FINAL TECHNICAL REPORT

Study of Adequacy of Commercial Truck Parking Facilities - Technical Report

Prepared for

Federal Highway Administration
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101

FOREWORD

This report provides technical documentation supporting the Report to Congress on the study called for in Section 4027 of the Transportation Equity Act for the 21st Century to "determine the location and quantity of parking facilities as commercial truck stops and travel plazas and public rest areas that could be used by motor carriers to comply with Federal hours of service rules." This report documents the analysis of commercial truck parking demand and supply and summarizes activities State partnership groups identified for addressing areas with parking shortages.

Janet A. Coleman
Director, Office of Safety Programs
Safety Core Business Unit

Michael F. Trentacoste
Director, Office of Safety
Research and Development

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16. Abstract This report documents the findings of a study to investigate the adequacy of commercial truck parking facilities serving the National Highway System (NHS). The study involved: 1) a national assessment of the extent and geographic distribution of parking shortages, 2) research to clarify drivers' parking-related needs and decision-making, and 3) development of a technical guidance document to be used by partnerships of public- and private-sector stakeholders in 49 States (excluding Hawaii) for inventorying current facilities serving the NHS, analyzing current and projected shortages in commercial truck parking at public rest areas and commercial truck stops and travel plazas, and developing plans for action at the appropriate jurisdictional levels. The process involved: 1) the development of an inventory of public and commercial truck spaces serving the NHS, 2) development, calibration, and application of a truck parking demand model, 3) a national survey of truck drivers to determine how drivers plan for and address their parking needs, how truck drivers select when, where, and at which facilities they park, and what truck drivers think of the adequacy of current parking facilities, 4) an estimate of parking demand using a modeling approach, 5) identification of parking deficiencies at the State and corridor level by comparing supply and demand, and 6) identification of improvements that were recommended by State partnerships to mitigate any existing or future problems identified.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
	AREA			
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
	VOLUME			
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 l shall be shown in m^3.				
	MASS			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
	ILLUMINATION			
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
	FORCE and PRESSURE or STRESS			
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
	VOLUME			
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
	MASS			
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
	TEMPERATURE (exact)			
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
	ILLUMINATION			
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
	FORCE and PRESSURE or STRESS			
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised September 1993)

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ACRONYMS

AADT	Annual Average Daily Traffic
ART	America's Road Team
ATA	American Trucking Association
CORBOR	National Corridor Planning & Development Program and Coordinated Border Infrastructure Program
CVSA	Commercial Vehicle Safety Alliance
DOT	Department of Transportation
FHWA	Federal Highway Administration
HOS	Hours of Service
HPMS	Highway Performance Monitoring System
IFTA	International Fuel Tax Agreement
IRP	International Registration Plan
ITS	Intelligent Transportation System
MFCA	Motor Freight Carriers Association
NATSO	National Association of Truck Stop Operators
NHS	National Highway System
NITL	National Industrial Transportation League
NPTC	National Private Truck Council
NTSB	National Transportation Safety Board
OOIDA	Owner-Operator Independent Driver Association
PATT	Parents Against Tired Truckers
PMAA	Petroleum Marketers Association of America
SH/LH	Short-Haul/Long-Haul
TEA-21	Transportation Equity Act for the 21st Century
VMS	Variable Message Sign

EXECUTIVE SUMMARY

This report documents the findings of a study undertaken to investigate the adequacy of commercial truck parking facilities serving the National Highway System (NHS) in response to Section 4027 of the Transportation Equity Act for the 21st Century (TEA-21). Section 4027 requires the following:

> *...a study to determine the location and quantity of parking facilities at commercial truck stops and travel plazas and public rest areas that could be used by motor carriers to comply with Federal hours of service rules. The study shall include an inventory of current facilities serving the National Highway System, analyze where shortages exist or are projected to exist, and propose a plan to reduce the shortages. The study may be carried out in cooperation with research entities representing motor carriers, the travel plaza industry, and commercial motor vehicle drivers.*

To assist in the preparation of this report, the Federal Highway Administration (FHWA) encouraged the creation of partnerships of public- and private-sector stakeholders at the State level and provided a technical guidance document for their use in conducting an inventory of current facilities serving the NHS, analyzing current and projected shortages, and developing plans for action at the appropriate jurisdictional levels. FHWA provided technical assistance to the partnerships to guide them in completing these activities. FHWA division offices worked closely with the partners for approximately one year and provided guidance and advice on forming and structuring partnership membership, conducting partnership meetings to review inventory and analysis results, and preparing partnership status reports that describe actions to mitigate any parking shortfalls identified. This report summarizes the results of this effort.

This study of the NHS is a follow-up to a previous study of the Interstate Highway System completed in 1996.[1] Subsequent to this 1996 report, a number of States also conducted studies of truck rest parking needs and availability within their jurisdictions.

FHWA solicited input on the truck rest parking issue through the Rest Area Forum, which FHWA hosted in Atlanta, GA, on June 29–30, 1999. Forum participants included more than 70 State Department of Transportation (DOT) and enforcement officials, representatives of the motor carrier industry, commercial truck-stop operators, commercial drivers, safety advocates, and other interested parties.[2]

In addition, on May 21, 1999, FHWA issued a Request for Information (RFI-ST-001) to obtain feedback on how best to design, focus, and conduct the Section 4027 study. Five individuals or organizations responded. The results from the 1996 report and individual States' subsequent studies, input from the Rest Area Forum participants, and responses to the Request for Information can be summarized as follows:

- Many Rest Area Forum participants and respondents to the Request for Information voiced the sentiment that we now know the problem and, therefore, should focus on solutions rather than on more studies. One significant exception is a response to the Request for Information that recommends: "The TEA-21 study should count all private- and public-sector spaces to accurately assess the truck parking situation."

- Parking shortages are concentrated and solutions thereto should be targeted at a corridor or regional level; therefore, the analysis of shortages and development of solutions should be performed at the corridor, State, or sub-State rather than the national level.

- Satisfying drivers' rest parking needs in corridors or regions with either real or perceived shortages in parking supply is likely to require public, private, and public-private solutions. Identifying consensus

solutions among parties with competing interests is likely to be easier and more successful at the corridor, State, or sub-State level.

- A major unknown and point of contention is whether, or to what extent, public rest area and commercial truck-stop parking are interchangeable. To supply parking where drivers need it, a better understanding of their parking-related needs and decision-making processes is required.

In consideration of this input, FHWA has undertaken a two-pronged approach to the Section 4027 study. First, FHWA contracted for research to clarify drivers' parking-related needs and decision-making processes. Second, FHWA encouraged the creation of partnerships of public- and private-sector stakeholders in 49 States (excluding Hawaii) and provided a guidance document for their use in inventorying current facilities serving the NHS, analyzing current and projected shortages, and developing plans for action at the appropriate jurisdictional levels. These partnerships provided a forum for interested parties, including State and local agencies as well as the private sector, to examine the problem and formulate strategies to mitigate any problems identified.

This report, which summarizes the work completed by these partnerships, involved the following process:

- Estimate parking demand using a modeling approach.
- Inventory public and commercial truck spaces.
- Identify deficiencies by comparing supply and demand.
- Develop recommendations for improvements to mitigate any existing or future problems identified.

Estimate Parking Demand Using a Modeling Approach

A nationwide estimate of the peak-hour demand for commercial truck parking facilities resulting from the need to comply with Federal hours-of-service (HOS) rules was conducted. The approach relied on the development of an engineering model to estimate the demand for commercial vehicle parking at public and commercial facilities. The model predicts commercial truck parking demand for a highway segment based on total truck-hours of travel and the time and duration of the stops. The model considers the effect of Federal HOS regulations on parking demand by using these regulations as part of the basis for estimating the average number of hours spent parking per hour spent driving.

A national survey of truck drivers' parking-related needs, preferences, and decision-making processes was conducted as part of the modeling effort. Surveys were distributed to a national sample of more than 2,000 truck drivers through site visits and mailings to truck stops. Survey results of drivers' preferences were used to estimate the fraction of total parking demand for public and private parking spaces.

Following are highlights from these efforts:

- There is currently an estimated peak hour demand for approximately 287,000 truck parking spaces at commercial truck stops and travel plazas and public rest areas serving Interstate highways and other NHS routes carrying more than 1,000 trucks per day.

- According to drivers' preferences, the percentages of total demand for parking at public rest areas and commercial truck stops are estimated as 23 and 77 percent, respectively.

- The 20-year forecast for the annual increase in parking demand is estimated to be 2.7 percent.

- Drivers' responses to the survey demonstrated definite preferences and priorities when it came to choosing where they would park. For long-term rest (more than 2 hours), drivers overwhelmingly

prefer commercial truck stops and travel plazas to public rest areas (78 percent to 6 percent, respectively). For short-term rest (less than 2 hours), drivers generally prefer public rest areas to commercial truck stops and travel plazas (45 percent to 19 percent, respectively). Short-haul driver preferences are the same as long-haul driver preferences, although short-haul drivers value parking facility features differently than long-haul drivers.

Additional details surrounding the national demand for commercial vehicle parking and the national survey of driver needs and preferences can be found in section 2.0 of this report.

Inventory Public and Commercial Truck Spaces

An inventory of the number of public rest areas and commercial truck stops that could be used to comply with Federal HOS rules was conducted as part of this study. The inventory included a survey of State DOTs to quantify the location and number of public rest areas. A proprietary database developed by Interstate America served as the primary basis for determining the number of spaces available at commercial truck stops and travel plazas. The driver survey also addressed features that truck drivers value at parking facilities. Highlights from the commercial truck parking supply inventory and driver survey include the following:

- An estimated 315,850 parking spaces at public rest areas and commercial truck stops and travel plazas serve Interstate highways and other NHS routes carrying more than 1,000 trucks per day.
- Approximately 10 percent of truck parking spaces are in public rest areas and 90 percent were in commercial truck stops and travel plazas.
- Expected growth of truck parking spaces at public rest areas is estimated to be smaller (5.1 percent over the next 5 years) than growth in the private sector (estimated at 6.5 percent annually).
- Truck drivers value public rest areas primarily for ease of access and convenience and value commercial truck stops and travel plazas for their amenities.
- A significant percentage (21 percent) of the parking supply used by drivers to comply with Federal HOS rules appears to occur at loading docks, company terminals, or other facilities (e.g., fast food restaurants, shopping plazas, and motels).
- Results from the driver survey and observational field studies suggest some, but not complete, interchangeability between parking spaces at public rest areas and commercial truck stops and travel plazas.

Refer to section 3.0 of this report for additional information pertaining to the supply of commercial truck parking spaces, including drivers' assessments of parking facility quality and the interchangeability of public rest areas and commercial truck stops and travel plazas.

Identify Deficiencies by Comparing Supply and Demand

A four-step process was used to determine where shortages in truck parking exist or are expected to exist. First, estimates of parking demand over roadway segments were developed using a modeling approach (section 2.0). Second, estimates of parking supply were gathered for each segment using available data sources (section 3.0). Third, a summary of the supply and demand for each roadway segment was provided to partners for review, verification, and comment. In many cases, subsequent analyses were

conducted to account for the local knowledge of partners to improve the estimates. Fourth, a final calibration of the model was completed, and the calibrated model was used to evaluate shortages (section 4.0). Highlights from these analyses follow.

- A shortage of parking at public rest areas may exist in up to 35 States, and a shortage of total parking may exist in up to 12 States.
- Shortages of parking at commercial truck stops and travel plazas are less common and, to the extent that these spaces are interchangeable, may offset shortages in parking at public rest areas.
- Although the driver survey indicates that 23 percent of the demand for truck parking spaces is at public rest areas, only 10 percent of the supply is at that type of facility.
- This imbalance in parking availability is underscored by the results of the driver survey in which 50 percent of the respondents indicated that parking is rarely or almost never available at public rest areas. Approximately 15 percent reported parking is rarely or almost never available at truck stops and travel plazas.
- The estimated growth rate of parking spaces at commercial truck stops and travel plazas (6.5 percent) will accommodate the expected growth in demand for these spaces (2.7 percent).
- The estimated growth rate of truck parking spaces at public rest areas (5.1 percent over the next five years or 1.0 percent annually) is below the estimated growth in demand for these spaces (2.7 percent annually). The increased demand for public parking will exacerbate the supply shortages already apparent for public parking unless either additional public spaces are made available or steps are taken to encourage drivers to better utilize the existing supply of private spaces.

Additional findings stemming from the analysis of commercial truck parking supply and demand, including a national summary and a State-by-State analysis of parking shortages, can be found in section 4.0 of this report.

Develop Recommendations for Improvements to Mitigate Any Existing or Future Problems Identified

The State partnerships provided a set of recommended actions to solve any parking shortages that have been identified either through this study or as a result of other similar studies conducted in recent years for their States. These actions fall into six broad categories, as listed below.

- Expand or improve public rest areas.
  - A total of 15 States have firm plans to provide additional parking spaces.
  - Eleven of these States provided a specific number of spaces for a total increase in spaces of approximately 1,600 over the next five years.
  - Improve geometric design of public rest areas to increase convenience for drivers using these facilities.
- Expand or improve commercial truck stops and travel plazas.
  - Increase yearly truck registration fees with the stipulation that these special funds can be used only by States on initiatives to address the truck parking issue.

  - Implement a program that allows States to close rest areas in locations that are well served by private-sector business and shift funds to areas where additional development is desirable.

  - Remove cost-prohibitive road improvement requirements imposed by State DOTs upon developers attempting to open new facilities.

- Encourage the formation of public-private partnerships.

  - Provide low-interest loans or grants to commercial truck stops to increase capacity.

  - Construct State-owned lots adjacent to commercial truck stops and travel plazas and enter into agreements with these owners to lease or maintain the lots.

  - Work with owners of commercial truck stops to help them promote the availability of parking in large lots close to the Interstate highway (e.g., provide signage on the highway).

- Educate or inform drivers about available spaces.

  - Develop Intelligent Transportation System deployments that provide drivers with real-time information on the location and availability of parking spaces. For example, investigate using cellular phones and radio frequencies to broadcast parking locations and availability to drivers.

  - Investigate using mailings related to credentials administration for the International Registration Plan and the International Fuel Tax Agreement as a means of distributing information on the location and type of parking spaces within the base State to participating motor carriers.

  - Publish and distribute a "trucker's map," in both paper and electronic format, that pinpoints parking facilities for drivers (both public and commercial), including lot capacity and space availability.

- Change parking enforcement rules.

  - Implement more stringent enforcement of parking rules to remove vehicles from locations such as interchange ramps.

  - Change parking limits to permit trucks more time to park at public rest areas.

  - Encourage local government and business support for constructing and operating commercial truck stop and travel plaza facilities in or near their community industrial and business parks (i.e., zoning).

- Conduct additional studies.

  - Refine the results from the present study and develop more detailed assessment strategies at specific highway locations (e.g., target heavily traveled truck corridors).

  - Establish a multi-State committee to evaluate alternatives and recommend solutions that would address the "staging" of trucks at certain locations in response to "just-in-time" delivery.

  - Conduct additional research to further refine the demand model (e.g., to accommodate local factors that can influence demand, such as a higher rate of parking near major distribution centers).

More detail on these and other suggested recommendations from the State partnerships for reducing truck parking shortages, including recommendations from the 1999 Rest Area Forum and from government and motor carrier industry stakeholders surveyed as part of this study, can be found in section 5.0 of this report.

1.0 INTRODUCTION

1.1 BACKGROUND

The role of the Federal government in addressing issues related to driver fatigue and the safety of the commercial vehicle industry began in 1937 with the promulgation of hours-of-service (HOS) rules by the Interstate Commerce Commission. These rules established limits on the number of hours that truck drivers may drive and be on duty before a mandatory rest break must be taken. Complying with these rules has created a demand for parking spaces so that commercial vehicle drivers can rest. Until recently, a rough balance seemed to exist between this demand for truck parking spaces and the spaces available at public rest areas, commercial truck stops and travel plazas, and other locations. However, changes in the trucking industry that began in the 1980s initiated disturbances to this balance.

The deregulation of the trucking industry in the early 1980s led to significant changes in the way goods and products are moved throughout the United States. Prior to deregulation, approximately 20,000 motor carriers operated in an environment in which operating authority was issued by the Interstate Commerce Commission and entry into the industry was difficult. As of 2000, approximately 500,000 interstate motor carriers operated in the United States, and projections for the next 20 years estimate continuing growth. As truck traffic on America's highways has increased, the demand for services and facilities for the trucking industry, including the demand for truck parking spaces, has increased as well.

Another significant change in the movement of goods and services was the advent of just-in-time delivery. Manufacturers now operate in an environment in which large warehouse inventories of parts and supplies are no longer maintained but, instead, are delivered by trucks in tightly scheduled deliveries such that these inputs arrive just in time to be used in the manufacturing process. Just-in-time delivery places new demands on truck parking facilities as trucks use these facilities as staging areas to better meet their delivery requirements. The combination of increased truck traffic and tighter delivery schedules is one of the primary reasons for the increased demand for truck parking, and this increased demand has resulted in perceived shortages of truck parking spaces in some parts of America.

This report documents the findings of a study to investigate the adequacy of commercial truck parking facilities throughout the Nation. The information contained in this report describes the technical details of the analyses considered by FHWA in preparing a Report to Congress in response to Section 4027 of the Transportation Equity Act for the 21st Century (TEA-21). Section 4027 requires FHWA to prepare the following:

> *...a study to determine the location and quantity of parking facilities at commercial truck stops and travel plazas and public rest areas that could be used by motor carriers to comply with Federal hours-of-service rules. The study shall include an inventory of current facilities serving the National Highway System, analyze where shortages exist or are projected to exist, and propose a plan to reduce the shortages. The study may be carried out in cooperation with research entities representing motor carriers, the travel plaza industry, and commercial motor vehicle drivers.*

To assist in the preparation of this report, FHWA encouraged the creation of partnerships of public- and private-sector stakeholders at the State level and provided a technical guidance document for their use in conducting an inventory of current facilities serving the National Highway System (NHS), analyzing current and projected shortages, and developing plans for action at the appropriate jurisdictional levels. FHWA provided technical assistance to the partnerships to guide them in completing these activities. FHWA division offices worked closely with the partners for approximately one year and provided guidance and advice on forming and structuring partnership membership, conducting partnership meetings to review

inventory and analysis results, and preparing partnership status reports that describe actions to mitigate any parking shortfalls identified. This report describes the results of this effort.

