both	65	162
	Seligman	98	Both	72	87

[a] ROW and terrain constraints prevent parking expansion

3.1.3 Other Parking Areas

3.1.3.1 Mohawk Rest Area, I-8 Milepost 56

The Mohawk Rest Area is located along I-8 at Milepost 56 (Figure 3-18). The rest area serves both directions and is expected to be deficient by 16 truck spaces by 2032 and 25 truck parking spaces by 2042. This rest area has the capacity to expand truck parking by 16 spaces within the existing ROW. The undesignated truck parking analysis showed no clustering around Mohawk Rest Area. The nearest minor cluster located in Yuma, Arizona. The nearest truck parking facilities include the Sentinel Rest Area 36.6 miles to the east and a private truck parking facility 14.6 miles to the west.

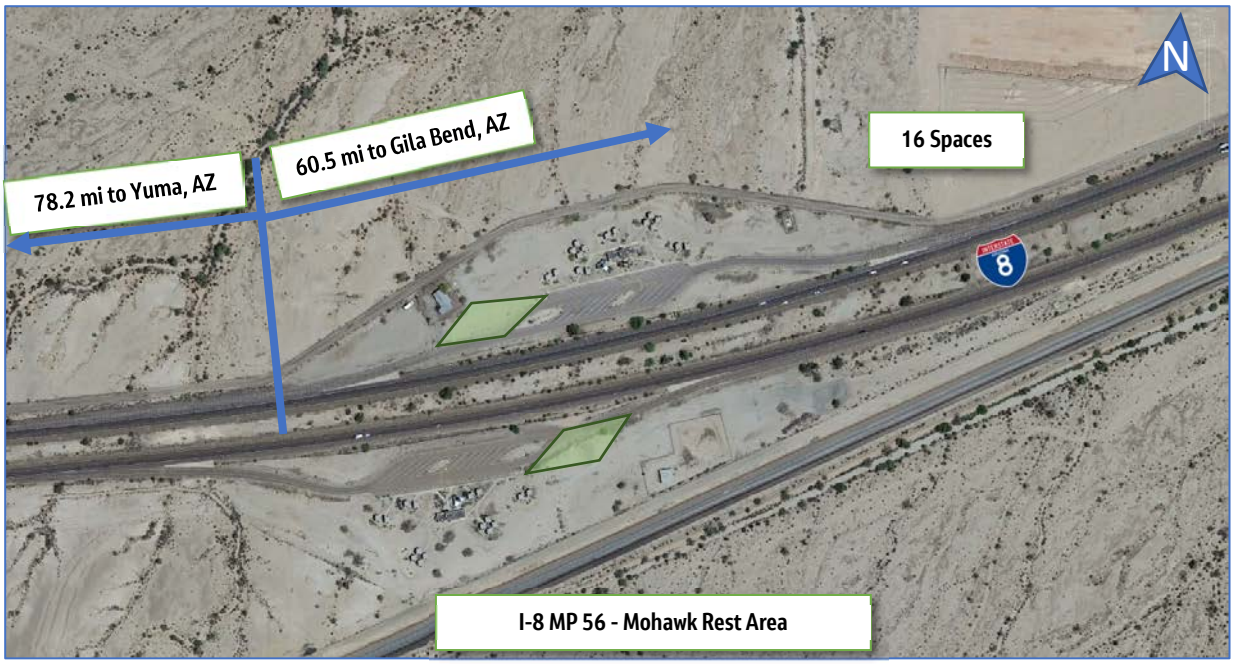

Figure 3-18. Mohawk Rest Area Expansion Opportunity

3.1.4 Other Parking Opportunities

The truck parking community cited areas near the ADOT Nogales Port of Entry near I-19 in Nogales, Arizona, and a location at the junction of US 93 at SR 97 near the Bagdad Mine. These locations had minor undesignated truck parking clusters. Considerations for parking along these routes are included below.

3.1.4.1 SR 97 at US 93 – Bagdad Mine, US 93 Milepost 155

The location at the junction of SR 97 and US 93 is near the Bagdad Mine and was evaluated based on the mining truck's staging and parking deficiencies (Figure 3-19). The area is along US 93 at Milepost 155 and can accommodate parking facilities.

Based on the low volume of trucks and the low undesignated parking intensity, the study team recommends this site or similar sites along US 93 be considered as part of the future I-11 program.

Figure 3-19. Bagdad Safe Lot Expansion Opportunity

3.1.4.2 I-19 Safe Lot, I-19 Milepost 30

The location near the ADOT Nogales Port of Entry for truck parking and staging was identified within the 25-mile radius that is restricted for international truckers to enter the country and transfer loads to the US truckers for delivery in the US. The site was selected along I-19 at milepost 30 in an area parallel to the frontage road between I-19 (Figure 3-20). This site has the potential to add 20 new truck parking spaces. The site is 16.9 miles from the U.S.-Mexico border to the south and 18.5 miles from Canoa Ranch Rest Area to the north. Developing this site will require ROW acquisition and extensive ground-leveling effort (excavation and flattening to develop the site). These limitations will necessitate extensive work to provide access to this site.