1.2 PROBLEM STATEMENT

The Federal Motor Carrier Safety Administration has tentatively estimated that driver fatigue is a primary factor in 4.5 percent of truck-involved fatal crashes and is a secondary factor in an additional 10.5 percent of such crashes.[3] A 1995 study conducted by the National Transportation Safety Board (NTSB) asserts that the most important factors in predicting a fatigue-related accident are the duration of the last sleep period, the time slept in the past 24 hours, and interruptions in sleep periods.[4] The availability of parking for commercial vehicles can affect all of these factors.

In 1996, the FHWA funded a study of parking along the Interstate Highway System in response to a Senate recommendation to evaluate the adequacy of places for truck drivers to stop and rest. [1] This study estimated a shortfall of 28,400 public truck-parking spaces nationwide. While a detailed survey of public rest areas was conducted, the survey of commercial truck stops and travel plazas was more cursory and relied on a statistical weighting of the 17 percent of commercial truck stops and travel plazas that completed and returned the survey.

This national study was followed by a number of State-specific studies documenting shortages of truck parking facilities. Minnesota completed a study of public rest area usage in 1998 that estimated potential capacity problems for more than 50 percent of the public rest areas surveyed.[5] In 1999, New York completed a study that summarized public rest area construction activities for Interstate highways in that state.[6] A Tennessee study completed in 1999 indicated that nearly 44 percent of truck parking on weekday evenings occurred on ramps and shoulders.[7] Iowa completed a study in 1999 that observed an excess demand for parking at public rest areas but sufficient supply at most commercial truck stops and travel plazas.[8]

In 1999, the NTSB began an initiative that held public hearings to obtain information about the relevant safety issues regarding trucks and buses and the ways to address these issues. The major issue addressed in the NTSB investigation was the lack of safe, available commercial vehicle parking on or near Interstates. The report also addressed the lack of information about parking available to truck drivers and the State-enforced parking time limits. In 2000, NTSB published a special investigation report that summarized the results of these hearings.[9]

Congress responded to this growing body of evidence that availability of truck parking was becoming a significant problem with potential safety implications and to the concerns raised about the previous studies of this issue by mandating, in Section 4027 of TEA-21, that a study be conducted to determine the adequacy of parking facilities. The mandated study of the NHS was intended as a follow-up study to the previously referenced 1996 study of the Interstate Highway System and was intended to address some of the criticisms of that study.

In response to this Congressional mandate, FHWA implemented a series of initiatives. The Rest Area Forum was hosted by FHWA in Atlanta, GA, on June 29 and 30, 1999.[2] Forum participants included 70 State Department of Transportation (DOT) and enforcement officials, representatives of the motor carrier industry, commercial truck stop and travel plaza operators, commercial drivers, safety advocates, and other interested parties. The forum identified 17 key issues affecting commercial vehicle parking, identified the 7 highest-priority issues, and developed recommendations to address these 7 issues.

In May 1999, FHWA issued a Request for Information (Reference Number RFI-ST-001) to obtain feedback on how best to design, focus, and conduct the Section 4027 study. Five individuals or organizations provided responses to the Request for Information. FHWA used these responses, along with the results of the 1996 report, the State studies, and the input from Rest Area Forum participants, to identify the following parameters to guide the Section 4027 study mandated under TEA-21:

- Many Rest Area Forum participants and respondents to the Request for Information believed that the rest area problem was now understood and that future work should focus on solutions rather than on more studies. One significant exception was the recommendation that "the TEA-21 study should count all private and public sector spaces to accurately assess the truck parking situation."

- Parking shortages are concentrated and, therefore, analysis of shortages and development of solutions should be targeted at a corridor, State, or sub-State level rather than at the national level.

- Satisfying drivers' rest stop parking needs in corridors or regions with either real or perceived parking supply shortages is likely to require public, private, and public-private solutions. Identifying consensus solutions among parties with competing interests is likely to be easier and more successful at the corridor, State, or sub-State level than at the national level.

- A major unknown and point of contention is the extent to which public rest area and commercial truck stop and travel plaza parking are interchangeable. To supply parking where drivers need it, their parking-related needs and decision-making processes must be better understood.

In consideration of this input, FHWA developed a two-pronged approach to completing the Section 4027 study. First, FHWA contracted for research to clarify drivers' parking-related needs and decision-making processes. The results of this research were documented in a separate report.[10]

Second, FHWA encouraged the creation of partnerships of public- and private-sector stakeholders ("Partners for Adequate Parking Facilities") to address the truck parking shortage issue at the corridor, sub-State, and State levels. To assist with this, FHWA provided a technical guidance document for conducting an inventory of current facilities serving the NHS, analyzing current and projected shortages, and developing plans for action at the appropriate jurisdictional levels.[11] FHWA also provided technical assistance to the partnerships to guide them in the completion of these activities. FHWA division offices worked closely with the partnerships over a period of approximately one year, providing guidance and advice on the following:

- Formation and membership structure of the partnerships and the conducting of partnership meetings to review inventory and analysis results.

- Preparation of partnership status reports that described actions to mitigate any parking shortfalls identified.

1.3 RESEARCH APPROACH

The research presented in this report is focused on 49 States and excludes Hawaii, the District of Columbia, and Puerto Rico. Discussions among the State partnerships for each of these States, which typically included membership representing motor carriers, the travel plaza industry, and commercial vehicle drivers, formed the basis for understanding truck parking demand and supply and helped in the development of a plan of action to address any problems that were identified. FHWA provided a technical guidance document to each partnership and encouraged the partnership to consider using the methodology

contained in that document for pinpointing parking needs and developing a plan of action to mitigate any problems identified.

A nationwide survey of parking spaces at public rest areas was conducted during the summer of 2000 to ascertain the number and characteristics of publicly owned and operated spaces for heavy trucks. An inventory of commercial truck stop and travel plaza spaces was created using a proprietary database developed and maintained by Interstate America. The information from the survey and the inventory comprised the basis to determine the location and quantity of both public and commercial parking facilities that could be used by motor carriers to comply with Federal HOS rules as required in the TEA-21 Section 4027 study.

Demand for parking on a highway segment was estimated through a modeling approach that considered the daily volume of trucks traveling across the segment, the duration of stops anticipated to comply with HOS rules, and other short-term stops (e.g., restroom breaks, phone calls). A national driver survey and field observations were also used to develop and calibrate the model. The parking demand and parking supply values over the full length of a highway segment were compared to determine whether a surplus or shortage existed. Partners examined these model estimates in light of actual observational studies or experience to provide a basis for determining the validity of the results. Where appropriate, model parameters were adjusted to better replicate observed parking demand values against modeling results.

The State partnerships discussed the supply and demand analysis results to identify roadway segments with a parking shortage. In cases in which either current or future shortfalls were identified, partners worked together to develop strategies to mitigate these shortages. Finally, the results of the study were organized and synthesized into a series of reports.

1.4 ORGANIZATION OF REPORT

This report is divided into six parts. Following this introductory section, section 2.0 contains an overview of factors affecting commercial vehicle parking demand and the modeling approach used in this study. Section 3.0 describes the commercial vehicle parking supply, and section 4.0 compares parking supply and demand. Section 5.0 outlines the recommended actions proposed by partners to reduce any shortages that were identified. Finally, section 6.0 contains a summary and the report's conclusions.

2.0 COMMERCIAL TRUCK PARKING DEMAND

2.1 FACTORS CONTRIBUTING TO PARKING SPACE DEMAND

This section summarizes an analysis that was conducted to develop an estimate of the peak hour demand for commercial truck parking resulting from the need for drivers to rest and to comply with Federal HOS rules. The two most important factors that contribute to the demand for truck parking are the need to comply with Federal HOS rules and the need for drivers to perform certain non-driving activities (e.g., eating, fueling).

Under the current HOS rules, truck drivers participating in interstate commerce are generally permitted to drive up to 10 hours after 8 consecutive hours off duty. A driver is permitted to be on duty up to 15 hours a day, with 10 hours driving and 5 hours performing non-driving tasks, after which the driver must take off 8 consecutive hours. The regulations further require that, if a motor carrier does not operate commercial vehicles every day of the week, then its drivers may not drive more than 60 hours over a 7-day period. If the motor carrier does operate commercial vehicles every day of the week, then its drivers may not drive more than 70 hours over an 8-day period. At the end of each time period, drivers are required to take a 24-hour rest break, after which the "HOS clock" restarts. These regulations induce a demand for parking spaces so that drivers who must drive more than 10 hours between their origin and destination (i.e., long-haul drivers) can obtain the required 8 hours of long-term rest. In other words, these rules typically require drivers of commercial motor vehicles to complete a period of rest while en route to a destination if the driver is unable to return home for the required rest.

In addition to the breaks required for achieving long-term rest, drivers also take regular short breaks for activities such as eating, refueling, or using bathroom facilities. These breaks induce a demand for short-term parking spaces at locations that provide amenities to support these activities. While drivers are required to obtain extended rest, there is no single agency, organization, or group that is responsible for providing drivers extended rest locations. Essentially, drivers find such locations themselves and typically rely upon two primary options: commercial truck stops and travel plazas or public rest areas. Commercial truck stops and travel plazas are designed to provide drivers an opportunity to fulfill many non-rest-related activities, while public rest areas provide the driver with only minimal services.

The demand for truck parking along a particular stretch of highway is driven not only by the general factors that induce demand, but also by other factors that affect the distribution of that demand. For example, truck drivers' desire to accommodate their natural sleep cycles results in greater demand for truck parking spaces at night than during the day. Tight delivery schedules associated with just-in-time delivery can result in demand for truck parking spaces near loading/unloading facilities because drivers use these spaces as staging areas to help ensure on-time delivery. Truckers who drive as teams are likely to have different parking requirements because one team member can drive while the other rests. Also, some States limit parking at public rest areas, encouraging commercial drivers to seek other locations for parking.

Taken together, these factors can result in complex demand patterns for truck parking. For example, HOS rules require rest periods away from home primarily for long-haul drivers; a short-haul driver will typically arrive at the destination before a mandatory rest is required. Therefore, highways with a larger proportion of long-haul drivers (relative to the total number of trucks on the road) will typically generate a larger demand for truck parking than other highways. Because short-haul drivers are not required to take an extended rest, one might expect them to take more frequent, shorter breaks, which would favor the use of public rest areas over commercial truck stops and travel plazas. Stretches of a highway that are 8 to 10 hours

from a center of commercial traffic might be expected to have higher parking demand because the HOS rules will force drivers from that origin to take an extended rest before driving further. Alternately, an area near a significant commercial vehicle destination may have a substantial early morning parking demand as drivers use rest facilities as staging areas while waiting for the loading/unloading facilities to open.

While the factors listed above help determine the total demand for truck parking in an area (i.e., the latent demand), other factors help determine how that demand is distributed among the available parking locations (i.e., the demand choice). For example, drivers wanting to take a short break are more likely to choose a location for its convenience, while drivers taking a long break are more likely to choose a location that has more favorable amenities. Drivers taking a break for a specific activity (e.g., to take a shower) will park at only a location that supports that activity. If one stretch of highway has a shortage of parking locations, demand that cannot be met on that stretch of highway will be met by parking locations on nearby stretches of highway.

The primary purpose of this section is to discuss the factors that can affect latent demand for commercial vehicle parking and to describe a model to estimate this demand; this helps meet the stated objective of the Section 4027 study to "analyze where shortages exist or are projected to exist." A secondary goal is to evaluate some of those factors that affect the demand choice because, even in an area in which sufficient parking spaces exist, drivers may still choose to park at inappropriate locations such as on the shoulder of a road. A three-step approach was used to achieve these goals:

1. Administer a national survey of driver parking needs and preferences.
2. Develop a model for commercial vehicle parking demand.
3. Use the model to generate national demand estimates.

The remainder of this section documents the process followed to complete these steps, lists the results of each step, and identifies conclusions from these results.

2.2 NATIONAL SURVEY OF DRIVER PARKING NEEDS AND PREFERENCES

The first step in evaluating the demand for commercial vehicle parking was to administer and evaluate a national driver survey about driver parking needs and the adequacy of current parking facilities. This survey accomplished two goals. First, it helped better characterize the factors that affect parking demand, which assisted in the design of the demand model. For example, the survey results helped explain the preference for parking at either a public rest area or a commercial truck stop or travel plaza. Second, the survey provided data that were used to verify some of the assumptions in the model. It has already been noted that the ratio of long-haul to short-haul vehicles could have an important effect on parking demand; the survey results helped identify differences in the parking patterns of long-haul and short-haul drivers. The survey methodology and some of the results of this survey are summarized in this document. A separate report presents a complete description of the national driver survey report.[10]

2.2.1 Survey Methodology

The six-page driver survey was developed with input from a broad spectrum of public- and private-sector stakeholders. The surveys were tested and found to be acceptable during a small pilot or trial survey of 40 respondents at public rest areas and commercial truck stops and travel plazas. The respondents did suggest that distribution at commercial truck stops would be more effective because the quick stops taken by most drivers at public rest areas would not allow time for the completion of the survey. After careful consideration, the advice to survey at only commercial truck stops was followed. To determine whether

omitting public rest areas from the list of distribution locations would limit the sample of short-haul drivers, the survey team asked short-haul drivers if they use commercial truck stops and travel plazas as often as they use public rest areas. Short-haul drivers consistently indicated that they use both types of facilities equally. Therefore, to maximize response rate and minimize negative impact on drivers' time, commercial truck stops and travel plazas were used exclusively for the survey distribution. A geographically stratified sample of commercial truck stops and travel plazas was selected at which to gather data to help ensure a nationally representative distribution of respondents (see figure 1).

Two methods were used to gather survey results at the selected commercial truck stops and travel plazas. At 20 locations, researchers made site visits and distributed surveys to truck drivers at those sites. The response rate at those sites was 80 percent, collecting a total of 1,042 completed surveys. At 22 other locations, commercial truck stop and travel plaza operators agreed to make the surveys available in heavily traveled areas of the truck stop and to ship back completed surveys. This resulted in nearly 1,100 additional completed surveys.

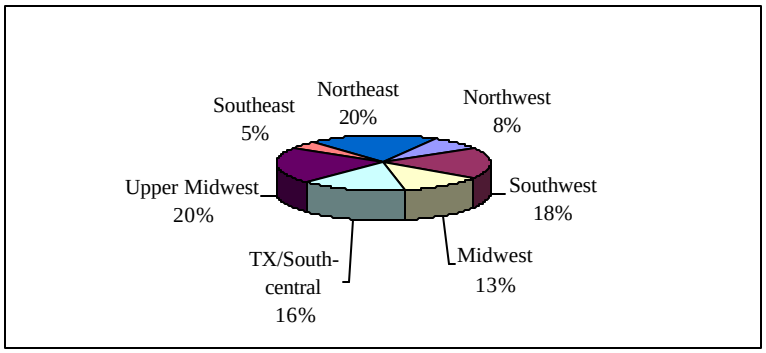

Figure 1. Respondent distribution by region.

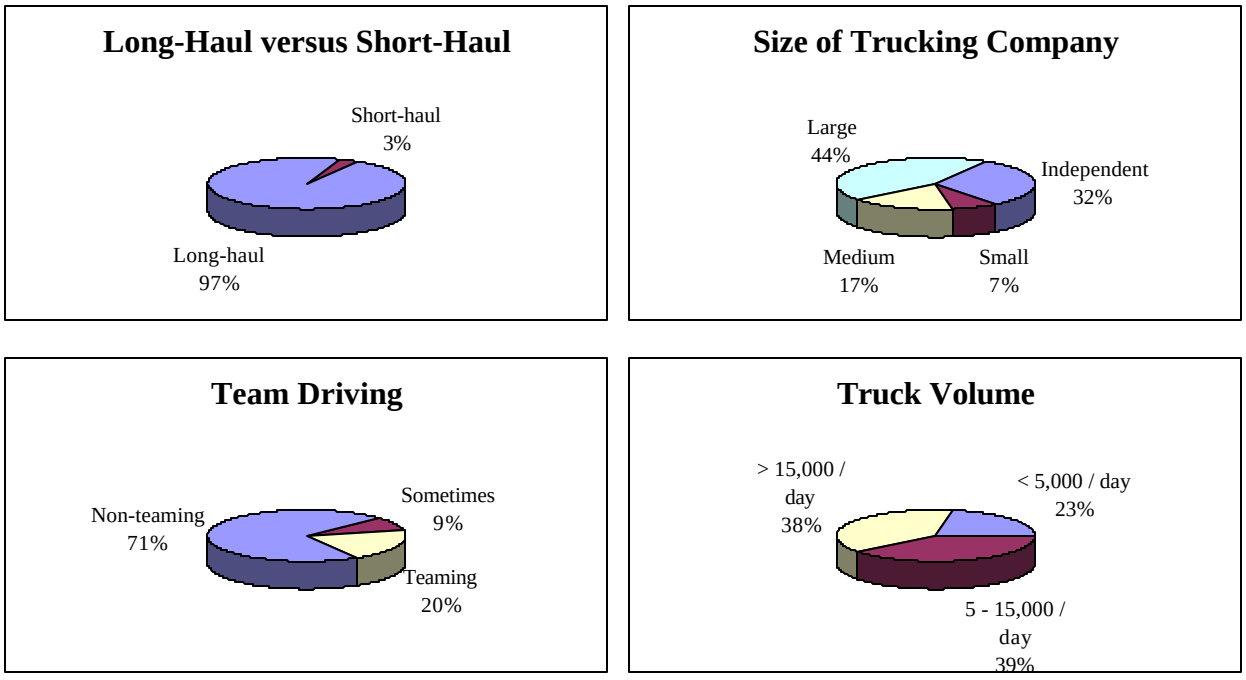

Figure 2. Demographics of truck driver respondents.

The charts in Figure 2 describe the distributions of the respondents in terms of the following four factors: (1) long-haul versus short-haul drivers; (2) the size of the company for which the driver works (independent, small, medium, or large); (3) whether the driver often works as part of a driving team (non-teaming, sometimes, or teaming); and (4) the truck volume of the location at which the survey was taken (< 5,000

trucks per day, 5,000 to 15,000 trucks per day, or > 15,000 trucks per day). The distribution of the respondents between long-haul and short-haul drivers is *not* characteristic of the commercial vehicle driver population; intercept surveys performed at weigh stations indicated that 35 to 65 percent of drivers, depending on the location, are on short-haul trips. This discrepancy between the real-world and sample demographics indicates that care should be taken when interpreting the survey results on factors that may differ between short-haul and long-haul truck drivers. (The survey results primarily represent only long-haul drivers; however, as previously mentioned, a trial survey of short-haul drivers indicated that these drivers use commercial truck stops as often as they use public rest areas. Also, the lack of short-haul driver representation in the sample is due largely to self-selection. When approached by members of the survey team, these drivers indicated that the Truck Parking Needs and Preferences survey was not relevant to them. Most of the short-haul drivers that were approached elected not to participate in the survey.) No attempt was made to confirm whether the other demographic factors are consistent with the population of truck drivers as a whole.

2.2.2 Survey Results

This survey seeks to answer two questions that are fundamental to the truck parking shortage:

- Where do drivers prefer to park, and what factors affect a driver's decision on where to park?
- Are there sufficient parking spaces available, and if not, what can be done to eliminate the shortages?

Figure 3 addresses the first question, indicating that drivers stopping for a quick nap (two hours or less) have a slight preference for parking at a public rest area, and drivers stopping for an extended rest (more than two hours) strongly prefer a commercial truck stop or travel plaza to a public rest area.

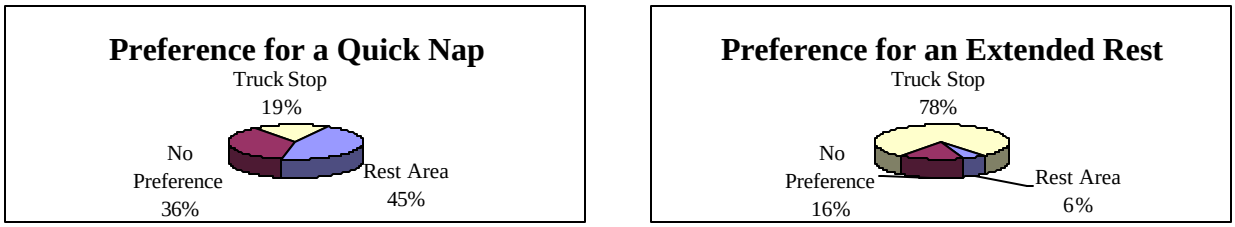

Figure 3. Preferred parking locations.

The survey addressed parking location by asking drivers where they had most recently stopped for sleep and where they expected to next park their trucks to sleep. Table 1 summarizes the responses to this question and helps validate the results from the previous question; the stated preference for parking at commercial truck stops and travel plazas for sleep is consistent with the locations at which the drivers last parked and expect to park next.

Table 1. Driver parking locations.

Facility	Last Stop	Next Stop
Home	9%	8%
Truck Stop	56%	58%
Public Rest Area	8%	7%
Loading Dock	10%	14%
Ramp	4%	2%
Other	11%	9%
No Response	4%	4%

The second part of the question regarding the preference for truck parking locations is designed to identify the factors that affect a driver's decision on where to park. One factor is already apparent: the preferred parking location is dependent on whether the driver is making a long or a short stop. Other factors that drivers rate as important when choosing a place to park include availability of restrooms, convenience to the highway, availability of showers, availability of a restaurant, availability of public phones, a well-lit parking area, and availability of fuel.

Because of the safety issues involved with parking on ramps and shoulders, the survey specifically asked for the four most common reasons why truck drivers sometimes park on entrance or exit ramps and highway shoulders. The following list includes the most common responses to this question, reinforcing the fact that the dominant problem in truck parking is one of availability; truck drivers do not prefer to park on ramps and shoulders but do park there when unavailable parking elsewhere forces them to.

- No empty spaces are available at nearby facilities (94 percent).
- There are no nearby parking facilities (83 percent).
- Time limits at nearby facilities are too short (50 percent).
- Empty spaces are available at nearby facilities, but access is blocked (50 percent).

The second question, whether a parking shortage exists and how to correct any shortage that does exist, was also addressed in this survey. Figure 4 indicates truck driver opinions on how often parking is available at public rest areas and commercial truck stops and travel plazas.

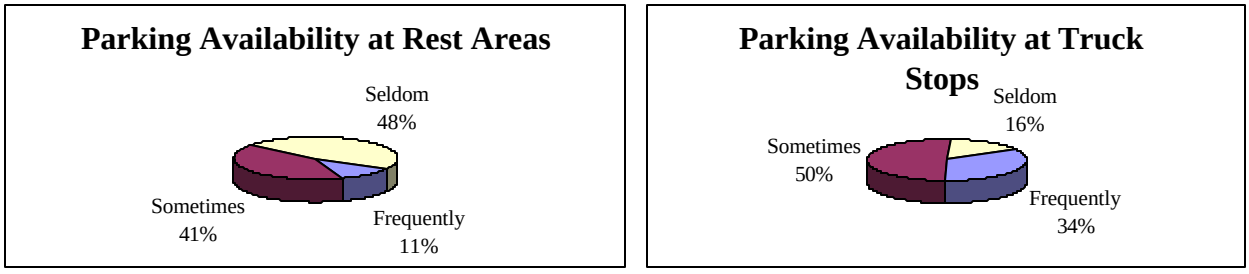

Figure 4. Parking availability at public rest areas and commercial truck stops and travel plazas.

Truck drivers perceive a significant problem with finding parking at public rest areas and a much smaller problem with finding parking at commercial truck stops and travel plazas. When asked to rank methods for improving truck parking facilities, the respondents identified the following methods as most important:

- Build more commercial truck stop and travel plaza parking spaces – 79 percent listed in top 5.
- Build more public rest area parking spaces – 66 percent listed in top 5.
- Stop enforcement officers from waking driver – 57 percent listed in top 5.
- Eliminate time limits – 49 percent listed in top 5
- Improve parking configuration (e.g., more pull-through parking) – 46 percent listed in top 5.
- Separate truck, car, and recreational vehicle parking – 41 percent listed in top 5.

2.3 NATIONAL COMMERCIAL VEHICLE PARKING DEMAND MODEL

A modeling approach was employed to develop an estimate of the demand for commercial vehicle parking spaces at public facilities (i.e., rest areas, weigh stations) and commercial facilities (e.g., truck stops and travel plazas, motels, fast food restaurants). First, a model was developed to estimate the demand for truck parking for highway segments; this model is summarized in section 2.3.1. Second, field measurements of truck parking demand were made to calibrate the model. The field measurements included all available parking along a highway corridor, including space available at public rest areas, commercial truck stops and travel plazas, hotels and motels, fast food restaurants, shopping malls, and exit ramps. Thus, the calibrated model estimates total demand for parking along a highway corridor. Intermediate model results and model parameters were provided to State partnerships so that they could review the results and model parameters to ensure that they were consistent with local observations. Finally, the model was calibrated and used to estimate the demand for truck parking for all highway segments that are part of the NHS. A complete description of the development and use of the demand model is documented in a separate report, and the following three sections summarize that description.[12]

2.3.1 Model Development

This description of the model occurs in two parts. The first part describes a highly simplified version of the model that still captures most of the key elements. This section should be used to become familiar with the general nature and limitations of the model and concludes with a list of factors that are not considered in the simplified model. The second part describes the additional factors that are considered in the final model.

2.3.1.1 The Simplified Demand Model

The simplified model predicts the demand (D) for commercial truck parking spaces along a highway segment based on total truck-hours of travel per day (THT) on that segment and the average parking time per truck-hour of travel (P_{avg}).

$$D = THT \cdot P_{avg} \tag{1}$$

The average truck-hours of travel per day for a segment is estimated from the formula:

$$THT = P_t \cdot AADT \cdot L/S \tag{2}$$

where P_t is the percent of vehicles that consists of commercial trucks, $AADT$ is the annual average daily traffic, L is the length of the segment, and S is the speed limit or average truck speed. The term P_{avg} is a parameter that is estimated during the calibration step to best fit the calibration data.

Although this model is conceptually appealing and simple to understand, it does include several limitations. The list below describes some of these limitations and how the simplified model was adapted to help circumvent these limitations. The demand model used in this study is the result of these modifications.

- The goal of this study is to estimate parking shortages that will occur at peak parking demand. The formula used to estimate THT is for the average truck-hours of travel per day, not the peak. This formula should be adjusted to consider both seasonal and daily variations in the truck volume. The demand model includes a term F_s in the estimate for THT that accounts for the seasonal variation in truck volume, and an F_s value of 1.15 is assumed to apply for all segments. In other words, the seasonal peak truck volume is assumed to be 15 percent greater than the annual average daily truck

volume. The demand model uses peak parking factors to account for large demands during certain times of the day.

- As described above, the average parking time per truck-hour of travel varies significantly between long-haul and short-haul trucks. The demand model accounts for this difference by estimating the demand separately for long-haul and short-haul trucks and summing these to estimate the total demand. This involves (1) introducing a new term, the short-haul to long-haul ratio (*SH/LH*), that is used to "split" the total truck-hours of travel per day into the number of truck-hours of travel for short-haul trucks and the number of truck-hours of travel for long-haul trucks and (2) estimating a separate value of P_{avg} for long-haul and short-haul trucks.

- The term *SH/LH* can vary dramatically between different highway segments depending on a number of factors, such as the proximity to a population center that is the focus of short-haul transportation and whether the segment is part of a major, long-distance transportation corridor. The demand model uses two values for the term *SH/LH*: one value is used for segments classified as rural segments, while another value is used for segments classified as urban segments.

- It is important for the model to differentiate between the demand for public parking spaces at public rest areas and private parking spaces at commercial truck stops and travel plazas. The model estimates public and private parking demand by estimating total demand and introducing a factor (P_{RA}), based on drivers' preferences, representing the percent of total demand that is for public rest area parking and a factor ($P_{TS} = 1 - P_{RA}$) representing the percent for commercial truck stop and travel plaza parking. The model does not consider variations in these factors that might exist between long-haul and short-haul drivers.

- The parameter P_{avg}, which represents the ratio of truck parking time at public rest areas and commercial truck stops and travel plazas (including weigh stations, fast food restaurants, hotels, etc.) to the truck driving time, can be estimated directly from survey results that describe the percent of time a truck driver spends driving, at home, and resting away from home. This parameter is influenced by HOS rules, differs between long-haul and short-haul drivers, differs between public and private parking spaces, and may differ with other factors such as geographical region and type of highway. The model includes separate values of P_{avg} for long-haul and short-haul drivers but does not consider other factors that might affect this parameter. Researchers estimated the value of this parameter based on the limitations imposed by HOS rules and information gathered during the driver survey about how drivers spend their time.

There are other factors that could influence the demand for truck parking (e.g., geographical variations in the short-haul to long-haul ratio). However, the above list summarizes those that were considered in the final demand model developed for this study.

2.3.1.2 The Demand Model

The final demand model uses the general equations and modifications described in the previous section to estimate commercial vehicle parking demand for the NHS. The factors that are used in the final model can be divided into two categories: model variables and model parameters.

The model variables (listed in table 2) are the values on the right-hand side of equation (2), which define each highway segment and the commercial vehicle volume on the segment. The values for these variables were obtained from either the Highway Performance Monitoring System[13] (HPMS) or through a State's own databases and information systems. It is these factors that create differences in the estimates for parking demand for different highway segments.

Table 2. Demand model variables.

Variable	Description
L	Length of the highway segment (mi)
$AADT$	Annual average daily traffic (vehicles per day)
P_t	Percent of daily traffic consisting of commercial trucks
S	Speed limit of highway, or average truck speed (mi/h)

The model parameters are the values (like F_s) that are used to adjust the truck volume estimate of equation (2) and other values that are used to estimate the term P_{avg} in equation (1). The parameter values were typically estimated from either other data sources, such as the driver surveys, or from calibrating the model based on empirical measurements made as part of this study. Table 3 lists the model parameters and the values of these parameters used in the demand model.

Table 3. Demand model parameters.

Parameter	Description	Value
F_s	Seasonal peaking factor	1.15
SH/LH	Short-haul to long-haul ratio	0.36/0.64, 0.07/0.93
D_{ST}	Short-term parking duration per hour traveled	5 min/h
$T_{DRIVING}$	Time driving for long-haul drivers	70 h/8 days
T_{HOME}	Time at home for long-haul drivers	42 h/8 days
$T_{LOAD/UNLOAD}$	Time loading and unloading for long-haul drivers	15 h/8 days
$T_{SHIPPER/RECEIVER}$	Time at shipper/receiver for long-haul drivers	16 h/8 days
P_{RA}, P_{TS}	Portion of demand for public rest areas/commercial truck stops	0.23, 0.77
PPF_{SH}	Peak-parking factor for short-haul trucks	0.02
PPF_{LH}	Peak-parking factor for long-haul trucks	0.09
PR_{LH}	Long-haul parking ratio	0.7833

The model parameters are defined as:

- Seasonal peaking factor. This is the ratio of seasonal peak average daily truck volume to average daily truck volume. This value, representing a peak truck volume of 15 percent above the average, was assumed.

- Short-haul to long-haul ratio. This is the ratio of the number of trucks performing short-haul trips to those performing long-haul trips. Because this ratio will be different for segments in populous regions (urban segments) and those in less populous regions (rural segments), two values were used. An origin-destination study performed as part of this study estimated a value of 0.32/0.68 for urban segments. The values of 0.36/0.64 for urban segments and 0.07/0.93 for rural segments were derived during the model calibration. Some States provided specific values for the short-haul to long-haul ratio, in which case those values were used instead of the calibrated values.

- Short-term parking duration per hour traveled. This is the number of minutes (on average) spent parking per hour traveling. A value of five minutes was assumed. This assumption was based on professional judgment and information obtained from talking with drivers about their typical stopping patterns.

- Time driving for long-haul drivers. This is the average number of hours spent driving during an 8-day period. A value of 70 was used, based on HOS rules.

- Time at home for long-haul drivers. This is the average number of hours spent at home during an 8-day period. A value of 42 was derived from responses to the driver survey performed during this study. (On average, drivers stated they sleep at home 6.7 days per month. Multiplying this by 12 months per year, multiplying by 24 hours per day, dividing by 365 days per year, and multiplying by 8 days per 8-day period results in an estimate of 42 hours per 8-day period.)

- Time loading and unloading for long-haul drivers. This is the average number of hours spent loading/unloading during an 8-day period. A value of 15 was derived from responses to the driver survey performed during this study. (The question on which this estimate was based was not part of the original driver survey and was asked of only about 30 drivers.)

- Time at shipper/receiver for long-haul drivers. This is the average hours spent parking at a shipper/receiver (e.g., for rest, waiting to load/unload) during an 8-day period. A value of 16 was derived from responses to the driver survey performed during this study. (On average, drivers stated they stopped for long-term rest at a shipper/receiver 2.6 times per week. Assuming a 6-hour stay each time, drivers spent an average of 16 hours per week resting at these facilities.)

- Portion of demand for public rest areas and commercial truck stops and travel plazas. The proportions of total parking demand for rest area spaces and truck stop spaces were derived from responses to questions in the driver survey regarding where drivers prefer to stop for different activities (e.g., long-term rest, restroom, meal, etc.). The values were derived as follows: 1) the number of driver responses for each preference category (i.e., rest area, truck stop, no preference) was weighted according to the average amount of time spent parking for each activity (thereby converting number of drivers into number of truck-hours of parking according to preference); 2) the truck-hours of parking were then summed for each preference category; 3) the truck-hours of parking in the "no preference" category were then divided evenly between the rest-area and truck-stop preference categories; and 4) the total truck-hours of parking for rest areas and truck stops were then divided into the overall total truck-hours of parking. The resulting proportions of parking demand for rest area and truck stop spaces were 0.23 and 0.77, respectively.

- Peak-parking factor for short-haul trucks. This is the ratio of parking demand (in spaces) during peak demand hours to total daily parking demand (in hours) for short-haul trucks. If parking demand was evenly distributed throughout the day, this value would be 1/24 or about 0.04. Because parking demand for short-haul trucks is concentrated during the day and overall peak parking demand occurs at night, this number should be smaller than 0.04. A value of 0.02 was assumed.

- Peak-parking factor for long-haul trucks. This is the ratio of peak parking demand (in spaces) to total daily parking demand (in hours) for long-haul trucks. If parking demand were evenly distributed throughout the day, this value would be 1/24 or about 0.04. Because parking demand for long-haul trucks is concentrated during the overnight hours due to drivers stopping to rest, this number should be greater than 0.04. A value of 0.09 was derived during model calibration.

- Long-haul parking ratio. This is the ratio of the total parking time to the total driving time for long-haul trucks. The following equation is used to estimate this parameter:

$$PR_{LH} = \frac{8days \cdot 24hr/day - T_{DRIVING} - T_{HOME} - T_{LOAD/UNLOAD} - T_{SHIPPER/RECEIVER}}{T_{DRIVING}} + \frac{5\,\text{min}}{60\,\text{min}} = 0.7833$$

2.3.1.3 Model Calibration and Validation

The demand model includes three calibration parameters: the value of *SH/LH* for rural segments, the value of *SH/LH* for urban segments, and the value of PPF_{LH}. Table 4 presents the results of the field survey and the final model calibration.

Table 4. Field survey results for model calibration.