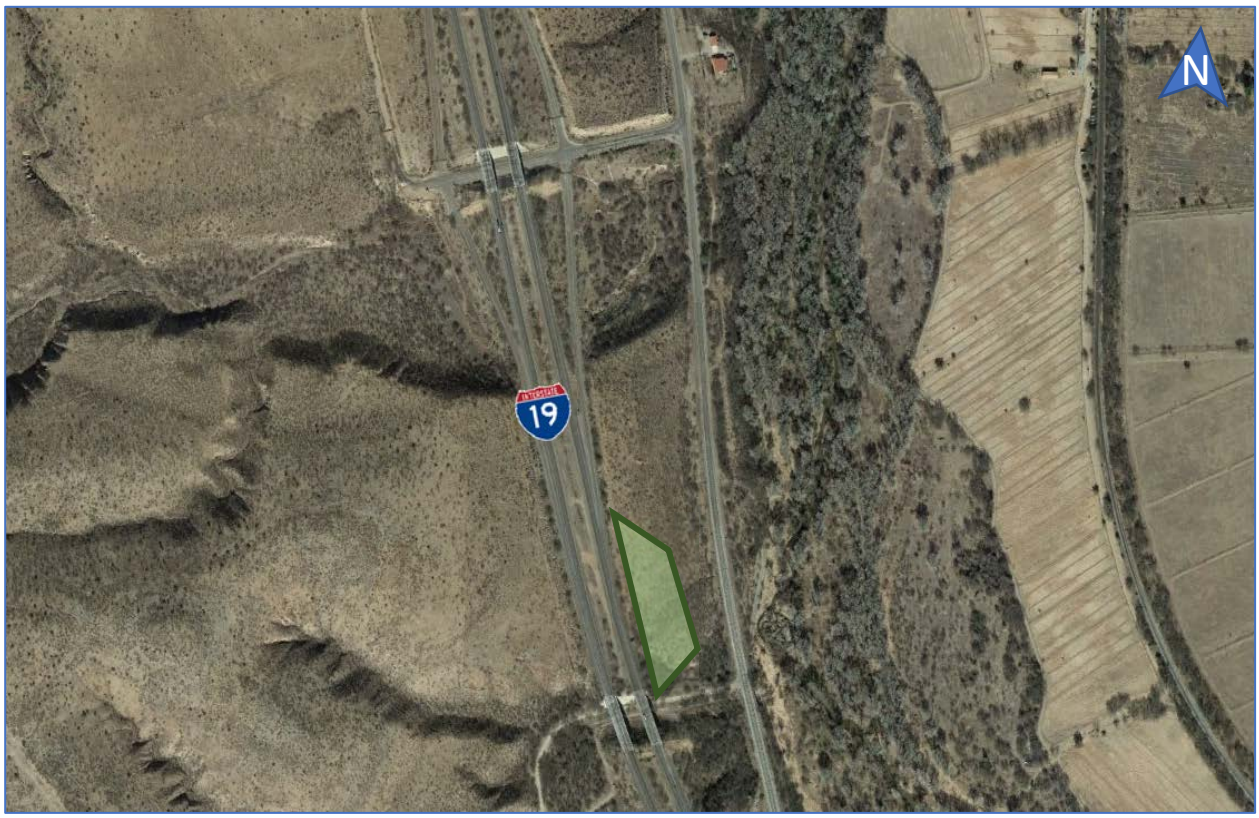

Figure 3-20. I-19 Frontage Road Expansion Opportunity

3.1.4.3 Other Rest Areas

The Sentinel Rest Area along I-8 and Canoa Ranch Rest Area along I-19 had sufficient truck parking as a result of the undesignated truck parking analysis. Therefore, these sites were not analyzed for truck parking expansion under this study. Table 3-5 lists the parking expansion considerations for the locations along I-8, I-19, and US 93.

Table 3-5. Other Corridor Locations for Truck Parking Expansion

	Site Location	Corridor/Milepost	Traffic Directions Served	Potential Truck Spaces	Truck Spaces Needed
Rest Areas	Mohawk	I-8 MP 56	Both	16	25
	Sentinel[a]	I-8 MP 83	Both	0	0
	Canoa Ranch[a]	I-19 MP 33	Both	0	0
Safe Lots	I-19 Safe lot[b]	I-19 MP 30	Both	N/A	N/A
	US 93/SR 97[c]	US 93 MP 155	Both	N/A	N/A

[a] Sufficient truck parking at site
[b] Roadway access and existing geometry constraints prevent parking expansion
[c] Future consideration as part of I-11 construction

4 Implementation Plan

The parking expansion prioritization framework considers the factors of parking demand, parking needs met, rest areas truck parking expansion, economy, benefit-cost ratio, project readiness, funding, and stakeholder input. These factors were selected based on review and inspection of peer state truck parking plans and discussions with project stakeholders. Each factor is individually scored based on its contribution to mitigate the truck parking need. The prioritization framework used in this analysis employs a weighting factor for each category. The weighted categories are shown in Table 4-1.