Region	Corridor	Segment	Observed Trucks	Model Estimate	Error
Atlanta, GA	1	I-20 AL State line to Atlanta	807	550	-32%
Atlanta, GA	1	I-75 Atlanta to Macon	859	1,202	40%
Atlanta, GA	1	I-16 Macon to Soperton	186	158	-15%
Atlanta, GA	1	I-16 Soperton to Savannah	161	194	20%
Atlanta, GA	1	Corridor Subtotal	2,013	2,104	4%
Atlanta, GA	2	I-75 Bolingbroke to Cordele	641	487	-24%
Atlanta, GA	3	I-95 Port Wentworth to Darien	415	473	14%
Atlanta, GA	1-3	Region Subtotal	3,069	3,064	0%
Pocatello, ID	4	I-15 UT State line to MT State line[1]	427	457	7%
Pocatello, ID	4	US-20 Idaho Falls to MT State line[1]	54	118	119%
Pocatello, ID	4	Corridor Subtotal	481	575	20%
Pocatello, ID	5	I-84 OR State line to Mountain Home[1]	763	530	-30%
Pocatello, ID	5	I-84 Mountain Home to UT State line[1]	817	1,003	23%
Pocatello, ID	5	I-86 Jct. I-84 to Pocatello[1]	92	174	89%
Pocatello, ID	5	Corridor Subtotal	1,672	1,707	2%
Pocatello, ID	6	I-90 WA State line to MT State line[1]	212	206	-3%
Pocatello, ID	6	US-12 Lewiston to MT State line[1]	64	83	30%
Pocatello, ID	6	Corridor Subtotal	276	289	5%
Pocatello, ID	4-6	Region Subtotal	2,429	2,571	6%
Harrisburg, PA	7	I-81 Jct. I-64 to Harrisonburg[1]	1,023	758	-26%
Harrisburg, PA	7	I-81 Harrisonburg to WV State line[1]	817	964	18%
Harrisburg, PA	7	I-81 MD State line to Harrisburg[1]	1,493	1,307	-12%
Harrisburg, PA	7	I-81 Harrisburg to Frackville[1]	618	1,005	63%
Harrisburg, PA	7	Frackville to Scranton[1]	480	574	20%
Harrisburg, PA	7	Corridor Subtotal	4,431	4,608	4%
Harrisburg, PA	8	I-80 Dubois to Rote[1]	654	511	-22%
Harrisburg, PA	8	I-80 Rote to Bloomsburg[1]	507	383	-24%
Harrisburg, PA	8	I-80 Bloomsburg to Scotrun[1]	546	222	-59%
Harrisburg, PA	8	Corridor Subtotal	1,707	1,116	-35%
Harrisburg, PA	7-8	Region Subtotal	6,138	5,724	-7%
Memphis, TN	9	I-40 North Little Rock to Brinkley	652	828	27%
Memphis, TN	9	I-40 Wheatley to Memphis	808	888	10%
Memphis, TN	9	I-40 Memphis to Brownsville	119	373	213%
Memphis, TN	9	I-40 Brownsville to Holladay	740	397	-46%
Memphis, TN	9	Corridor Subtotal	2,319	2,486	7%
Memphis, TN	10	I-55 Winona to Batesville	322	378	17%
Memphis, TN	10	I-55 Batesville to Memphis	158	249	58%
Memphis, TN	10	I-55 Memphis to Blytheville	934	686	-27%
Memphis, TN	10	I-55 Holland to Bertrand	594	536	-10%
Memphis, TN	10	Corridor Subtotal	2,008	1,849	-8%
Memphis, TN	9-10	Region Subtotal	4,327	4,335	0%
All	All	TOTAL	15,963	15,694	-2%

[1]Segment classified as a rural segment.

To calibrate the model, field surveys were conducted in four regions to count the number of parked commercial vehicles during the period of peak nighttime parking demand between 10:00 p.m. and 6:00 a.m. Highways in each region were divided into segments, and the potential parking locations along each segment of highway were cataloged during daytime surveys of the highways. Each highway segment was resurveyed during the nighttime period of peak demand. All parked trucks were counted during the nighttime surveys.

The "Segment" column describes the highway segment, and the "Observed Trucks" column lists the results of the field surveys. The "Model Estimate" column lists the estimated demand for truck parking spaces for the calibrated demand model. The "Error" column lists the percentage error in the estimated demand (i.e., "Model Estimate" minus "Observed Trucks" divided by "Observed Trucks"). For example, the demand model underestimates the demand by 32 percent for the first highway segment and overestimates demand by 40 percent for the second.

Travel corridors were also defined based on likely travel routes for commercial vehicles, and the observed and estimated demands for the segments were summed to generate corridor-level values. A corridor subtotal row provides the percentage error in the summed estimated demand for each corridor. Because the observed demand for a highway segment can include unmet demand from nearby segments (e.g., if a highway segment does not have sufficient parking available, some drivers will park on the nearest highway segment with available parking), it was expected that the errors in the corridor-level results would be significantly lower than those at the segment level, which turned out to be true. Note that the error at the segment level does not necessarily indicate that the demand model is inaccurate when applied to highway segments, but may indicate that the lack of available parking spaces on some highway segments creates unmet demand that appears in field observations as unusually high demand on nearby segments with a surplus of parking. Region subtotal rows indicate the estimation error for the cumulative demand for all of the highway segments in the region, and the "-2%" error in the bottom row is for the 29 highway segments combined.

To calibrate the demand model, each highway segment was categorized as either rural or urban. A segment was categorized as urban if it was within 200 miles of a city with a population of 200,000 or more. Otherwise, it was classified as rural. Then, the model variables identified in table 2 were collected for each highway segment, and an iterative process was used to identify the values for the three parameters that enabled the demand model to best estimate the parking demand observed in the field surveys. Table 5 lists the resulting values of the calibration parameters.

The estimates of parking demand corresponding to these model parameters are listed in the "Model Estimate" column of table 4. This table also lists the results for ten highway corridors, four regions, and the total sample defined by combining results for the highway segments. This list indicates that the predictions of the model were more accurate at the corridor and regional level than at the segment level. At the segment level, the average absolute error in estimated demand was 38 percent, while it was 12 percent for the corridors and 3 percent for the regions.

Table 5. Values of calibration parameters.

Parameter	Value
SH/LH (rural)	0.07/0.93
SH/LH (urban)	0.36/0.64
PPF_{LH}	0.09

While the demand model does provide reasonable estimates of truck parking demand, the following limitations of the model and model calibration were noted:

- The demand model estimates latent demand for each highway segment and ignores variations in the parking supply that might affect the demand actually observed during the field surveys. For example, a driver on a highway section with insufficient parking supply is forced to drive to another segment with sufficient supply. Some of the latent demand for the section with insufficient supply is actually observed on a subsequent section.

- The demand model estimates latent demand caused by typical driver needs to rest and obtain services. It does not consider other factors that might influence demand in a local region, such as the desire to "stage" near a shipper/receiver at night in order to more easily access the loading dock in the morning.

- The fact that the *SH/LH* ratio varies was reflected in the model by classifying each highway segment as either rural or urban based on its proximity to a large city and using a different value for this parameter for rural and urban segments. This methodology may not capture the true variation in this parameter, and a more realistic model for estimating this ratio for each highway segment would likely result in better demand estimates.

- Demand for parking along half the 29 segments used for calibration was at or exceeding capacity, limiting the number of drivers who could find parking along those segments. Thus, the field surveys may have underestimated the actual demand (by not counting those drivers who wanted to park but could not), which would result in a calibrated model that also underestimates demand.

- Although the model provides more accurate demand estimates for larger geographical regions, evaluations based on large geographic regions may not be an appropriate way to evaluate truck parking shortages—an excess supply at one extreme of a large geographical region does not help a tired driver at the other extreme of the region to find rest.

To examine the validity of the model, the demand estimates generated by the model were compared against observed demand measured by the States of Iowa and South Dakota. Table 6 lists the results of this comparison. Neither of these comparisons is an exact comparison to the demand estimates generated by the demand model. The Iowa study was conducted in 1999 (not 2000), and the observed parking demand included only vehicles parked at public rest areas and at 39 of 58 commercial truck stops located near the Interstate highways. The study excluded vehicles parked at other public locations (e.g., weigh stations) and on exit ramps, and total demand for parking at commercial truck stops was estimated by extrapolating the observed values. In the South Dakota study, it was not clear whether the demand included trucks parked at other public locations (e.g., weigh stations) and on exit ramps. Despite these limitations in the compatibility of these surveys with the demand estimates, the comparison supports the conclusions drawn from the model calibration results listed in table 4.

Table 6. State survey results for model validation.

State	Highway	Observed Demand	Estimated Demand	Error
Iowa[8]	I-29	599	392	-35%
	I-35	487	601	23%
	I-80	1,813	1,844	2%
	I-380	275	153	-44%
	Total	3,174	2,990	-6%
South Dakota[14]	I-29	243	346	42%
	I-90	532	519	-2%
	Total	775	865	12%

2.4 NATIONAL DEMAND FOR COMMERCIAL VEHICLE PARKING

The demand model described in the previous section of this document was used to estimate parking demand for corridors along the Interstate and non-Interstate portions of the NHS using procedures outlined in the technical guidance document.[11] The process for developing parking demand estimates requires three steps:

1. Identify major trucking corridors and select analysis segments.
2. Collect demand model inputs.
3. Apply truck parking demand model to estimate peak hour demand.

The explanation of each step is as follows:

- Identify major trucking corridors and select analysis segments. The modeling approach was applied to appropriate NHS roadway segments throughout 49 States (excluding Hawaii). The corridors considered for analysis were identified by examining the amount of commercial vehicle traffic carried by a highway. These corridors generally consist of Interstate highways and non-Interstate highways that carry a significant amount of commercial vehicle traffic, including roadways that carry more than 1,000 combination vehicles per day. Additional NHS roads were considered if they were part of an identified national corridor.

  National corridors were selected on the basis of utilization, network continuity, and geographic distribution. As a rule, routes were initially identified on the basis of commodity flows. Rather than relying on strictly numerical criteria for identification of routes, the research team used visual scans of commodity flows on a State-by-State basis, using the relative magnitude of commodity flows as an initial selection approach. On this basis, the routes with the dominant volumes of commercial vehicle activity within each State were chosen.

  To ensure network continuity, the study team also looked at cross-border issues. In some instances, routes were selected because they accounted for critical links in regional or trans-regional commodity flows. Consideration was also given to the National Corridor Planning & Development Program and Coordinated Border Infrastructure Program (also known as CORBOR). CORBOR is looking at the 43 high-priority corridors on the NHS and at projects that improve transportation near our borders with Canada and Mexico. The intent of looking at CORBOR was to consider national and international trade implications of the national corridors.

  Once the proposed national corridors were identified, the corridors were segmented so that the demand model could be applied to the highway segments. Segments were identified to be consistent with the technical guidance document and with a logical partition of the proposed corridors. Proposed corridors and candidate segments were then presented to the States for comment; in some instances, the States proposed changes either in the routes selected or in the segmentation of the corridors. In other cases, segments were excluded because there were not sufficient parking supply data or a practical method for estimating truck volume. The resulting highway segments are typically between 60 and 120 miles long and carry a uniform amount of commercial vehicle traffic.

- Collect demand model inputs. To apply the demand model, the length, travel speed, annual average daily traffic (AADT), and percent trucks must be known for each segment, and estimates for these parameters were collected from a variety of sources. Although the data sources were generally the same for each State, there were some differences. The data sources typically included the following:

  – Length values were estimated by referring to highway maps.
  – Speed limit values were based on HPMS and augmented by comments provided by the State DOT.

- AADT and projected AADT were derived from HPMS and augmented by public rest area survey responses and comments provided by the State DOT.
- Some State DOTs provided additional comments and corrections to AADT and other values.
- When other sources of traffic flow data were not available, the "Heavy Commercial Vehicle Flow Atlas of the United States National Highway System" (revised on August 27, 1998) was used.

Partners in each State reviewed these estimates and provided comments and suggestions that were used to improve the estimates. In many cases, adjustments were made to better reflect the volume of truck traffic on a segment, the speed limit, and other model factors. For example, the following States suggested different values for the short-haul to long-haul ratio for some highway segments: Idaho used a 0.20/0.80 ratio; Alaska used a 0.75/0.25 ratio because all the routes in Alaska can be driven in a single day; Kansas, Michigan, and Washington used a 0.60/0.40 ratio for some highly urban highway segments; and South Dakota used a 0.03/0.97 ratio for some highly rural highway segments. After the States completed their review of the model variable and parameter data, a final calibration of the demand model was completed that generated final values for the short-haul to long-haul ratios and the long-haul peak parking factor. The collected data and the calibrated parameters were used for the final demand estimates.

- Apply truck parking demand model to estimate peak hour demand. After defining the highway segments and identifying estimates for the model variables, the demand model was used to estimate the parking demand for each segment. The demand estimates (as well as the demand model inputs) for each section are listed in the Final State Status Reports. The demand estimates for each segment were summed to generate demand estimates for each State (table 7) and for Interstate and non-Interstate highways. In this table, the "Rest Area" and "Truck Stop" columns list the estimated demand for truck parking at public rest area and commercial truck stops and travel plazas, respectively, and the "Total" column lists the estimated total truck parking demand. The total demand on Interstate highways was for 245,389 truck parking spaces (56,424 spaces at public and 188,965 at commercial facilities), and the total demand on non-Interstate highways was for 41,927 spaces (9,643 at public and 32,284 at commercial facilities). The demand estimates are for 39,963 miles of Interstate highway, which cover most of the Interstate highways, and 21,702 miles of non-Interstate highway, which include only those sections of non-Interstate highways with a significant volume of commercial vehicle traffic

  The "Annual Increase" column lists the estimated annual increase in truck parking demand for each State over the next 20 years, which is estimated from corresponding estimates for the increase in truck volume over this period. In other words, the same demand model was used to estimate the demand for truck parking in 2000 and in 2020, and the "Annual Increase" was calculated as the annual growth rate necessary to account for the growth in the estimated demand between 2000 and 2020. Note that, because most States could provide only forward projections for AADT values, the other model variables and parameters (e.g., percent trucks, speed limit) were assumed to remain fixed between 2000 and 2020.

  While 35 States elected to use these demand model results to satisfy the requirements of the Section 4027 study, 14 States elected to use a different method of evaluating the demand for and supply of truck parking spaces. Table 8 lists the State demand estimates and compares these estimates to those of the demand model.

Table 7. Commercial truck parking demand: Peak hour demand along interstates and other NHS routes carrying more than 1,000 trucks per day, 2000.

State	Rest Area Demand	Truck Stop Demand	Total Demand	Estimated Annual Increase in Demand
Alabama	1,634	5,473	7,107	4.4%
Alaska	25	88	113	1.0%
Arizona	1,052	3,523	4,575	3.2%
Arkansas	1,783	5,968	7,751	2.9%
California	4,539	15,183	19,722	1.9%
Colorado	760	2,546	3,306	3.0%
Connecticut	616	2,060	2,676	1.7%
Delaware	206	694	900	2.4%
Florida	1,694	5,665	7,359	2.8%
Georgia	2,188	7,324	9,512	3.0%
Idaho	734	2,462	3,196	3.0%
Illinois	3,338	11,172	14,510	1.1%
Indiana	4,299	14,400	18,699	3.0%
Iowa	688	2,302	2,990	3.6%
Kansas	566	1,907	2,473	2.7%
Kentucky	2,206	7,380	9,586	2.7%
Louisiana	2,060	6,910	8,970	3.0%
Maine	205	691	896	0.5%
Maryland	592	1,983	2,575	2.0%
Massachusetts	863	2,894	3,757	1.3%
Michigan	1,275	4,262	5,537	2.2%
Minnesota	872	2,925	3,797	2.0%
Mississippi	1,254	4,194	5,448	2.7%
Missouri	2,643	8,841	11,484	2.7%
Montana	462	1,550	2,012	2.6%
Nebraska	251	837	1,088	3.6%
Nevada	682	2,285	2,967	2.0%
New Hampshire	72	243	315	2.2%
New Jersey	457	1,528	1,985	0.6%
New Mexico	1,218	4,083	5,301	2.5%
New York	1,801	6,034	7,835	3.0%
North Carolina	1,270	4,262	5,532	3.0%
North Dakota	188	635	823	3.0%
Ohio	3,301	11,059	14,360	2.9%
Oklahoma	1,078	3,610	4,688	1.8%
Oregon	1,139	3,819	4,958	1.8%
Pennsylvania	2,360	7,903	10,263	3.0%
Rhode Island	167	566	733	1.4%
South Carolina	1,265	4,236	5,501	3.8%
South Dakota	199	666	865	1.7%
Tennessee	1,214	4,073	5,287	4.0%
Texas	8,305	27,797	36,102	2.7%
Utah	391	1,307	1,698	4.3%
Vermont	27	91	118	1.2%
Virginia	1,772	5,932	7,704	1.4%
Washington	815	2,724	3,539	2.1%
West Virginia	468	1,572	2,040	3.0%
Wisconsin	633	2,115	2,748	4.2%
Wyoming	440	1,475	1,915	3.6%
TOTAL	66,067	221,249	287,316	2.7%

Table 8. Commercial truck parking demand: Comparison of state and demand model estimates.

State	Model	Public Rest Area Demand	Private Truck Stop Demand	Total Demand
Alaska	State Estimate[1]	68	97	165
	Demand Model	25	88	113
California	State Estimate[2]	9,162	13,595	22,757
	Demand Model	4,539	15,183	19,722
Colorado	State Estimate[2]	1,491	2,212	3,703
	Demand Model	760	2,546	3,306
Connecticut	State Estimate[3]	1,462		
	Demand Model	616	2,060	2,676
Idaho	State Estimate[4]	567	1,886	2,453
	Demand Model	734	2,462	3,196
Maine	State Estimate[5]	205	691	896
	Demand Model	205	691	896
Nebraska	State Estimate[2]	519	769	1,288
	Demand Model	251	837	1,088
Ohio	State Estimate[2]	6,931	10,294	17,225
	Demand Model	3,301	11,059	14,360
Rhode Island	State Estimate[6]	228	766	994
	Demand Model	167	566	733
South Dakota	State Estimate[7]	179	905	1,084
	Demand Model	199	666	865
Tennessee	State Estimate[8]			
	Demand Model	1,214	4,073	5,287
Vermont	State Estimate[9]			
	Demand Model	27	91	118
West Virginia	State Estimate[10]			
	Demand Model	468	1,572	2,040
Wyoming	State Estimate[11]			
	Demand Model	440	1,475	1,915

[1]Used a preliminary version of the demand model, which is the same as the final model but with the following different parameter values: Short-haul to Long-haul (SH-LH) Ratio = 0.40/0.60, Long-haul Parking Ratio = 1.25, Long-haul Peak Parking Factor (PPF) = 0.07, Short-haul Percent Public/Private = 0.6/0.4, and Long-haul Percent Public/Private = 0.4/0.6. Alaska customized the preliminary model by using a SH-LH Ratio of 0.75/0.25 for all highway segments.(11)

[2]Used a preliminary version of the demand model, which is the same as the final model but with the following different parameter values: SH-LH Ratio = 0.40/0.60, Long-haul Parking Ratio = 1.25, Long-haul PPF = 0.07, Short-haul Percent Public/Private = 0.6/0.4, and Long-haul Percent Public/Private = 0.4/0.6.(11)

[3]Used the model from a 1996 study.(1) This model estimates demand at a public rest stop based primarily on the annual average daily traffic of the road served by the rest stop.

[4]Used a version of the demand model, which is the same as the final model but with the following different parameter values: SH-LH Ratio = 0.20/0.80 and Long-haul PPF = 0.08.

[5]Maine has hired a consultant to perform the required rest area study, and the results of that study are not yet available. In the interim, Maine has accepted preliminary numbers generated using the demand model.

[6]Did not specify the model used to generate the State estimates.

[7]Used a preliminary version of the demand model, which is the same as the final model but with the following different parameter values: SH-LH Ratio = 0.40/0.60, Long-haul Parking Ratio = 1.25, Long-haul PPF = 0.07, Short-haul Percent Public/Private = 0.6/0.4, and Long-haul Percent Public/Private = 0.4/0.6. South Dakota customized the preliminary model by using different SH-LH Ratios (0.03/0.97, 0.1/0.9, and 0.4/0.6) on different highway segments.(11) South Dakota also conducted field surveys to validate the model predictions.