In addition, a post-processing stakeholder input factor is applied to the total weight for each site based on input from ADOT leadership and trucking community representatives. The scoring criteria and weighting factors used to prioritize truck parking expansion opportunities are summarized in Table 4-1.

Table 4-1. Prioritization Framework Criteria and Weighted Factors

Prioritization Criteria	Description	Scoring Criteria	Weighted Factor
Parking Demand	Improvements near high need for parking and high intensity of undesignated parking	Undesignated parking > 100 = 3 Undesignated parking > 50 but less than 100 = 2 Undesignated parking < 50 = 1	30%
Parking Need Met	Improvements will address the parking needs	2045 parking demand met = 1 2045 parking demand unmet = Ratio of provided/needed	15%
Rest Area Truck Parking Expansion	Truck parking expansions are at a rest area	Rest area parking demand met = 1 Rest area parking demand partially met = Ratio of provided/needed parking not at a rest area location = 0	5%
Economy	Truck VMT (per day) in 30-mile buffer	VMT>500,000 = 3 VMT between 500,000 and 250,000 = 2 VMT less than 250,000 =1	10%
Benefit-Cost	Benefits – safety, travel time savings, emissions savings, initial cost, operations and maintenance cost	B/C > 3 = 3 B/C between 3 and 2 = 2 B/C less than 2 = 1	20%
Project Readiness	Within ROW, power, water, wastewater connectivity	All conditions met = 2 Partial conditions met = 1 None = 0	10%
Funding	Available and can be obligated within next two years	Yes = 1 No = 0	10%
Stakeholder Input	Prioritized locations based on input from ADOT leadership and trucking community		

VMT = vehicle miles traveled

4.1 Parking Demand

The parking demand factor represented the need for truck parking based on the amount and intensity of undesignated parking. The number of trucks parked in undesignated locations was collected using ATRI truck GPS data, as described in *Working Paper 1: Existing Conditions Analysis*. The point values for the number of trucks parked in an undesignated area near a rest area or potential safe lot are shown in Table 4-2.

Table 4-2. Parking Demand Points Evaluation

	Site ID	Number of Trucks in Undesignated Parking	Points Value
Rest Areas	Mohawk	25	1
	Ehrenberg	80	2
	Bouse Wash	48	1
	Burnt Well	125	3
	Sacaton	38	1
	Texas Canyon	186	3
	San Simon	120	3
	Meteor Crater	122	3
Safe Lots	I-10 at US 191	100	2
	I-10 at Sibyl Rd	86	2
	B-10/SR 186 TI	186	3
	I-40 at Hibbard	158	3
	I-40 at Crazy Creek	162	3
	I-40 at Seligman	80	2

4.2 Parking Need Met

The parking need met factor considered how much of the parking deficiencies for a given location were met by the development of each potential site. If the site could completely accommodate the parking deficiencies, the score was 1. For sites that only met a portion of the truck parking deficiencies, the ratio of parking spaces added to parking spaces needed was used as the score. Table 4-3 shows the scores for each potential site.

Table 4-3. Parking Need Met Points Evaluation

	Site ID	Truck Spaces Added	Truck Spaces Needed	Points Value
Rest Areas	Mohawk	16	25	0.64
	Ehrenberg	53	80	0.66
	Bouse Wash	55	48	1.00
	Burnt Well	103	125	0.82
	Sacaton	20	38	0.53
	Texas Canyon	17	186	0.09
	San Simon	80	120	0.67
	Meteor Crater	140	122	1.00
Safe Lots	I-10 at US 191	85	100	0.85
	I-10 at Sibyl Rd	37	86	0.43
	B-10/SR186 TI	127	186	0.68
	I-40 at Hibbard	158	158	1.00
	I-40 at Crazy Creek	176	162	1.00
	I-40 at Seligman	72	80	0.90

4.3 Rest Area Truck Parking Expansions

The factor for rest area truck parking expansions considered the cost savings on amenities at rest areas as compared to safe lots. For example, the rest areas already included amenities, whereas the safe lots would need installation of new amenities and would have additional O&M costs. For expansions at existing rest areas, the ratio of parking spaces added to parking spaces needed was scored. The non-rest area locations scored zero points. The scoring results for the improvements at rest areas criterion are summarized in Table 4-4.

Table 4-4. Rest Area Truck Parking Expansions Points Evaluation

	Site ID	Located at a Rest Area	Points Value
Rest Areas	Mohawk	Yes	0.64
	Ehrenberg	Yes	0.66
	Bouse Wash	Yes	1.00
	Burnt Well	Yes	0.82
	Sacaton	Yes	0.53
	Texas Canyon	Yes	0.09
	San Simon	Yes	0.67
	Meteor Crater	Yes	1.00
Safe Lots	I-10 at US 191	No	0
	I-10 at Sibyl Rd	No	0
	B-10/SR186 TI	No	0
	I-40 at Hibbard	No	0
	I-40 at Crazy Creek	No	0
	I-40 at Seligman	No	0

4.4 Economy

The economy factor considered the truck VMT within a 30-mile buffer of each site. The sites with a truck VMT greater than 500,000 miles received a score of 3 points, sites with a truck VMT between 500,000 miles and 250,000 miles scored 2 points, and sites with a truck VMT less than 250,000 miles scored 1 point. The scoring results for the economy factor are summarized in Table 4-5.

Table 4-5. Economy Factor Site Evaluations

	Site ID	2022 Truck Vehicle Miles Traveled	Points Value
Rest Areas	Mohawk	250,472	2
	Ehrenberg	558,445	3
	Bouse Wash	556,841	3
	Burnt Well	675,373	3
	Sacaton	668,478	3
	Texas Canyon	370,628	2
	San Simon	453,592	2
	Meteor Crater	675,614	3
Safe Lots	I-10 at US 191	378,269	2
	I-10 at Sibyl Rd	335,188	2
	B-10/SR186 TI	370,628	2
	I-40 at Hibbard	583,520	3
	I-40 at Crazy Creek	617,581	3
	I-40 at Seligman	418,285	2

4.5 Project Readiness

The project readiness criterion considered whether each site was within ROW, including access to power, water, and sewer. The sites that could meet all of the project readiness needs received a score of 2 points. The sites that met some of the project readiness needs received a score of 1 point, and sites that did not have access to utilities and needed additional ROW scored zero points. The scoring results for the project readiness factor are summarized in Table 4-6.

Table 4-6. Project Readiness Factor Site Evaluation

	Site ID	Utilities Available	ROW	Points Value
Rest Areas	Mohawk	Yes	Yes	2
	Ehrenberg	Yes	Yes	2
	Bouse Wash	Yes	No	1
	Burnt Well	Yes	No	1
	Sacaton	Yes	Yes	2
	Texas Canyon	Yes	Yes	2
	San Simon	Yes	Yes	2
	Meteor Crater	Yes	No	1
Safe Lots	I-10 at US 191	No	Yes	1
	I-10 at Sibyl Rd	No	Yes	1
	B-10/SR186 TI	No	Yes	2
	I-40 at Hibbard	No	Yes	1
	I-40 at Crazy Creek	No	Yes	1
	I-40 at Seligman	No	Yes	1

4.6 Funding

The funding factor considered whether the funds for each project area were available and could be used to develop the site over the next 2 years. If yes, then the funding factor earned 1 point. If the funding was not available within the 2-year period, then zero points were awarded. At this stage, a score of 1 was assigned to all sites, as the funding availability was expected to change depending on how fast some sites could be advanced to implementation. Factors that played a key role in this decision included project bundling opportunities, environmental clearance requirements, and legislative needs. Additionally, the available funding was expected to change based on the availability of new federal grants through the infrastructure bill.

4.6.1 Funding Availability

ADOT allocated $50 million of National Highway Freight Program (NHFP) funding for truck parking. Of the $50 million, $18 million has been obligated to the ongoing truck parking expansions at Haviland, Parks, Christensen, McGuireville, and Sunset Point Rest Areas. This plan recommended truck parking expansion projects to program the remaining $32 Million.

Federal grants play a pivotal role in bolstering the development and enhancement of freight facilities within Arizona. These grants, often administered by agencies such as the USDOT, provide a vital source of financial support for projects aimed at improving transportation infrastructure. They help states address crucial challenges related to freight movement, such as capacity constraints, infrastructure maintenance, parking enhancement, and the implementation of innovative technologies. ADOT should explore options for funding through such federal grants. The availability of federal grants would allow ADOT to pursue some of the improvements to freight parking identified in this study.

Federal freight-related grants or grants that support innovative freight practices allocated to Arizona within the near term are summarized in Table 4-7.

Table 4-7. Funding Opportunities in Arizona for Freight-Related Projects

Grant Programs for Trucking Investments	Funding Agency	Funding Amount Allocated to Arizona	Impacts for Trucking Infrastructure
Infrastructure for Rebuilding America (INFRA) Funds	USDOT Office of the Secretary of Transportation	$32.6 million	• INFRA grants cover up to 60% of total freight project cost (freight projects on the National Highway Freight Network (NHFN), NHS and other intermodal projects) • Additional 20% of project cost maybe funded with other federal assistance
Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Funds	USDOT Office of Infrastructure Finance and Innovation	$60.8 million (as of 2023)	• RAISE discretionary grants help project sponsors at the state and local levels, including municipalities, Tribal governments, counties, and others complete critical freight and passenger transportation infrastructure projects • Covers 80% of total project cost
Carbon Reduction Funding (CRF)	USDOT FHWA	$117 million (through 2026)	• Infrastructure Improvements and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law, contains program targeted at mitigating the impacts of climate change and increasing the resilience of the surface transportation system • Advanced truck stop electrification systems are eligible for CRF funds
Infrastructure Improvements and Jobs Act (IIJA) National Highway Freight Program (NHFP) Funds	USDOT FHWA	$50 million (through 2026 – *specifically for truck parking*)	• NHFP funds are used to improve efficient movement of freight on the NHFN • Additional source of funding includes 5.7% state match • *About 90% of NHFP funds are available after 2025*
National Highway Performance Program (NHPP) Funds	USDOT FHWA	$2,700 million (through 2026)	• NHPP funds are eligible on a project that supports progress toward the achievement of national performance goals for improving infrastructure condition, safety, congestion reduction, system reliability, or freight movement on the NHS
Surface Transportation Block Grant (STBG) Funds	USDOT FHWA	$1,300 million (through 2026)	• The STBG program provides specific eligibility for the construction of truck parking on federal-aid highways