[8]Used a model proposed in 1981 by the Federal Highway Administration in the report *Safety Rest Area: Planning, Location, Design*, which estimates demand at public rest areas based primarily on traffic counts of vehicles entering the rest areas. Tennessee also conducted field studies to help evaluate usage of public rest areas.

[9]Vermont conducted a field survey of rest area usage and did not estimate parking demand.

[10]West Virginia did not provide estimates of rest area demand.

[11]Wyoming inventoried the supply of parking spaces along highway segments and evaluated the adequacy of that supply by comparing it to the daily count of trucks using each highway segment. Wyoming used driver interviews to generate demand estimates for a highway segment only when this analysis indicated a potential supply inadequacy.

3.0 COMMERCIAL TRUCK PARKING SUPPLY

3.1 ESTIMATING PARKING SPACE SUPPLY

This section contains an inventory of the number of public rest areas and commercial truck stops and travel plazas that could be used to comply with Federal HOS rules. The two primary data sources for the commercial vehicle parking supply information presented in this document are 1) the Interstate America database of commercial truck stops and travel plazas and 2) a survey of public agency rest areas conducted for this study. The inventory information presented herein is the most recently available and is generally characteristic of conditions in 1999 (in the case of the commercial truck stop database) and 2000 (in the case of the public rest area survey).

While this inventory does include the parking areas that are located close to the NHS and used most often by truck drivers, the inventory does not include parking that is available from other sources (e.g., restaurants and stores located close to the NHS, loading and unloading facilities). Table 1 lists the locations at which drivers reported last parking for rest and the relative frequency with which these locations were reported.

The inventory presented includes all the Interstates on the NHS and selected non-Interstate portions of the NHS with daily truck volumes of greater than or equal to 1,000. Information was gathered for each parking facility on each highway segment and summed to generate estimates of the parking supply for each highway segment.

3.2 PUBLIC PARKING FACILITIES

A survey that included 49 States (excluding Hawaii) was conducted to gather information on truck parking capacity at public rest areas and welcome centers. Information was obtained from all 49 State DOTs and their toll road agencies for a combined total of 1,771 public rest areas. Information was compiled and entered into an electronic database for use in this study. The results for each State are summarized in table 9.

The “Parking Facilities” column of this table lists the total number of public rest areas identified in each State, and the “Parking Spaces” column lists the total number of parking spaces at those facilities. The “Weigh Station” column indicates whether the State allows parking at weigh stations, and the “Imposes Time Limits” column indicates whether the State imposes time limits on parking at public rest areas.

As can be seen from reviewing the results of table 9, some States permit drivers to use weigh stations for parking when the stations are closed. While this does create additional parking spaces for drivers, the estimated number of spaces created was not included in the analysis. During the driver surveys (summarized in section 2.2 of this report), many drivers indicated that parking at a weigh station was not a desirable solution. These facilities often lack amenities, and concern was also expressed about parking at an enforcement facility. An additional constraint to estimating the number of parking spaces at these facilities is that weigh station hours of operation vary and rotate between daytime and evening operations. This variance meets the needs of the enforcement community, as it enables enforcement personnel to maintain random inspection patterns. However, this variance makes the availability of these facilities for use as parking spaces somewhat random. The study team determined that, based on these factors, weigh and inspection stations should not be considered as a supply source of parking spaces for the overall analysis.

Table 9. Commercial truck parking inventory: Public rest area facilities along interstates and other NHS routes carrying more than 1,000 trucks per day.

State	Parking Facilities	Parking Spaces	Weigh Stations	Imposes Time Limits
Alabama	27	712		✓
Alaska	N/A[1]	457		
Arizona	38	559		
Arkansas	21	343		
California	88	1,106		✓
Colorado	31	167		
Connecticut	20	361	✓	
Delaware	1	70		✓
Florida	69	1,709	✓	✓
Georgia	31	1,162	✓	✓
Idaho	30	245	✓	✓
Illinois	54	1,267		
Indiana	52	2,430	✓	
Iowa	38	804		✓
Kansas	29	455		✓
Kentucky	44	991	✓	✓
Louisiana	15	221		
Maine	11	113		
Maryland	11	295		
Massachusetts	17	140		✓
Michigan	75	1,570		
Minnesota	40	536		✓
Mississippi	43	428	✓	✓
Missouri	35	618		
Montana	43	392	✓	
Nebraska	22	263		✓
Nevada	36	260		✓
New Hampshire	6	86		✓
New Jersey	19	667		✓
New Mexico	11	78	✓	✓
New York	36	1,257	✓	✓
North Carolina	37	642		
North Dakota	30	260		
Ohio	98	1,402		
Oklahoma	63	767		
Oregon	40	602		✓
Pennsylvania	65	1,298		✓
Rhode Island	5	267		
South Carolina	49	816		
South Dakota	21	371	✓	✓
Tennessee	30	767		✓
Texas	105	654		✓
Utah	24	238		
Vermont	41	178		
Virginia	39	820		✓
Washington	29	455		✓
West Virginia	21	506		
Wisconsin	23	652		
Wyoming	58	792		
TOTAL	1,771	31,249		

[1]Alaska did not report the number of facilities.

Note: Checks denote States allowing truck parking in weigh stations and States that impose time limits in public rest areas.

An additional consideration identified during the course of the survey is that 25 States indicated that they have time limits on the amount of time a truck may be parked at a public rest area. Of these, 9 States have limits that should have little impact on using the facilities for long-term rest to satisfy HOS rest requirements (e.g., the time limit is greater than 8 hours, the time limit applies only during the day), while the other 16 States have limits that might impact using the facilities for long-term rest. Of these 16 States, 10 enforce the time restrictions only rarely or never, leaving only 6 States sometimes enforcing time restrictions that might impact the use of the facilities for long-term rest.[a]

An analysis of the number of parking spaces at public rest areas along Interstate highways versus non-Interstate highways indicated a total of 28,396 spaces distributed along 39,963 miles of Interstate highways included in this study and 2,853 non-Interstate spaces distributed along 21,702 miles of non-Interstate highways.

Although not developed as part of the inventory process, researchers did develop an estimate of 1 percent annually for the expected growth rate of truck parking spaces at public rest areas. This estimate was derived from the response of the State partnerships regarding plans to improve public rest areas (see section 5.4.1). Fifteen States indicated that they have firm plans to provide additional parking spaces at public facilities, and 11 of these States provided a specific number of spaces for a total increase of 1,609 spaces at public facilities over the next 5 years. This increase of 1,609 spaces is 5.1 percent of the 31,249 current spaces, and a 5.1 percent increase over 5 years is equivalent to a 1 percent annual growth rate.

3.3 COMMERCIAL TRUCK STOP AND TRAVEL PLAZA PARKING FACILITIES

Commercial truck stops and travel plazas are designed to provide drivers an opportunity to fulfill many non-rest related activities, while public rest areas provide the driver with only minimal services. Commercial truck stop operators provide a number of services to trucks and typically provide extended parking to encourage drivers to use these services. In other words, commercial truck stop and travel plaza operators do not provide extended-stay parking as a primary service but only to encourage purchases of fuel, food, and other services. Truck stop operators do not generally charge for parking and provide parking only to attract business.

The primary data source for the inventory of commercial truck stops and travel plazas was the *Truck Stops Database* developed by Interstate America. FHWA, for purposes of this study, obtained a license permitting the use of the 1999 database. This database, which includes every known facility in the United States and Canada (for a total of 6,327 facilities), is updated annually and contains information describing the number of commercial vehicle parking spaces available at a facility as well as information about the amenities at that facility. Unfortunately, the number of truck parking spaces available is not expressed as an exact number, but as one of the ranges listed in table 10; this results in a range of possible values for the inventory of truck parking spaces for each highway segment rather than an exact number.

The commercial truck stops and travel plazas listed in this database were identified with the road segments that were the basis of the demand model calculations. The number of parking spaces for each road segment was determined by summing the spaces at each commercial truck stop and travel plaza for that segment. Because the number of truck parking spaces was reported as a range, this resulted in a minimum number of spaces (obtained by summing the bottom number of the range) and a maximum number of spaces (obtained by summing the top number of the range) when this database was used to evaluate the supply of truck parking.

[a] The NTSB identified 19 States that have laws limiting the amount of time that a vehicle can park at a public rest area, 16 of which were also identified in this study. Three of the States identified by the NTSB did not provide complete information to this study team on whether there were time limits for some rest areas within the State.

Table 10. Parking capacity ranges from the *Truck Stops Database*

Parking Code	Definition	Min	Max
NM	Not Marked	0	0
N	None	0	0
L	Limited	1	4
5-25	Range from 5 to 25	5	25
26-50	Range from 26 to 50	26	50
51-99	Range from 51 to 99	51	99
100-199	Range from 100 to 199	100	199
200-299	Range from 200 to 299	200	299
300-399	Range from 300 to 399	300	399
400-499	Range from 400 to 499	400	499
500-600	Range from 500 to 600	500	600

In an effort to better quantify shortages of truck parking spaces that may exist, some States completed a field inventory of the commercial parking facilities along the highway segments included in this study. This generated an exact count (i.e., the minimum and maximum number of spaces is the same) for the number of parking spaces available, and these exact counts were used in place of the ranges obtained from the truck stops database. The results of this inventory for each State are summarized in table 11.

The "Parking Facilities" column of this table lists the total number of commercial truck stop and travel plaza facilities identified in each State, and the "Parking Spaces" column lists the total number of parking spaces at those facilities.

An analysis of the number of parking spaces at commercial truck stops and travel plazas along Interstate highways versus non-Interstate highways indicated a total of between 153,829 and 260,599 spaces distributed along 39,963 miles of Interstate highways included in this study and between 13,705 and 24,002 non-Interstate spaces distributed along 21,702 miles of non-Interstate highways.

The expected growth of truck parking spaces at commercial truck stops and travel plazas is expected to be about 6.5 percent annually. This estimate was derived from an evaluation of the *Truck Stops Database* for the years 1997 to 2000 performed by the National Association of Truck Stop Operators (NATSO) Foundation. This evaluation found an historical growth rate of 6.5 percent for this period, and NATSO expects this growth rate to continue in the future.

3.4 DRIVER ASSESSMENT OF PARKING FACILITY QUALITY

The number of parking spaces is only part of the issue related to the adequacy of the supply of truck parking spaces. For example, if sufficient spaces are available yet these spaces are either difficult to access or do not have the amenities that a driver needs, then a driver may choose to park at an over-crowded facility, may park at an inappropriate location, or may drive while tired to find a more favorable facility. This section summarizes the results from the driver survey (see section 2.2) that indicate truck drivers' assessments of the quality and availability of truck parking facilities.

Table 11. Commercial truck parking inventory: Commercial truck stop and travel plaza facilities along interstates and other NHS routes carrying more than 1,000 trucks per day.

State	Parking Facilities	Parking Spaces
Alabama	99	3,650-6,902
Alaska[1]	—	—
Arizona	58	4,730-8,140
Arkansas	108	3,806-7,519
California[2]	122	7,496
Colorado[2]	57	2,710
Connecticut	12	650-1,243
Delaware	8	128-324
Florida	85	3,692-7,339
Georgia	122	6,158-11,475
Idaho[2]	25	1,967
Illinois	122	4,962-9,602
Indiana	119	7,972-14,529
Iowa	65	2,994-5,209
Kansas	55	2,209-4,383
Kentucky	76	3,745-7,186
Louisiana	115	4,682-9,159
Maine	16	738-1,248
Maryland	14	2,008-2,290
Massachusetts	20	1,040-1,916
Michigan	90	2,925-6,147
Minnesota	58	2,200-4,503
Mississippi	98	3,277-7,003
Missouri	140	6,468-12,272
Montana	39	1,499-3,085
Nebraska[2]	46	2,835
Nevada	31	2,930-4,979
New Hampshire	13	294-697
New Jersey	34	1,980-3,730
New Mexico	49	3,657-6,322
New York	97	3,441-6,970
North Carolina	102	3,771-7,323
North Dakota	25	960-2,039
Ohio[2]	135	11,474
Oklahoma	129	4,683-9,632
Oregon	52	3,052-5,702
Pennsylvania	134	7,722-14,502
Rhode Island[2]	3	420
South Carolina	96	4,291-8,515
South Dakota[2]	30	1,331
Tennessee[2]	89	6,419
Texas	284	12,277-23,525
Utah	43	1,138-2,488
Vermont	63	185-449
Virginia	13	4,183-7,445
Washington	39	1,295-2,663
West Virginia	21	821-1,717
Wisconsin	80	2,863-5,971
Wyoming[2]	51	3,806
TOTAL	3,382	167,534-284,601

[1]Alaska did not report on the number of commercial parking facilities and spaces.
[2]These States provided independent estimates of parking facilities and spaces.

Drivers were asked to report how frequently truck parking spaces have certain usability characteristics. Drivers rated how frequently available parking is convenient to the highway, has the features they need, has time limits that allow enough time for their needs, has enough room for them to maneuver their trucks in and out, and is used only by trucks. Respondents gave mixed ratings for all these usability characteristics (table 12). For each of these usability characteristics, *sometimes* [encountered] was the most frequently reported driver response. The usability characteristic that was most often encountered by respondents (i.e., most often given ratings of frequently or almost always) was *available parking has the features I need*, marked by 51 percent of respondents. Thirty-nine percent of respondents indicated that available parking is *frequently* or *almost always* convenient to the highway.

Table 12. Driver-reported usability characteristics in truck parking.

Usability Characteristic	Almost Always	Frequently	Sometimes	Rarely	Almost Never
Parking is convenient to highway	9%	30%	41%	12%	7%
Facility has features needed	15%	36%	38%	7%	3%
Parking time limits allow enough time	15%	22%	30%	18%	15%
Parking allows enough room to drive in and out	8%	24%	48%	15%	6%
Truck spaces used only by trucks	9%	25%	34%	20%	12%

Note: Due to rounding, percentages may not sum to 100.

To help clarify drivers' parking preferences, the survey asked drivers to identify how important various parking facility features are to them when they park their trucks. Drivers rated various features on a scale from one to five (*almost always important* to *almost never important*). Table 13 shows the features evaluated, along with the mean and modal ratings they received. Features rated as most important were generally the ones that address basic needs. Food, fuel, restrooms, phones, showers, convenience to highway, and well-lighted parking lots all received modal ratings of *almost always important*. In fact, between 70 and 85 percent of the sample rated these features as *frequently* or *almost always important*. Interestingly, drivers appear to value well-lighted parking lots more than they value security presence. Seventy-five percent of respondents rated "well-lighted parking lots" as *frequently* or *almost always important*, while only 60 percent gave the same ratings to "security presence." The majority of drivers rated features such as entertainment facilities, Internet connections, and availability of travel information as less important.

Almost 400 respondents provided written comments on the parking facility features they consider important. The single most frequently mentioned feature was *big parking spaces that allow trucks to maneuver in and out* (written by 45 drivers). Drivers indicated that they look for quiet parking facilities where they are not likely to be disturbed by police officers or solicitors. They value clean facilities where the personnel are friendly. Drivers also commented that they prefer parking facilities that allow access to shopping areas with grocery or department stores. Finally, drivers commented that laundry facilities add to the appeal of a parking facility.

Ratings given by short-haul drivers reflected the fact that they value parking facility features differently than long-haul drivers. Specifically, long-haul drivers most often rated features such as showers, fuel, and well-lighted parking lots as *almost always important*, while short-haul drivers most often rated these same features as only *frequently important*. Female respondents provided different ratings than their male counterparts on some features. Eighty percent of women rated security presence as *frequently* or *almost*

Table 13. Driver-rated importance of features when parking.

Important Features	Mean	Median	Mode
Restrooms	1.4	1.0	1
Convenient to highway	1.6	1.0	1
Showers	1.7	1.0	1
Well-lighted parking lot	1.9	1.0	1
Public phones	1.9	1.0	1
Restaurant	1.9	1.0	1
Fuel	2.0	1.0	1
Security presence	2.3	2.0	1
Repair facilities	2.6	3.0	1
Prepaid fuel cards accepted	2.9	3.0	1
Vending machines	3.4	3.0	5
Entertainment facilities	3.4	3.0	5
Travel information available	3.6	4.0	5
Internet connections	4.0	5.0	5

Note: Respondents rated the features on a scale from one to five (*almost always important* to *almost never important*).

always important, while just under 60 percent of men gave the same ratings to security presence. Additionally, 92 percent of women rated "well-lighted parking lots" as *frequently* or *almost always important,* while about three-quarters of men did the same.

In addition to inquiring about the features that are important to drivers, the survey also asked which type of parking facilities (public versus commercial) they prefer for parking. Because parking facility preference likely depends on the purpose of the stop, various common "reasons for parking" were identified to give context to their facility preferences. Generally when drivers showed a preference, they indicated a preference for commercial truck stops over public rest areas (table 14). Public rest areas were preferred to commercial truck stops only when drivers stopped for a quick (less than 2-hour) nap. For extended rest (more than 2 hours), performing minor truck maintenance, and eating a meal, drivers overwhelmingly preferred truck stops to rest areas, with between 79 and 91 percent of drivers indicating a preference for truck stops and fewer than 6 percent indicating a preference for rest areas. Most respondents marked *no preference* for stops made to use vending machines, get travel information, use public phones, and use the restroom. However, among those drivers who did show a facility preference when making these types of stops, more drivers indicated a preference for truck stops. For all the parking reasons listed, short-haul driver preferences were the same as long-haul driver preferences.

Table 14. Drivers' parking facility preferences by purpose of stop.

Reason for Parking	Rest Area	No Preference	Truck Stop
Take a quick nap (≤ 2 hours)	45%	36%	19%
Take an extended rest (> 2 hours)	6%	16%	79%
Use vending machines	28%	58%	14%
Get travel information	9%	51%	40%
Use public phones	14%	49%	37%
Perform minor maintenance on truck	2%	19%	79%
Use the restroom	25%	45%	30%
Eat a meal	1%	8%	91%

Note: Due to rounding, percentages may not sum to 100.

3.5 INTERCHANGEABILITY OF PUBLIC REST AREA AND COMMERCIAL TRUCK STOP AND TRAVEL PLAZA PARKING

An important factor in determining whether there is a sufficient supply of truck parking spaces involves the concept of interchangeability of spaces at public rest areas and commercial truck stops and travel plazas. That is to say, can a surplus of parking spaces at commercial truck stops and travel plazas compensate for a shortfall in available public rest area parking? Because most truck drivers use public rest areas and commercial truck stops and travel plazas for resting, it is logical to conclude that a driver can rest equally well while parked at a public rest area or at a commercial truck stop or travel plaza and, therefore, that these spaces are interchangeable. This view is challenged, however, by the results of the national survey of driver needs and preferences, by the findings of field observational studies, and by the imbalance identified within the supply and demand ratios between public and commercial parking spaces.