Grant Programs for Trucking Investments	Funding Agency	Funding Amount Allocated to Arizona	Impacts for Trucking Infrastructure
Highway Safety Improvement Program (HSIP) Funds	USDOT FHWA	$290 million (through 2026)	• HSIP is a federal-aid program with a purpose to achieve a signficant reduction in traffic fatalities and serious injuries on all public roads, including non state-owned roads and roads on Tribal land • Truck parking facilities may be funded through this program provided the need for CMV parking is consistent with the State Strategic Highway Safety Plan
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Funds	USDOT FHWA	$133.4 million (through 2026)	• PROTECT apportioned funds could be used to make resilience improvements at existing truck parking facilities

4.7 Benefit-Cost Analysis

The benefit-cost analysis (BCA) generally was modeled after the USDOT 2023 Benefit-Cost Analysis Guidance for Discretionary Grant Programs[2]. The methodology is consistent for each of the sites analyzed and includes determining existing and future conditions, as well as the benefits and costs associated with the construction and operation throughout the 20-year life of the facility. The methodology also uses USDOT-recommended monetized values for travel time savings, emissions, reduced fatalities, injuries, and property damage. Other benefits are monetized from best practices and prior project cost comparisons. The dollar values represent 2021 dollars, while future benefits and costs are discounted with a rate of 7%, consistent with USDOT guidance. The following sections detail the costs and benefits of safety, travel time, emissions, and operations and maintenance considerations.

4.7.1 Safety Savings

The safety savings criterion considered the number of crashes related to parked trucks and truck driver fatigue over the past 5-year period. A 30-mile buffer around proposed parking expansion sites was used to identify crashes along each corridor. The crash rate for each injury severity category is determined by the number of crashes per 100 million miles traveled.

The safety savings by year then are calculated using the given savings by injury severity level per the 2023 BCA parameters (Table 4-8). The applied safety savings for each site can be seen in Table 4-9. The crash rates for each injury severity level were assessed for a no-build scenario and a build scenario, in which the build scenario had a crash reduction rate of 100% for parked vehicle crashes and 50% for fatigued driver crashes among all injury types. The safety savings are applied to the crash rates to determine the discounted savings for the project facility's 20-year lifespan. Additional factors are applied to safety benefits if the parking demand exceeds the benefits provided by expansion at a specific site; if parking demand in a 30-mile buffer is satisfied, then the safety benefits as computed are not reduced; if parking demand is more than the available spaces even after expansion, then the safety benefits are reduced by applying a multiplicative factor determined using the ratio of parking provided by parking needed.

Table 4-8. Safety Savings by Injury Severity

Injury Severity	Safety Savings per Incident ($)
O – No Injury	4,000
C – Possible Injury	78,500
B – Non-incapacitating	153,700
A – Incapacitating	564,300
K - Fatal	11,800,000

[2] Benefit Cost Analysis Guidance 2023 Update.pdf (transportation.gov)

Table 4-9. BCA Safety Savings Sites Evaluation

	Site ID	Fatigue Crash Rate	Parked Crash Rate	Total Undiscounted Savings (in Million $)	Total Discounted Savings (in Million $)
Rest Areas	Mohawk	1.25	1.25	2.01	0.85
	Ehrenberg	1.45	0.78	64.58	36.86
	Bouse Wash	2.92	0.56	10.41	5.70
	Burnt Well	1.20	0.65	73.89	39.22
	Sacaton	0.19	0.19	3.13	1.74
	Texas Canyon	2.87	1.01	0.50	0.28
	San Simon	0.41	0.83	2.96	1.68
	Meteor Crater	1.48	1.39	0.77	0.51
Safe Lots	I-10 at US 191	1.40	0.66	36.34	19.37
	I-10 at Sibyl Rd	1.96	1.68	0.29	0.17
	B-10/SR186 TI	2.87	1.52	12.20	6.35
	I-40 at Hibbard	0.32	1.55	35.78	18.76
	I-40 at Crazy Creek	1.52	1.42	76.49	40.05
	I-40 at Seligman	1.94	1.34	7.65	4.10

4.7.2 Travel Time Related Savings

The travel-time savings are based on the USDOT BCA value of travel time savings for trucks in 2021 dollars. A monetization factor of $31.90 is applied to the annual vehicle hours traveled (VHT) savings for the single truck driver occupant per truck. The VHT is derived by dividing the VMT by 60 miles per hour, which represents the average speed along the corridor. The VMT savings determines the VMT saved each day by adding truck spaces. A truck annualization factor of 320 (as per the USDOT BCA guidance) was used, as well as applying savings factors from fuel and driver time, noise, congestion reduction, and state of good repair (Table 4-10). The 7% discount factor is applied to the final travel time savings for each year of the project facility's 20-year lifespan. Table 4-11 details the travel time savings over the 20-year lifespan of each potential site.