3.5.1 National Truck Parking Needs and Preferences Survey

Drivers' responses to the Truck Parking Needs and Preferences Survey conducted as part of this study demonstrated definite preferences and priorities when it comes to choosing where they will park. These preferences are offered as evidence of the limited interchangeability or substitutability between public rest areas and commercial truck stops or travel plazas.

When drivers park for quick naps (less than 2 hours), they prefer to park in public rest areas (45 percent of the drivers preferred a public rest area, 19 percent preferred commercial truck stops, and 36 percent expressed no preference between public rest areas and commercial truck stops). For more lengthy activities (greater than 2 hours), such as eating a meal, resting for the night, or repairing a truck, drivers choose truck stops where possible (79 percent of the drivers preferred a truck stop, 6 percent preferred rest areas, and 16 percent expressed no preference between rest areas and truck stops).

To help clarify drivers' parking preferences, the survey asked drivers to identify how important various parking facility features are to them when they park their trucks. Restrooms, convenience to highway, showers, well-lighted parking lots, and public phones were the top features selected from a list of 14 features that drivers rated as most important. Three of the five features address drivers' basic needs, while the other two clearly address drivers' preferences. Drivers were also given the opportunity to write comments on the parking features they consider most important. The single most frequently mentioned feature was big parking spaces that allow trucks to maneuver in and out.

The survey also provided the respondents with the opportunity to speculate about why truck drivers sometimes park on entrance or exit ramps and highway shoulders. The most commonly reported reasons were that no nearby parking facility was available, no empty spaces were available at nearby truck stops or rest areas, nearby parking spaces have time limits that are too short, empty parking spaces nearby were blocked by others vehicles, the ramp/shoulder is convenient for getting back on the road, interruptions by strangers (e.g., drug dealers, prostitutes) were less likely, it is hard to drive around congested parking lots, and better lighting exists on ramp(s)/shoulder(s) than in lot(s).

3.5.2 Field Observational Studies

In addition to the driver self-report data cited above, more objective evidence to support the notion of limited interchangeability between public rest areas and commercial truck stops and travel plazas can be found from the results of observational field surveys conducted both for this study and by a number of States.

Commercial vehicle parking field surveys were conducted as part of the demand model development effort for this study. The purpose of these observational studies was to record trucks parked during the peak hour in public rest areas, commercial truck stops, pull-out areas, interchange ramps, mainline and cross-street shoulders, fueling stations, fast food restaurants, hotels, etc. The studies were conducted along three segments of NHS highway in Arkansas, six segments in Georgia, seven segments in Idaho, two segments in Mississippi, one segment in Missouri, six segments in Pennsylvania, two segments in Tennessee, and two segments in Virginia. These segments were selected as representing the typical range, from low to high, of truck parking supply and demand. Although most of the rest areas were full or overflowing, some of the commercial truck stops had spaces available, as did most of the fast food restaurants, fueling stations, and shopping centers along the segments, suggesting that drivers do differentiate between parking at public rest areas and other commercial parking areas.

The University of Tennessee conducted nighttime observational studies at all public rest areas in Tennessee for each day of the week.[7] Availability of space in commercial truck stops and travel plazas near interchanges was also examined. The results of the occupancy studies showed that the rest areas were overflowing with trucks at night, as evidenced by trucks parked along the shoulders of highway exit and entrance ramps as well as on interchange ramps. While the rest areas were overflowing, approximately 30 percent of the private truck parking spaces were not occupied, and the unoccupied private parking spaces outnumbered the trucks parked along the highways by nearly three-to-one. To understand why some truck drivers park along the highway when there are available private parking spaces, in-depth interviews were held with drivers. The opinions of the drivers interviewed were quite consistent. The findings were that commercial truck stops and public rest areas are not substitutes for each other because they meet different needs.

The State of Iowa completed field observations of truck parking on Interstate highways in 1999.[8] This study divided the Interstates in Iowa into six segments. Parking at public rest areas was observed to be above capacity for almost every segment and almost every day during the observation period, and trucks were observed parking on the shoulder at exit and entrance ramps. On the other hand, parking at commercial truck stops and travel plazas was observed to be above capacity for only a single segment, and then for only two of the seven days during the observation period. These observations suggest that drivers do differentiate between parking at public rest areas and other commercial parking areas.

In 1999 the Baltimore Metropolitan Council sponsored a study of truck parking in the Baltimore area that concluded that, even though there was a sufficient supply of parking spaces available to truck drivers, trucks were often parked illegally along the highways at night.[15] These observations suggest that truck drivers do differentiate between parking spaces by choosing to park in illegal spaces along the highway rather than legally at other locations.

FHWA supported a study in 1996 that included observations of truck parking along a stretch of I-81 between Radford, VA, and Knoxville, TN.[1] These observations indicated that public rest areas tended to fill up quickly, reaching capacity before commercial truck stops. These findings suggest that truck drivers differentiate between parking at public rest areas and other commercial parking facilities.

3.5.3 Public-Private Supply/Demand Imbalance

As stated earlier in this report, the national driver survey was also used to develop an estimate of public and private parking demand to reflect drivers' preferences for the two facility types. Drivers were asked, for each of seven activities, if they preferred to use public or commercial facilities. The relative preference for the two facility types was estimated by taking an average of the preferences for each activity, weighted by the duration of that activity. The results showed the proportions of total hourly parking demand for public rest areas and commercial truck stops to be 0.23 and 0.77, respectively.

Therefore, if drivers had their preference, 23 percent of the total truck hours of parking demanded in a day (or the peak hour) would occur at public facilities, while the remaining 77 percent of the total truck hours of parking demand would occur at commercial facilities.

An assumption made in the modeling process, to convert 24-hour parking demand to peak-hour parking demand, was that a truck will occupy a space for at least 1 hour. While this assumption may not hold for daytime hours, the majority of trucks parked in the overnight peak hours are parked for longer periods of time in accordance with the HOS regulations. With this assumption in mind, due to the multiplicative nature of the model's parameters, the proportions of hourly parking demand for public and commercial facilities can be directly compared to the proportions of parking supply at these two types of facilities. On average, only about 10 percent of the total available parking supply is at public facilities, while around 90 percent of the available parking supply is at commercial facilities. This imbalance in supply (10 percent at public facilities and 90 percent at commercial facilities) and demand (23 percent at public facilities and 77 percent at commercial facilities) is further evidence on the limits of interchangeability from the driver's perspective.

In summary, while it may be argued that, because truck drivers could rest equally well at public rest areas and commercial truck stops and travel plazas, parking spaces at these two different types of rest stops are interchangeable. In other words, truck stop parking can be substituted for rest area parking, even if the private parking is not as convenient. On the other hand, empirical evidence provided through both driver surveys and observations of parking behavior indicate that parking at these locations is not interchangeable; more likely, the evidence suggests that there is some interchangeability and that this interchangeability is limited due to preferences expressed by drivers for one type of space over another. In reality, a system of parking exists in this country that consists of public rest areas, commercial truck stops and travel plazas, weigh stations, and various commercial establishments (motels, fast food restaurants, etc.). As a system, a certain synergy applies such that substitution occurs among the available types of spaces. However, it is not a complete substitutability. The interchangeability of one type of parking space for another is limited or governed by an array of factors that affect driver preferences (e.g., purpose of the stop, amenities available, parking convenience, time of day, hours since last slept, distance to next pickup/delivery), and these are the factors that influence a driver's decision as to where to park.

4.0 COMMERCIAL TRUCK PARKING SUPPLY/DEMAND BALANCES

4.1 METHODOLOGY

The methodology used to analyze where shortages exist or are expected to exist involved a six-step process. First, the supply of available truck parking spaces was inventoried based on a database of commercial truck stops and travel plazas and a survey of public agency rest areas. Second, a parking demand model was developed and calibrated (based on a limited data set) to estimate parking demand along highway segments. Third, demand estimates from the preliminary model were sent to States and State partners for review and comment. Fourth, the model estimates were refined, based on the partnerships' comments, and the model was re-calibrated based on additional field data. Fifth, the new estimates were sent back to the partners for a final round of review and comment. Sixth, model estimates were refined based on the partners' comments, and the results of the analyses were used in this report.

Note that the results of these analyses were meant to assist in developing strategies and plans to reduce or better manage any shortages. The information was not intended to provide a sufficient level of detail to define the specific location and quantity of truck parking spaces required. The design-level detail required to complete this type of needs assessment was not practical within the time frame and resources of this study. However, the supply and demand information provided at the corridor level did fulfill the goal of identifying system-level problems and needs that can serve as the bases for the formulation of policy alternatives and the conducting of a more detailed study at a later time. In fact, many of the partners used the supply and demand results described above for exactly this purpose.

4.2 DETERMINING CURRENT LEVEL OF PARKING SPACE UTILIZATION

The analysis conducted for this study included information compiled for 49 States and addressed all the Interstate highways as well as a significant share of non-Interstate highways that comprise the NHS. Detailed modeling analysis and truck parking space inventory were conducted for nearly 520 individual roadway segments. By comparing the estimated demand with the inventoried supply, it was possible to determine if a shortage of truck parking existed along a highway segment.

To simplify the interpretation, a rating system was developed to summarize the results of the supply and demand analysis. Dividing the estimated demand by the estimated supply for both public and private parking spaces formed a demand/supply ratio that indicated the level of utilization statewide.[a] A ratio less than one indicates that demand is smaller than supply and an apparent surplus of spaces exists, while a ratio greater than one indicates that demand outstrips supply and there is an apparent shortage.

Because of the uncertainty of the demand and supply estimates, using one as an exact cutoff for indicating whether shortages exist is not appropriate. Instead, the demand/supply ratios have been grouped into three categories, as indicated in table 15. The first category, "Surplus Spaces," indicates that the number of parking spaces available is likely to exceed the peak demand. The second category, "Sufficient Spaces," indicates that the peak demand and the supply of parking spaces are nearly the same. The third category, "Shortage of Spaces," indicates that overcrowding is likely. Because the estimates of truck parking supply

[a]The truck parking supply inventory described in section 3.0 estimated both a minimum and a maximum supply for each highway segment. For the purpose of determining the demand/supply ratio, the maximum value was used. This approach helped ensure that the demand/supply ratio provided a conservative estimate of the locations at which inadequate truck parking exists.

indicate a range of parking spaces, several different supply values could be used in determining this ratio; the results in this report use the maximum estimated truck parking spaces.

Table 15. Demand/supply ratio categories.

Demand/Supply Ratio	Parking Space Utilization
Less than 0.9	Surplus Spaces
0.9 to 1.1	Sufficient Spaces
More than 1.1	Shortage of Spaces

Table 16 contains a national summary of the results using the parking space utilization classification method. These results provide a general sense of the level of unmet needs for commercial truck parking. A total of 35 States are rated as having a shortage of spaces at public rest areas, while a total of 8 States are rated as having shortages at commercial truck stops and travel plazas. When looking at a combined rating (i.e., the sum of demand and supply for both public rest areas and commercial truck stops and travel plazas), a total of 12 States are rated as having shortages.

Table 16. Parking space utilization: National summary of demand/supply ratio along interstates and other NHS routes carrying more than 1,000 trucks per day.

Parking Space Utilization	Public Rest Areas	Commercial Truck Stops [1]	Total
Shortage of Spaces	35	8	12
Sufficient Spaces	4	6	8
Surplus Spaces	10	34	29

[1] This column excludes Alaska, which did not report on the number of parking spaces available at commercial truck stops and travel plazas.

Table 17 provides a State-by-State breakdown of these results. The "Ratio" column lists the demand/supply ratio, and the "Category" column lists the parking space utilization category for each State. The "Public" column refers to the demand/supply ratio for parking spaces at public rest areas, the "Commercial" column refers to the demand/supply ratio for parking spaces at commercial truck stops and travel plazas, and the "Total" column refers to the ratio for parking spaces at both types of facilities.

In addition to determining where truck parking shortages currently exist along the NHS, the study also attempted to estimate where future shortages might exist. Table 7 lists the expected annual growth rate for the truck parking space demand for each of the 49 States considered in this study, with values ranging from 0.5 to 4.4 percent. In section 3.0, the expected annual growth rate for the supply of truck parking spaces is estimated at about 1 percent for public spaces and about 6.5 percent for commercial spaces. Because the estimated growth rates for parking supply are national averages and local growth will vary considerably, it is not appropriate to use these figures to generate State-specific estimates of the future adequacy of truck parking space supply. However, the following observations can be made:

- The expected growth in supply of public spaces is not projected to match the expected growth in demand. As there is already an apparent shortage of public spaces in many States, this projection indicates that the shortage of public spaces will worsen in the future unless steps are taken to either 1) increase the growth rate of public spaces or 2) increase the interchangeability between public and commercial spaces so that the relative demand for public spaces decreases.

- The expected growth in supply of commercial spaces is projected to exceed the expected growth in demand, indicating that the surplus of commercial spaces is likely to increase in the future.

Table 17. Parking space utilization: Demand/supply ratio along interstates and other NHS routes carrying more than 1,000 trucks per day.

State	Public		Commercial		Total	
	Ratio	Category	Ratio	Category	Ratio	Category
Alabama	2.29	Shortage	0.79	Surplus	0.93	Sufficient
Alaska[1]	0.05	Surplus	N/A	N/A	N/A	Surplus
Arizona	1.88	Shortage	0.43	Surplus	0.53	Surplus
Arkansas	5.20	Shortage	0.79	Surplus	0.99	Sufficient
California	4.10	Shortage	2.03	Shortage	2.29	Shortage
Colorado	4.55	Shortage	0.94	Sufficient	1.15	Shortage
Connecticut	1.71	Shortage	1.66	Shortage	1.67	Shortage
Delaware	2.94	Shortage	2.14	Shortage	2.28	Shortage
Florida	0.99	Sufficient	0.77	Surplus	0.81	Surplus
Georgia	1.88	Shortage	0.64	Surplus	0.75	Surplus
Idaho	3.00	Shortage	1.25	Shortage	1.44	Shortage
Illinois	2.63	Shortage	1.16	Shortage	1.33	Shortage
Indiana	1.77	Shortage	0.99	Sufficient	1.10	Shortage
Iowa	0.86	Surplus	0.44	Surplus	0.50	Surplus
Kansas	1.24	Shortage	0.44	Surplus	0.51	Surplus
Kentucky	2.23	Shortage	1.03	Sufficient	1.17	Shortage
Louisiana	9.32	Shortage	0.75	Surplus	0.96	Sufficient
Maine	1.81	Shortage	0.55	Surplus	0.66	Surplus
Maryland	2.01	Shortage	0.87	Surplus	1.00	Sufficient
Massachusetts	6.16	Shortage	1.51	Shortage	1.83	Shortage
Michigan	0.81	Surplus	0.69	Surplus	0.72	Surplus
Minnesota	1.63	Shortage	0.65	Surplus	0.75	Surplus
Mississippi	2.93	Shortage	0.60	Surplus	0.73	Surplus
Missouri	4.28	Shortage	0.72	Surplus	0.89	Surplus
Montana	1.18	Shortage	0.50	Surplus	0.58	Surplus
Nebraska	0.95	Sufficient	0.30	Surplus	0.35	Surplus
Nevada	2.62	Shortage	0.46	Surplus	0.57	Surplus
New Hampshire	0.84	Surplus	0.35	Surplus	0.40	Surplus
New Jersey	0.69	Surplus	0.41	Surplus	0.45	Surplus
New Mexico	15.62	Shortage	0.65	Surplus	0.83	Surplus
New York	1.43	Shortage	0.87	Surplus	0.95	Sufficient
North Carolina	1.98	Shortage	0.58	Surplus	0.69	Surplus
North Dakota	0.72	Surplus	0.31	Surplus	0.36	Surplus
Ohio	2.35	Shortage	0.96	Sufficient	1.12	Shortage
Oklahoma	1.41	Shortage	0.37	Surplus	0.45	Surplus
Oregon	1.89	Shortage	0.67	Surplus	0.79	Surplus
Pennsylvania	1.82	Shortage	0.54	Surplus	0.65	Surplus
Rhode Island	0.63	Surplus	1.35	Shortage	1.07	Sufficient
South Carolina	1.55	Shortage	0.50	Surplus	0.59	Surplus
South Dakota	0.54	Surplus	0.50	Surplus	0.51	Surplus
Tennessee	1.58	Shortage	0.63	Surplus	0.74	Surplus
Texas	12.70	Shortage	1.18	Shortage	1.49	Shortage
Utah	1.64	Shortage	0.53	Surplus	0.62	Surplus
Vermont	0.15	Surplus	0.20	Surplus	0.19	Surplus
Virginia	2.16	Shortage	0.80	Surplus	0.93	Sufficient
Washington	1.79	Shortage	1.02	Sufficient	1.14	Shortage
West Virginia	0.92	Sufficient	0.92	Sufficient	0.92	Sufficient
Wisconsin	0.97	Sufficient	0.35	Surplus	0.41	Surplus
Wyoming	0.56	Surplus	0.39	Surplus	0.42	Surplus

[1]Alaska did not report the number of commercial parking spaces; however, the number of public spaces exceeded the estimated total demand.

4.3 RESULTS FROM THE DRIVER SURVEY

Several hundred drivers provided written and verbal comments, both solicited and unsolicited, regarding the availability of truck parking. Overwhelmingly, drivers remarked that there are not enough parking spaces at either public rest areas or commercial truck stops and travel plazas, particularly during the overnight hours. Drivers also reported that more parking is needed near metropolitan areas and in certain regions of the country (e.g., Northeast, Southern California, Northwest).

Drivers were asked how frequently they encounter available parking at public and commercial truck parking facilities (table 18). Among the overall sample, only 11 percent of respondents indicated that they frequently or almost always find available parking at public rest areas and only 34 percent of respondents reported that they frequently or almost always find available parking at commercial truck stops. Forty-eight percent of respondents indicated that they only rarely or almost never find available parking at public rest areas, while only 16 percent reported that they only rarely or almost never find available parking at commercial truck stops.

Table 18. Frequency with which drivers find available parking at public rest areas and commercial truck stops.