Table 4-10. Travel Time Related Savings Factors

Travel Time Savings Factors	Monetized Savings ($) per Hour
Fuel Savings and Driver Time	1.1057
Noise	0.0223
Congestion Reduction	0.197
State of Good Repair	0.1057

Table 4-11. BCA Travel Time Savings Site Evaluation

	Site ID	Truck Spaces Added	Truck Spaces Needed	Total VMT Saved (in Millions)	Total VHT Saved (in Millions)	Total Undiscounted Savings (in Million $)	Total Discounted Savings (in Million $)
Rest Areas	Mohawk	16	25	1.84	0.03	3.62	1.06
	Ehrenberg	53	80	9.97	0.17	19.56	9.08
	Bouse Wash	55	48	9.43	0.16	18.51	8.26
	Burnt Well	103	125	15.70	0.26	30.80	11.70
	Sacaton	20	38	4.42	0.08	8.12	1.08
	Texas Canyon	17	186	3.43	0.05	6.73	2.83
	San Simon	80	120	16.1	0.27	31.65	15.26
	Meteor Crater	140	122	15.27	0.25	29.96	12.24
Safe Lots	I-10 at US 191	85	100	14.66	0.24	28.77	11.36
	I-10 at Sibyl Rd	37	86	7.46	0.12	14.64	5.83
	B-10/SR186 TI	127	186	15.29	0.25	30.01	13.32
	I-40 at Hibbard	158	158	20.16	0.34	39.56	16.66
	I-40 at Crazy Creek	176	162	16.13	0.27	31.65	15.26
	I-40 at Seligman	72	80	14.52	0.24	28.48	12.00

4.7.3 Environmental Benefits

The environmental benefits consider the tons of emissions avoided along each segment through the addition of a proposed parking expansion site. The analysis includes the number of metric tons avoided for emissions of nitrous oxide (N_2O), carbon dioxide (CO_2), and particulate matter of 2.5 micrometers or smaller ($PM_{2.5}$). The monetized value per metric ton for each of these emission types is a given parameter in the USDOT BCA. The emission rates in grams per hour (g/hr) for each of the emission types were sourced from studies conducted by the U.S. Environmental Protection Agency. Table 4-12 shows the parameters and assumptions used for the emissions savings analysis. The N_2O and $PM_{2.5}$ have discounted emission savings at 7% while the CO_2 has discounted emission savings at 3%. The emissions savings are applied to vehicle delay hours avoided, also known as the VHT value savings. The idling emissions savings for the sites over the 20-year lifespan of each facility is summarized in Table 4-13.

Table 4-12. Idling Emissions Factors

Pollutants	Emission Rates (g/hr)
Nitrous Oxide (N_2O)	3.6715
Carbon Dioxide (CO_2)	2443.925
Particulate Matter ($PM_{2.5}$)	0.02429

Table 4-13. BCA Idling Emissions Savings Sites Evaluation

	Site ID	VHT Savings (hr)	N_2O Avoided (metric tons)	CO_2 Avoided (metric tons)	$PM_{2.5}$ Avoided (metric tons)	Total Undiscounted Savings (in Thousand $)	Total Discounted Savings (in Thousand $)
Rest Areas	Mohawk	30,720	0.11	75.08	0.0007	8	4
	Ehrenberg	166,160	0.61	406.08	0.0040	44	27
	Bouse Wash	157,216	0.58	384.22	0.0038	40	30
	Burnt Well	261,584	0.96	639.29	0.0064	70	41
	Sacaton	73,600	0.25	164.23	0.0016	18	11
	Texas Canyon	57,120	0.21	139.60	0.0014	10	9
	San Simon	268,800	0.99	656.93	0.0065	70	40
	Meteor Crater	254,451	0.93	621.86	0.00262	69	39
Safe Lots	I-10 at US 191	244,384	0.90	597.26	0.0059	65	40
	I-10 at Sibyl Rd	124,320	0.46	303.83	0.0030	33	20
	B-10/SR186 TI	254,912	0.94	622.99	0.0062	70	40
	I-40 at Hibbard	336,000	1.23	821.16	0.0082	88	55
	I-40 at Crazy Creek	268,800	0.99	656.93	0.0065	70	44
	I-40 at Seligman	241,920	0.89	591.23	0.0059	64	40

4.7.4 Residual Benefits

The residual benefits of each site considers the costs savings associated with the project components that have a longer lifespan than the analysis period. These assets include highway and street components, as well as electric, light, and power components. The Bureau of Economic Analysis Rate of Depreciation, Service Lives, Declining-Balance Rates, and Hulten-Wykoff Categories[3] resource was used for determining the service life for the highway and streets, and power components. The alternative pavement lifespan was sourced from manufacturers of permeable grid polymer material (Table 4-14). The useful life is applied to the lifespan of the facilities and the 2021 dollar cost of construction to determine a percentage of useful life

[3] [PDF] The Measurement of Depreciation in the U.S. National Income and Product Accounts | Semantic Scholar

at the end of the analysis period and the value of remaining cost. The savings for each cost component at the potential sites after the 20-year lifespan of each facility are summarized in Table 4-15.

Table 4-14. Residual Savings Factors

Type of Asset	Service Life (Years)	Proportion of Useful Life Remaining
Alternative Pavement Material	40	50%
Telecommunications (Fencing, Poles)	40	50%
Highways and Streets (Ramp Improvements)	60	67%
Highway and Streets (Rest Area Pavement Material)	60	67%

Table 4-15. BCA Residual Savings Sites Evaluation

	Site ID	Ramp Improvements (in Million $)	Fencing, Poles (in Million $)	Alternative Pavement Material (in Million $)	Rest Area Pavement Material (in Million $)	Total Undiscounted Savings (in Million $)	Total Discounted Savings (in Million $)
Rest Areas	Mohawk	-	-	-	0.80	0.53	0.12
	Ehrenberg	1.09	-	-	1.33	1.25	0.28
	Bouse Wash	0.51	-	-	0.61	0.78	0.18
	Burnt Well	0.48	-	-	2.76	2.25	0.51
	Sacaton	0.89	-	-	1.05	0.44	0.13
	Texas Canyon	0.64	-	-	0.85	1.04	0.23
	San Simon	1.24	-	-	1.78	1.60	0.36
	Meteor Crater	0.83	-	-	4.13	1.95	0.44
Safe Lots	I-10 at US 191	0.62	0.08	3.26	-	1.70	0.38
	I-10 at Sibyl Rd	0.16	0.06	1.10	-	0.69	0.16
	B-10/SR186 TI	0.49	0.11	3.04	-	1.99	0.45
	I-40 at Hibbard	1.64	0.08	4.52	-	3.54	0.80
	I-40 at Crazy Creek	2.06	0.11	4.83	-	3.94	0.78
	I-40 at Seligman	1.46	0.10	1.70	-	1.96	0.44

4.7.5 Operations and Maintenance

The O&M costs are determined on a site-by-site basis. The cost difference between the annual O&M costs for each site in the no-build condition and the build condition was developed. The build operation and maintenance costs are based on the site-specific cost per parking space added. Rest areas have an adjusted operations and maintenance cost adjusted based on the ratio of added spaces to the total number of spaces at the facility, with the ratio applied to a flat O&M cost of $250,000 annually. The safe lot O&M costs are a flat fee of $180,000 annually. This value comes from an average O&M at each of the rest areas according to ADOT Facilities Management, with a cost deflation applied based on the waterless vaulted toilet installation with decreased maintenance costs. A deflation factor is added based on a best practices for gross domestic product and deflators, with fiscal year 2012 equal to 1.00 and estimates until 2027. The 7% discounted operations and maintenance costs for the 20-year lifespan of each facility are shown in Table 4-16.

Table 4-16. BCA Operations & Maintenance Savings Site Evaluation

	Site ID	Spaces Added	Total Spaces	O&M Annual Cost (in Millions $)	Total Undiscounted Cost (in Millions $)	Total Discounted Cost (in Millions $)
Rest Areas	Mohawk	16	31	0.12	2.55	1.23
	Ehrenberg	53	83	0.16	3.14	1.32
	Bouse Wash	55	95	0.13	4.89	4.34
	Burnt Well	103	163	0.16	3.09	1.49
	Sacaton	20	59	0.08	1.67	0.80
	Texas Canyon	17	60	0.07	1.37	0.66
	San Simon	80	116	0.16	3.38	1.63
	Meteor Crater	140	261	0.16	3.19	1.54
Safe Lots	I-10 at US 191	85	85	0.17	3.53	1.70
	I-10 at Sibyl Rd	37	37	0.17	3.53	1.70
	B-10/SR186 TI	127	127	0.17	3.53	1.70
	I-40 at Hibbard	158	158	0.17	3.53	1.70
	I-40 at Crazy Creek	176	176	0.17	3.53	1.70
	I-40 at Seligman	72	72	0.17	3.53	1.70

The prioritization scoring and BCA with weighted ranking of sites for truck parking implementation are summarized in Table 4-17.

Table 4-17. Truck Parking Implementation Overall Site Ranking

Site ID		Prioritization Criteria								Potential Truck Spaces to be Added	Truck Spaces Needed	Ranking
		Parking Demand	Parking Need Met	Improvements at Rest Areas	Economy	Benefit-Cost	Project Readiness	Funding	Weighted Score			
Rest Areas	Mohawk	1	0.64	0.64	2	1	2	1	1.13	16	25	14
	Ehrenberg	2	0.66	0.66	3	3	2	1	1.93	53	80	4
	Bouse Wash	1	1.00	1.00	3	2	1	1	1.40	55	48	10
	Burnt Well	3	0.82	0.82	3	3	1	1	2.16	103	125	1
	Sacaton	1	0.53	0.53	3	1	2	1	1.21	20	38	13
	Texas Canyon	3	0.09	0.09	2	1	2	1	1.62	17	186	9
	San Simon	3	0.67	0.67	2	1	2	1	1.73	80	120	8
	Meteor Crater	3	1.00	1.00	3	1	1	1	1.8	140	122	6
Safe Lots	I-10 at US 191	2	0.85	0	2	3	1	1	1.73	85	100	7
	I-10 at Sibyl Rd	2	0.43	0	2	1	1	1	1.26	37	86	12
	B-10/SR186 TI	3	0.68	0	2	2	2	1	1.90	127	186	5
	I-40 at Hibbard	3	1.00	0	3	2	1	1	1.95	158	158	3
	I-40 at Crazy Creek	3	1.00	0	3	3	1	1	2.15	176	162	2
	I-40 at Seligman	2	0.90	0	2	1	1	1	1.34	72	80	11