Type of Facility	Almost Never	Rarely	Sometimes	Frequently	Almost Always
Public Rest Areas	14%	34%	41%	9%	2%
Commercial Truck Stops	4%	12%	51%	25%	9%

Drivers also had the opportunity to rate how often their next stop (e.g., shipper or receiver) has available parking. The most frequently reported response (by 40 percent of the sample) was that sometimes their next stop has available parking. Thirty-seven percent of drivers reported that their next stop has available parking rarely or almost never. Twenty-three percent indicated that their next stop has available parking frequently or almost always.

5.0 ACTIVITIES TO REDUCE SHORTAGES

5.1 INTRODUCTION

This section of the report presents a compilation of recommended actions for addressing commercial truck parking shortages. The first set of recommendations was obtained through discussions with various stakeholder groups. These are groups that, in general, represent the national stakeholder constituencies, such as the Commercial Vehicle Safety Alliance (CVSA) [enforcement] and Parents Against Tired Truckers (PATT) [safety community]. These stakeholders help provide a high-level, national view on the issue and possible solutions.

The second set of recommendations was provided by the participating State partnerships. The recommendations, while often mirroring the national-level recommendations, also focus on State- and corridor-specific solutions – that is, the "grass roots" level.

5.2 REST AREA FORUM

On June 29-30, 1999, FHWA hosted a two-day Rest Area Forum in Atlanta, GA. More than 70 representatives from State DOTs and enforcement agencies, the motor carrier industry, commercial drivers, commercial truck stop operators, safety advocates, and other interested stakeholders participated in the Forum, which was intended to achieve the following objectives:

- Review issues surrounding the provision of parking for commercial drivers by both States and commercial truck stop operators.
- Describe and document success stories and best practices.
- Consider means to provide real-time information on the availability of truck parking spaces and information on driver fatigue.
- Identify actions and initiatives, including legislative actions and funding initiatives, that could be undertaken to address parking shortages.

A number of issues were identified by the participants, and recommendations were developed for the seven highest-ranked issues, which are presented below, but not in any ranked order.

- Improve safety and security at public rest areas and commercial truck stops and travel plazas.
- Provide low-interest loans, tax incentives, and public-private partnerships to support commercial truck stops (i.e., meet parking space demand through the private sector).
- Use alternative parking sites such as weigh stations and park-and-ride lots.
- Improve the provision and location of public rest areas and commercial truck stops (e.g., spacing standards between parking areas).
- Improve financial support for improving and expanding public rest areas, and make this a safety-related issue.
- Eliminate time limits on parking at public rest areas. Alternately, enforce time limits to increase the availability of spaces at public rest areas.
- Increase driver education and information on causes of fatigue and on the availability and location of available parking spaces.

These recommendations served as a resource for identifying a number of questions that were included in the survey.[2] It is interesting to note that the findings of the current study, which draws upon a significantly larger (and different) population than that included in the Rest Area Forum, are consistent with and support these recommendations. The Rest Area Forum report also noted that the recommendations developed were not necessarily consensus recommendations and that various stakeholders disagreed on approaches to addressing shortages of commercial vehicle parking spaces. The results of the current study support this lack of consensus, in particular on the issue of whether parking space shortages should be addressed by expanding public rest areas or relying on the private sector to meet demand.

5.3 NATIONAL STAKEHOLDER DISCUSSIONS

During the course of the study, FHWA provided the study team with a detailed listing of stakeholder groups that comprise the "national stakeholder" interests. These groups represent the enforcement community, the motor carrier industry, commercial truck stop operators, shippers and receivers, and the safety community. The intent of discussing truck parking space availability issues with stakeholders was to obtain a balanced portrayal of how the issue of truck parking space availability affects the various interest groups.

Each group was contacted by telephone to discuss the proposed interview. Groups were then given a list of questions and issues and either provided written comments or agreed to telephone discussions. As can be seen, the groups share a common desire to solve the truck parking problem. As outlined in this list, a variety of positions were proposed, including expanding public parking, changing regulations and financing, and increasing the number of commercial truck stop and travel plaza spaces:

- Advocates for Auto and Highway Safety. Expansion of commercial facilities represents the best solution to the truck parking problem.

- America's Road Team (ART). ART supports 1) increased State and Federal funding for public rest stop spaces and 2) encourages the use of existing facilities, such as weigh stations and park-and-ride lots, for parking, where possible.

- American Trucking Association (ATA) Foundation. ATA believes that DOT should lead a concerted effort to fund the construction of additional truck parking using existing funding sources. DOT should also explore technology for improving the efficiency of existing resources. ATA does not advocate one method of eliminating the shortfall over another. Instead, ATA wants organizations and agencies to do everything possible to improve the availability of parking spaces at both public and commercial facilities for truck drivers.

- Commercial Vehicle Safety Alliance (CVSA). CVSA has been active on this issue for two years. CVSA believes that there is a shortage of parking spaces and that the next reauthorization should include a Federal mandate to use highway funds to construct rest stop facilities if a need is demonstrated and proven. CVSA believes the permissive language on this issue is not strong enough and that a formal mandate is needed. A Federal mandate and funding for building new or additional parking facilities would be the most effective means of addressing the problem. Additional short-term solutions include the following:

    - Change State policies that restrict the amount of time truckers may stay in public rest areas.
    - Use inspection and weigh station facilities during off-hours to provide additional parking.
    - Use satellite parking to provide additional parking spaces.

  - Communicate information on space availability and facility locations to drivers. [Maryland is currently doing this through variable message signs (VMSs), the Web, and brochures.]

- Motor Freight Carriers Association (MFCA). MFCA stands behind the results of the ATA Foundation rest area/truck stop study, "Making Space for Safety," as far as the truck parking shortage is concerned. They report, "while our segment of the industry does not use public rest areas or commercial truck stops and travel plazas for long-term parking, we do believe that more can be done to encourage public/private partnerships to help solve the parking shortage."

- NATSO, Inc., the Association representing America's Travel Plazas and Truck Stops. NATSO believes that the commercial truck stop industry has in the past adequately met the needs of the professional driver and will do so in the future. NATSO believes professional trucking companies and drivers should bear the responsibility of finding safe, legal places to store their equipment. In that regard, NATSO recommends the following:

  - Increase yearly truck registration fees with the stipulation that these special funds can be used by States only on initiatives to address the truck parking issue.
  - Implement a program that allows States to close rest areas in locations that are well served by private-sector businesses and shift funds to areas in which additional development is desirable.
  - Remove cost-prohibitive road improvement requirements imposed by State DOTs upon developers attempting to open new facilities.

- Owner-Operator Independent Driver Association (OOIDA). OOIDA feels this is a problem so important to the industry that meaningful solutions will be found only through cooperation among all the stakeholders. Actions that OOIDA believes would be beneficial include the following:

  - Build more and bigger public rest areas.
  - Provide designated "trucks only" public rest areas.
  - Increase the number of overall spaces.
  - Accommodate longer (e.g., 53-ft) trailers.
  - Stop closing existing public rest areas.

- Parents Against Tired Truckers (PATT). PATT believes that a Federal mandate and funding for building new or additional parking facilities would be the most effective means of addressing the problem. Additional solutions include the following:

  - Provide low-interest loans for developing truck parking facilities (absent direct funding or as a supplement).
  - Explore public-private partnerships for developing additional rest facilities. An example would be a "super lot" in which a vendor or contractor would develop a facility on a State-provided land. Another example would be to have highway contractors who are working in an area in which a truck rest stop is located be available to help build additional parking spaces at that rest stop.
  - Review individual State policies that restrict the amount of time truckers may stay in public rest areas.

- Petroleum Marketers Association of America (PMAA). PMAA feels that ensuring that drivers get adequate sleep is the responsibility of the companies that use their services and that the best way to address parking shortages is for the trucking industry to seek out alternative solutions. For example, setting schedules so that drivers do not necessarily arrive in congested areas during peak times would help reduce overcrowding in some locations. The trucking industry could develop consortia to locate available parking areas in which inadequate parking currently exists, and large carriers could seek out

parking areas within reasonable distances of thruways and contract for parking at those facilities. Trucking companies could also work with their customers, shippers, and receivers to allow trucks to park at their facilities.

- Four other stakeholders [American Automobile Association, International Association of Chiefs of Police, National Industrial Transportation League (NITL), and National Private Truck Council (NPTC] were contacted but did not have an official position on the truck parking issue.

5.4 ACTIONS RECOMMENDED BY THE STATE PARTNERSHIPS

Partners provided a set of recommended actions to solve any parking shortfalls that have been identified either through this study or as a result of other similar studies conducted in recent years for their States. These actions fall into six broad categories, as listed below.

- Actions to expand or improve public rest areas.
- Actions to expand or improve commercial truck stops and travel plazas.
- Actions to encourage the formation of public-private partnerships.
- Actions to educate or inform drivers about available spaces.
- Actions to change parking enforcement rules.
- Actions to conduct additional studies.

Table 19 summarizes the actions that have either recently been completed or are currently being implemented in each State. Table 20 summarizes the actions by each State partnership for future implementation. The sections that follow describe in more detail some of the specific suggestions or comments associated with each of these six categories.

Table 19. Summary of recent or current actions pursued by State partners.

State	Expand Public Facilities	Expand Commercial Facilities	Foster Partnerships	Improve Information	Enforcement Changes	Additional Studies
Alabama						
Alaska						
Arizona	✓	✓				
Arkansas	✓	✓	✓	✓		
California	✓	✓		✓		
Colorado	✓	✓				
Connecticut	✓	✓				
Delaware						
Florida	✓	✓				
Georgia	✓	✓		✓		
Idaho	✓	✓	✓	✓		
Illinois	✓	✓		✓		
Indiana			✓	✓		
Iowa	✓	✓				
Kansas						
Kentucky	✓					
Louisiana	✓	✓		✓		
Maine						✓
Maryland	✓			✓		
Massachusetts						✓
Michigan						✓
Minnesota						
Mississippi	✓					
Missouri	✓	✓	✓	✓		
Montana	✓		✓			
Nebraska	✓					
Nevada	✓	✓		✓		
New Hampshire						
New Jersey						✓
New Mexico	✓					
New York						✓
North Carolina	✓			✓	✓	✓
North Dakota						
Ohio	✓	✓			✓	
Oklahoma						
Oregon	✓			✓		
Pennsylvania	✓			✓		
Rhode Island	✓	✓		✓		
South Carolina	✓					
South Dakota						
Tennessee	✓	✓				
Texas	✓					
Utah						
Vermont	✓					
Virginia	✓	✓		✓		
Washington	✓					
West Virginia						✓
Wisconsin	✓	✓	✓	✓		✓
Wyoming	✓			✓	✓	

Note: Checks denote States reporting recent or current actions.

Table 20. Summary of future actions recommended by State partners.

State	Expand Public Facilities	Expand Commercial Facilities	Foster Partnerships	Improve Information	Enforcement Changes	Additional Studies
Alabama						
Alaska						
Arizona	✓	✓				
Arkansas	✓	✓	✓	✓		
California	✓	✓		✓		
Colorado	✓	✓				
Connecticut	✓					
Delaware	✓				✓	
Florida	✓	✓				
Georgia	✓	✓		✓		
Idaho	✓	✓	✓	✓		
Illinois	✓	✓				
Indiana	✓		✓	✓		
Iowa	✓					
Kansas						
Kentucky	✓					
Louisiana	✓	✓		✓		
Maine						✓
Maryland	✓			✓		
Massachusetts	✓					
Michigan						
Minnesota						
Mississippi	✓					
Missouri	✓	✓	✓	✓		
Montana	✓					
Nebraska	✓					
Nevada	✓	✓		✓		
New Hampshire						
New Jersey						✓
New Mexico	✓					
New York						✓
North Carolina	✓			✓	✓	
North Dakota	✓					
Ohio	✓	✓				
Oklahoma						
Oregon	✓			✓		
Pennsylvania	✓			✓		
Rhode Island	✓			✓		
South Carolina	✓					
South Dakota	✓					
Tennessee	✓	✓				
Texas	✓					
Utah						
Vermont	✓					
Virginia	✓	✓		✓		
Washington	✓					
West Virginia						✓
Wisconsin	✓	✓	✓	✓		✓
Wyoming	✓			✓	✓	

Note: Checks denote States planning or considering future actions.

5.4.1 Actions to Expand or Improve Rest Areas

Thirty-two States indicated that they were currently taking or had recently taken actions to expand or improve the public rest area facilities as a strategy to increase the availability of adequate parking for trucks, and five additional States indicated an intention to do so in the future. The recommendations on how to expand public facilities included the following:

- Construct new public rest area facilities with additional truck parking spaces. Consider developing truck-only parking facilities. Raise the priority of public rest area construction by making it a safety-related issue.

- Add new truck spaces to existing public rest areas as part of scheduled rest area reconstruction or rehabilitation. Redesign and reconfigure rest areas to increase parking and improve commercial vehicle circulation through the lot. Also, convert parallel parking to pull-through parking for added driver convenience.

- Convert closed public rest areas into parking facilities, and consider designating these facilities for truck-only parking.

- Investigate the use of Federal funds for maintaining public rest areas. Explore alternative financing of public rest area construction. Develop pilot projects for generating revenue to keep public rest areas open.

- Partner with other State agencies, such as the Department of Tourism, to incorporate truck parking needs into the development of new tourist information sites.

- Review and expand security at public rest areas by providing call boxes, cameras, increased law enforcement, etc.

- Identify locations where commercial vehicle parking can be combined with ports of entry, weigh stations, or police substations. Consider exempting trucks from enforcement actions to encourage the use of these sites for parking by fatigued drivers.

- Construct turnouts in rural sections of Interstate for parallel parking by commercial trucks.

- Upgrade facilities currently closed during off-season to be open year round.

- Improve geometric design at interchanges to increase convenience to drivers choosing to exit. For example, increase turning radii, widen narrow bridges, place traffic signals where warranted, and add turning lanes to ease access and egress to commercial truck stops and travel plazas.

5.4.2 Actions to Expand or Improve Commercial Truck Stops and Travel Plazas

Eighteen States indicated that they were currently taking or had recently taken actions to help expand or improve commercial truck stops and travel plazas, and 15 of these States expressed an interest in continuing to do so in the future.[a] Six additional States (Delaware, North Carolina, Oregon, South Carolina, Texas, and Wyoming) indicated that they intended to rely on the private sector to provide additional commercial truck

[a] The 18 States cited refers to those States that identified this strategy in their draft action plans. It does not necessarily reflect the total number of States in which individual truck stop operators plan to expand facilities.

parking along overcrowded corridors. Growth estimates provided by the NATSO Foundation indicated that the number of private spaces has increased by an average of 6.5 percent per year over the last several years. If this rate continues, much of the private demand can be accommodated by the anticipated growth in private spaces.

5.4.3 Actions to Encourage Formation of Public-Private Partnerships

Six States indicated that they were currently taking or had recently taken actions to encourage formation of public-private partnerships to increase the availability of adequate parking for trucks, and five of these States expressed an interest in continuing to do so in the future. The recommendations on how to encourage formation of public-private partnerships included the following:

- Create working groups between public and private sectors to develop new parking and explore options to overcome barriers to cooperation.
- Work with the private sector to redevelop or construct new public rest areas with direct access to the Interstate.
- Provide low-interest loans or grants to commercial truck stops and travel plazas to increase capacity.
- Construct State-owned lots adjacent to commercial truck stops and travel plazas and enter into agreements to lease or maintain the lots.
- Work with owners of commercial truck stops to help them promote the availability of parking in large lots close to the Interstate highway (e.g., provide signage on the highway).

5.4.4 Actions to Educate or Inform Drivers about Available Spaces

Seventeen States indicated that they were currently taking or had recently taken actions to better educate or inform drivers about available parking spaces, and 16 of these States expressed an interest in continuing to do so in the future. States suggested that the Intelligent Transportation System (ITS) infrastructure may provide real-time information on the availability of parking to drivers. In addition, States suggested that drivers be informed of the importance of complying with HOS rules to encourage fatigued drivers to pull off the road. Specific recommendations offered by the States included the following:

- Educate drivers on the safety benefits of rest and encourage them to use available spaces. For example, provide safety information (e.g., through brochures and public service announcements) to both drivers and trucking companies about the relationship between driver fatigue and accidents to encourage fatigued drivers to get off the road.
- Develop ITS deployments that provide drivers with real-time information on the location and availability of parking spaces. For example, investigate using cellular phones and radio frequencies to broadcast parking locations and availability to drivers.
- Investigate using mailings related to credentials administration for the International Registration Plan (IRP) and the International Fuel Tax Agreement (IFTA) as a means of distributing information on the location and type of parking spaces within the base State to participating motor carriers.
- Publish and distribute a “trucker’s map” that pinpoints parking facilities for drivers.

- Initiate a program that informs drivers of State-approved parking facilities. Such facilities may have security, lighting, and other services that will encourage drivers to use existing spaces.

- Use both static and real-time signage to provide drivers with information about availability and location of public and private parking spaces.

5.4.5 Actions to Change Parking Enforcement Rules

Five States indicated that they recently had implemented or may in the future implement changes in parking regulations and other development-related regulations related to commercial vehicle parking. Specific recommendations offered by the States included the following:

- Implement more stringent enforcement of parking rules to remove vehicles from unsafe locations such as interchange ramps.

- Change parking limits to permit trucks more time to park at public rest areas.

- Encourage local government and business support for constructing and operating commercial truck stop facilities in or near their community industrial and business parks (i.e., zoning). The "Not in My Backyard" syndrome has made it difficult to gain this local support. This issue has become a major problem in the development of new commercial truck stops and public rest area facilities near the boundaries of larger cities.

- Encourage better recognition or credit and tax incentives for companies and terminal operators who provide "truck staging area" facilities for pickup and delivery activities with 24-hour access, parking, sanitation, and security. This could be promoted at both the State and national levels.

- Promote building requirements for future warehouse and delivery facilities to incorporate truck parking and staging facilities as part of their development/building permit process. Encourage public/private partnerships to fund or offset these increased costs. This could be promoted at both the State and local levels.

5.4.6 Actions to Conduct Additional Studies

Eight States indicated that they recently had conducted or may in the future conduct additional studies on the adequacy of parking for commercial vehicles to refine the results emerging from the Section 4027 study and to develop more detailed strategies targeted at specific locations.

One State will be pursing more detailed truck parking supply and demand studies at the State and regional levels on specific, heavily traveled truck corridors. The methodology used for the national study will be modified. Field interviews with truckers could be added to make the results of these studies more useful as planning tools for developing measures to address identified parking problems.

Another State suggested that a multi-State committee be established to evaluate alternatives and recommend solutions that would address "on-time deliveries." Many States noted that truck parking demand at certain locations is a reflection of trucks "staging" to provide just-in-time delivery.