4.8 Recommended Projects and Actions

Based on the prioritization ranking criteria, the sites that would have the greatest impacts for truck parking expansion are as follows:

1. Burnt Well Rest Area
2. Meteor Crater Rest Area
3. B-10/SR186 TI Safe lot
4. Crazy Creek Safe lot
5. Ehrenberg Rest Area
6. San Simon Rest Area
7. Bouse Wash Rest Area
8. Seligman Safe lot
9. Sacaton Rest Area
10. Mohawk Rest Area

Spreading the investment by corridor and prioritizing Burnt Well Rest Area, Meteor Crater Rest Area, and B-10/SR 186 TI safe lot will cost $28.95 million

To effectively make use of truck parking expansion funding, the sites were prioritized based on the improvement across multiple corridors of need with a pragmatic parking prioritization and implementation. The NHFP funding to the current truck parking expansion projects along I-17 (Christensen, McGuireville, and Sunset Point Rest Areas) amounts to $10.4 million and the current truck parking expansion project along I-40 at Haviland Rest Area amounts to $7.6 million. The remaining $32 million allotted to truck parking expansion may be distributed between sites at Burnt Well Rest Area ($9.1 million), Meteor Crater Rest Area ($10.97 million), and at B-10/SR 186 TI safe lot ($8.88 million). These prioritized sites amount to a total of $28.95 million.

The prioritized truck parking implementation recommendations are summarized in Table 4-18. Sites that were analyzed but not recommended for further consideration are summarized in Table 4-19.

Table 4-18. Truck Parking Expansion Prioritized Recommendations

Priority Rank	Site ID	Route	Travel Direction Served	Type of Parking Expansion	Number of Anticipated Truck Spaces Gained	Total Cost (in Million $)
1	Burnt Well Rest Area	I-10	Both	Expand truck parking by expanding rest area ROW and provide overflow alternate pavement lot in SE corner of existing rest area. Provide overflow alternate pavement lot in NW corner of existing rest area.	103	9.1
2	Meteor Crater Rest Area	I-40	Both	Provide overflow alternate pavement lot for truck parking area in the SW corner of the existing rest area.	140	10.97
3	B-10/SR186 TI Safe lot	I-10	Both	Expand truck parking within the existing ROW. Utilize existing ramps for minor realignment at traffic interchange. Provide alternative pavement in truck parking lot.	127	8.88
					Subtotal Parking Expansion Cost	28.95
4	Crazy Creek Safe lot	I-40	Both	Expand truck parking within the existing ROW. Provide new on/off ramps and alternative pavement in truck parking lot.	176	10.46
5	Ehrenberg Rest Area	I-10	Both	Expand truck parking within the existing ROW by relocating ramp along freeway with new ramp gore(s).	53	5.95
6	San Simon Rest Area	I-10	Both	Provide overflow gravel parking area.	80	7.85
7	Bouse Wash Rest Area	I-10	Both	Expand truck parking within the existing ROW using minor ramp realignments and provide overflow parking.	55	4.6
8	Seligman Safe lot	I-40	Both	Expand parking within the existing ROW by providing on/off ramps along freeway with new ramp gore(s).	72	8.28
9	Sacaton Rest Area	I-10	Both	Expand truck parking within the existing ROW using minor ramp realignment.	20	5.57
10	Mohawk Rest Area	I-8	EB	Expand truck parking within the existing ROW using minor ramp realignment.	16	2.36
					Total Parking Expansion Cost	74.02

Table 4-19. Other Truck Parking Sites Not Prioritized

Site ID	Route	Travel Direction Served	Reasoning for No Truck Parking Expansion	Number of Anticipated Truck Spaces Gained	Total Cost (in Million $)
Hibbard Safe Lot	I-40	Both	Close proximity to Meteor Crater Rest Area, which is developing additional truck parking spaces that meet the future demand in 2032	158	13.84
US 191 TI Safe Lot	I-10	WB	Close proximity to B-10/SR 186 safe lot, which is developing additional truck parking spaces that meet the future demand in 2032	85	7.37
Texas Canyon Rest Area	I-10	Both	Close proximity to B-10/SR 186 safe lot, which is developing additional truck parking spaces that meet the future demand in 2032	17	4.59
Sibyl Road TI Safe Lot	I-10	EB	Close proximity to B-10/SR 186 safe lot, which is developing additional truck parking spaces that meet the future demand in 2032	37	3.68

Appendices