6.0 SUMMARY AND CONCLUSIONS

6.1 STUDY SUMMARY

Section 4027 of the TEA-21 requires:

> *…a study to determine the location and quantity of parking facilities at commercial truck stops and travel plazas and public rest areas that could be used by motor carriers to comply with Federal hours of service rules. The study shall include an inventory of current facilities serving the National Highway System, analyze where shortages exist or are projected to exist, and propose a plan to reduce the shortages.*

This report, which has been prepared in cooperation with research entities representing motor carriers, the travel plaza industry, and commercial motor vehicle drivers, presents the findings of the Section 4027 study. These findings include results of a national driver survey, estimates of truck parking demand generated by a demand model, estimates of truck parking supply generated by a national inventory of truck parking facilities, and comments and recommendations on the issue of truck parking from State partnerships and national stakeholders. Sections 2.0 through 5.0 of this report describe the detailed results of this study, which are summarized in the list below:

- Only 11 and 34 percent, respectively, of truck drivers surveyed in the national driver survey indicated that they frequently or almost always find parking available at public rest areas and at commercial truck stops and travel plazas. Nearly half reported rarely or almost never finding available parking at public rest areas. Fewer than half of the truck drivers indicated that they frequently or almost always find any of the following features at truck parking facilities: parking convenient to the highway, parking facilities with the needed amenities, parking that allows adequate time, parking with enough room to drive in and out, and parking spaces used only by trucks. For each feature, about 40 percent of respondents indicated that they sometimes find that feature, and the remainder indicated that they rarely or almost never find that feature. The survey results indicate that truck drivers do perceive that there is a problem with the adequacy of available truck parking.

- An analysis of the driver surveys indicated that drivers prefer commercial truck stops and travel plazas for most activities that require them to park, but they prefer public rest areas when stopping for taking a quick nap. Weighting these results by the relative time spent on each activity indicated that 23 percent of the demand for truck parking is at public rest areas and 77 percent of the demand is for parking at commercial truck stops and travel plazas. This split is a key element in understanding the adequacy of truck parking because in many areas where there is an apparent shortage of spaces at public rest areas, there is an apparent surplus at commercial truck stops and travel plazas. One way to address the shortage of public parking spaces is to take steps to shift the demand to the available private spaces.

- The national survey of truck parking spaces identified 31,249 spaces at 1,771 public facilities (e.g., public rest areas, pull-offs, and weigh stations) and between 167,881 and 284,601 spaces at 3,382 commercial facilities. The demand model estimated a total demand for 66,067 spaces at public facilities and 221,249 spaces at commercial facilities. While the estimated demand for parking spaces at public facilities far outstrips the supply, the supply at commercial facilities seems sufficient to meet the current demand.

- A total of between 182,225 and 288,995 parking spaces was identified along Interstate highways, compared to an estimated demand for 245,389 truck parking spaces. A total of between 16,558 and

26,855 parking spaces was identified along non-Interstate highways, compared to an estimated demand for 41,927 spaces. The total supply of parking spaces along Interstate highways seems to match the estimated demand, while the total supply along non-Interstate highways falls far short of the estimated demand. Part of the discrepancy along non-Interstate highways may be accounted for by the greater access to other locations at which to park (e.g., restaurants and shopping malls) along non-Interstate highways than along Interstate highways.

- An analysis of the supply and demand for truck parking indicates that 35 States have a current shortage of parking at public facilities, while only 8 States have a shortage at commercial facilities, and 12 States have a shortage when both types of facilities are considered together. In some cases, the apparent shortage may be mitigated by regional factors (e.g., Delaware could be considered a "pass-through" State, and the parking shortage in Delaware may be offset by parking surpluses in nearby States). In other cases, however, no apparent mitigation exists.

- The growth rate of demand for truck parking was estimated to be 2.7 percent annually, while the growth rate of supply of public spaces was estimated to be 1 percent annually, and the growth rate of private spaces was estimated to be 6.5 percent annually. These estimates suggest that, if other factors that affect truck parking remain the same, the apparent shortage of spaces at public rest areas will worsen while a growing surplus of spaces at commercial truck stops will develop.

- A few States restrict parking (e.g., place time restrictions for parking) at public rest areas, which can further exacerbate any supply shortages that may exist for parking at public facilities. At the same time, some States augment the parking spaces available at public rest areas with parking spaces at other public facilities such as weigh stations.

- A number of factors indicate that the degree to which truck drivers use parking spaces at public rest areas and commercial truck stops and travel plazas interchangeably is limited. Responses to the driver survey indicate a preference for different facilities, depending on the reason for the stop. Field observational studies noted that parking spaces at public rest areas often fill up sooner than spaces at commercial facilities. The study team believes these differences arise for the following reasons: public rest areas typically offer more convenient access to the highway and more certainty of whether a parking space exists (because drivers can often observe the lot from the highway), while commercial truck stops and travel plazas typically offer more amenities. One way to shift demand from public rest areas to commercial truck stops and travel plazas would be to increase the convenience and certainty of finding parking spaces at commercial facilities.

- Geographically, truck parking shortages appear to be more common in the Northeast and the Midwest.

- A number of recommendations for addressing truck parking shortages were proposed by participants in the Rest Area Forum, national stakeholders, and State partnerships. Most of these recommendations fall into one of the following six categories: expand or improve public rest areas, expand or improve commercial truck stops, encourage formation of public-private partnerships, educate or inform drivers about available spaces, change parking enforcement rules, and conduct additional studies.

Although there is a consensus that the adequacy of truck parking is an important issue that must be addressed, there is wide disagreement both among the various stakeholder groups and among the States about the best approach to addressing the problem. Although the problem has national consequences, both the problem and the proposed solutions seem to be more local in nature. For example, some States have an apparent shortage of parking spaces while nearby States have an apparent surplus, and any shortages that do exist are often concentrated on a few sections of highway within a State. The solutions, too, can be

local in nature, with some States proposing to leverage existing ITS initiatives to broadcast parking information, others proposing to open more parking facilities, and others relying on private industry to meet the demand. One point of agreement, however, is that the various agencies, organizations, and special interest groups worked together as part of the State partnerships and want to continue to work together to address this issue.

6.2 INTERPRETATION OF THE SUMMARY AND CONCLUSIONS

The previous sections of this report provide detailed information about the adequacy of truck parking on the NHS. These results, when presented and viewed as a series of snapshots, tell only part of the story. Missing from that type of snapshot presentation is the bigger picture that surrounds the adequacy of commercial truck parking facilities serving the NHS. To wit: Is there a truck parking problem, and if so, what should be done about it? This section looks at the bigger picture by posing a series of questions whose answers are key to understanding and addressing the adequacy of truck parking and suggesting answers to these questions that are synthesized from the report findings. In particular, nearly all of the suggestions identified below are restatements of recommendations made by the State partners for the express purpose of establishing a starting framework for considering solutions to specific truck parking problems.

6.2.1 What problems are associated with an inadequate supply of truck parking spaces?

An inadequate supply of truck parking spaces can result in two negative consequences: (1) tired truck drivers may continue to drive because they have difficulty finding a place to park for rest, and (2) truck drivers may choose to park at unsafe locations, such as the shoulder of the road and exit ramps, if they are unable to find available parking. Both of these consequences generate a safety hazard for the truck driver and for other drivers using the NHS. However, any program meant to address the problems of an inadequate supply of truck parking spaces must concentrate on a number of issues beyond simply providing additional parking spaces. For example, a Federal program that simply earmarks funds for each State to build new truck parking may not completely address the "big picture" need. Earmarking funds for every State may not be necessary if some States already have a sufficient supply of truck parking. Also, building spaces that have neither the convenience nor the amenities necessary to convince a truck driver to use the spaces would not help; tired truck drivers would either continue to drive to locate spaces with preferred amenities or would park in unsafe locations because of the greater convenience. Finally, parking spaces need to be adequately spaced so that a surplus of spaces is not developed in a select group of locations while other roadway segments continue to have an inadequate supply of spaces. Consequently, the analyses and conclusions in this report will regularly refer back to these issues.

6.2.2 Is there an adequate supply of truck parking spaces for the NHS?

In determining whether the supply of truck parking spaces is adequate, it is important to evaluate not only the total supply of truck parking, but also the distribution (i.e., Are spaces located at the places necessary to meet demand?) and type (i.e., Will truckers use the spaces?) of those parking spaces.

A key issue is to determine what types of parking spaces are available. That is, do the available spaces have the convenience and amenities necessary so that the driver will choose to use them? If these spaces do not meet the needs of a driver, the driver may choose to either drive tired or park on the shoulder. This fact leads to another key element in addressing this problem: a proposed solution must not only consider the number of available spaces, but must also consider the factors that influence truck drivers' choices about where and when to park.

A second key issue is to determine whether the distribution and spacing of parking spaces address the factors that impact the need for these spaces. For example, an important factor impacting the demand for truck parking spaces is the HOS regulations, which place strict limits on the number of consecutive hours a truck driver may drive. If a driver has "used up" his hours, she/he is forced to either violate these regulations or find a place to rest. If there are no legal parking spaces available, the driver must either park at an unsanctioned location (e.g., an exit ramp) or continue to drive until a parking space is located. Similarly, a very tired driver must either find a parking space immediately or continue to drive while tired. This leads to the following observations about the truck parking problem with respect to distribution and spacing:

- The problem of truck parking is, by its very nature, a local problem. A State or highway that has sufficient parking spaces, in general, can still have important stretches of highway with inadequate parking.

- In the absence of an extreme abundance of truck parking spaces, the factors that influence truck parking must include some flexibility to alleviate truck parking problems. For example, because HOS regulations (or fatigue) place strict limits on the amount of time a driver may drive, drivers must have some flexibility in where they park. It may be safer for a highly fatigued driver to take a short nap on an exit ramp than to continue to drive. On the other hand, a driver who habitually parks on exit ramps may pose a greater safety hazard to himself and the general public than one who drives so as to avoid the necessity of parking on ramps.

The driver surveys, field observations, and demand model calculations all support the conclusion that there is a shortage of truck parking spaces at many locations in the United States and that this shortage is worse for parking at public rest areas than at commercial truck stops and travel plazas. Shortages also appear to be worse for non-Interstate highways, though the fact that those highways are often not access-controlled makes it more likely that other types of parking spaces (i.e., not at public rest areas or commercial truck stops or travel plazas) are used as supplemental parking.

The demand model provides a useful method for identifying locations at which parking shortages may exist, but further investigation is required to confirm the implications of the demand model. For example, the demand model does not consider the fact that demand generated in one section of a highway can often be safely met by supply in a nearby section or that a driver who is getting tired might stop early to park at a favored facility. Also, the demand model does not consider a number of local factors that can influence demand, such as a higher rate of parking near major distribution centers. Further research and refinement of the demand model could help sharpen the demand estimates made with the model. In the meantime, it should be used as only an *indicator* of potential shortages.

Finally, there is the question of the type of parking (public or private) that is available. Many field surveys have observed that drivers choose to park at overcrowded public rest areas or on the shoulder when parking is available at a nearby commercial truck stop or travel plaza. This could be caused by the uncertainty of finding parking at a nearby truck stop, the relative difficulty of entering and exiting a truck stop, or some other reason. If steps are taken to reduce the factors that make some truck drivers favor parking at public rest areas (or even on shoulders), then the commercial truck stop industry can be effective in addressing the need for truck parking. However, as long as truck drivers view these types of parking spaces differently, a need will exist for both types of parking spaces.

6.2.3 Is it appropriate for the State and Federal governments to take steps to address any inadequacies in truck parking, if they exist?

Even if there is a shortage of truck parking spaces, it may not be the responsibility of the State or Federal government to address the problem. Certain stakeholder groups have argued that expanding public

parking for commercial vehicles amounts to a subsidy of the trucking industry and unfairly penalizes the commercial truck stops that serve it. Parallels have been drawn to the aviation industry, where Federal HOS regulations limit pilot flying time, but the Federal government does not help provide sleeping facilities for the pilots.

The other side of the issue is that tired truck drivers pose an imminent health risk to other drivers on the road and that governments have a prevailing interest to protect citizen-drivers by helping tired truck drivers find rest. This view is supported by the existence of citizen-led organizations that are lobbying the government to address this problem and by the media attention that this problem has drawn.

The clearest indication of whether the government has a role to play in addressing this issue comes directly from the comments of the stakeholders interviewed for this study. While different stakeholders prefer different roles for government, ranging from leveraging ITS technologies to better disseminate information about available parking spaces to building more and better public parking facilities, most stakeholders do agree that government should play a role. For example, a large number of State partner groups advocate a hybrid approach that involves the commercial industry working with the State and/or Federal government to help solve the parking problem.

6.2.4 How can locations with inadequate truck parking be identified?

The first step in alleviating parking shortages is to identify the locations at which those parking shortages exist. The demand model and supply inventory represent a good first step in achieving this goal. The primary limitations of this model, however, are that it does not consider a number of local factors that can affect local demand (e.g., proximity to distribution centers that results in truck drivers staging at parking facilities, proximity to other parking facilities that absorb demand, and consideration of travel patterns that affect the short-haul/long-haul ratio). Because of these limitations, the model should be used as a guideline for identifying possible locations of parking shortages that can be evaluated more carefully through additional study and field observations.

As a first step in this process, State governments can use their knowledge of local conditions to refine the model for local usage. For example, the model may estimate that the parking supply for an important North-South travel corridor is "at capacity." Because the route of interest is an important long-distance travel corridor, however, the proportion of long-haul vehicles on the route is likely higher than that used in the model, which will result in a greater demand than that estimated by the model. Alternately, a route between two nearby population centers may generate an unusually high amount of short-haul commercial traffic, which will result in a smaller demand than that estimated by the model. In each case, model parameters can be calibrated specifically for these routes in order to generate more accurate demand estimates.

Once locations with possible shortages have been identified, field observations can be used to verify the shortage prior to implementation of any expensive plans to address the perceived shortage. These field observations should note not only signs of over-utilized parking facilities (e.g., parking above capacity at public rest areas and parking on shoulders), but also under-utilized parking facilities that may be nearby. Many field studies have already identified situations in which public rest areas were full and overflowing and trucks were parking on shoulders and exit ramps, but capacity still existed at nearby commercial truck stops and travel plazas. To identify the most cost-effective solution to a local truck parking problem, the field observations must identify existing resources that might be used to address the problem. Useful resources might include under-utilized parking at commercial truck stops and travel plazas; VMSs, radio broadcasts, and Intelligent Transportation Technology (e.g., Global Positioning System) to deliver real-time parking information and other public facilities on the highway (e.g., park-and-ride lots and weigh stations) that could be opened for parking at night. Several State partners have recommended that the Federal government facilitate this process by providing funds to conduct additional studies (e.g., field

observations) where parking shortages are suspected. Furthermore, implementation guides can be developed to help standardize and increase the effectiveness of these studies, as can evaluation guides to help interpret the results of these studies for the purpose of formulating cost-effective plans for addressing the problem.

One of the most powerful features of the truck parking demand model is its ability to estimate future demand so that long-range plans can be formulated to accommodate this future demand. States could use this model to initially identify locations with possible parking shortages, then, based on local knowledge and field observations, refine the model to better reflect local conditions. The refined model could then be used to make long-term projections of parking demand so that appropriate long-term plans could be implemented.

6.2.5 How can inadequate parking at some locations be rectified?

When a parking shortage has been identified, a number of alternatives exist for how best to address that shortage. The alternatives that are best for a particular location will depend primarily on the local observations that were made while verifying the parking shortage. The following list describes some local observations that may be made and the possible solutions. The suggestions listed below are restatements of various suggestions made by the State partners consulted as part of the research for this report:

- Trucks are observed parking on the shoulder, but parking is available both at nearby public rest areas and commercial truck stops and travel plazas. This may be an indication that truck drivers are not aware of the parking that is available, and a program to disseminate parking information (e.g., with fixed highway signage, with VMSs, and through the Internet) might help. Truck drivers may not be aware of the safety risks of parking on the shoulder, and educational brochures could be used to teach them about these safety risks. Perhaps local enforcement of safe parking practices is lax. While waking a tired driver and forcing him to drive to another location is probably not a good practice for enforcement officers, leaving a warning ticket that explains the penalty for parking illegally and informs the driver of nearby parking locations might be more appropriate.

- Trucks are observed parking at overcrowded rest areas, but parking is available at nearby commercial truck stops and travel plazas. Truck drivers might not be aware of the available parking, and some of the suggestions mentioned above might help (e.g., VMSs, educational brochures). Truck drivers may favor the convenience of parking at a public rest area. If the exit ramps or roadways leading to nearby commercial truck stops and travel plazas are difficult to navigate, the State could choose to improve the exit ramps and improve access to the parking provided at the commercial facilities. Providing signage on corridors to inform drivers of the nearby facilities, and better yet, whether parking is currently available at those facilities, might also make use of the commercial facilities more appealing. If sufficient parking is available, the State can also make inappropriate parking less convenient by issuing tickets and levying fines.

- Overcrowded truck parking facilities are observed near a major city. Truck drivers may be using the parking facilities as a staging area to ensure timely arrival at a loading/unloading facility. Perhaps the owners or managers of the loading/unloading facilities could be convinced to provide access to a staging area for trucks making deliveries.

- Trucks are observed parking illegally, but legal parking is available nearby, information is available to guide truck drivers to the available parking, and access to this parking is convenient. In this case, truck drivers are likely parking illegally for the convenience of easy access to the highway, and enforcement activities could be used to make this illegal parking a less attractive option. Before beginning to enforce regulations more strictly, a warning period may be appropriate to give truck

drivers a chance to become better acquainted with nearby parking facilities and the new enforcement practices.

- Other nearby parking facilities are near or at capacity, but parking is available at a public rest area. In this case, it is likely that the physical layout of the rest area makes parking inconvenient for truck drivers. For example, a rest area may provide only parallel parking for commercial vehicles. The solution may be to reconfigure the rest area to better accommodate parking for commercial vehicles in accordance with published guidelines (i.e., American Association of State Highway and Transportation Officials) for designing safer and more trucker-friendly public rest areas.

- All nearby parking facilities are near or at capacity. This situation is indicative of a true shortage of parking spaces, and a new source of parking must be located. However, correcting this problem does not necessarily entail construction of new public parking facilities. If other public facilities that are typically closed at night are available, parking at those facilities could be used to supplement the existing parking. A similar arrangement might be made with nearby commercial facilities, or the government could rent parking space from commercial facilities for nighttime use. Commercial truck stops or travel plazas may already have expansion plans that will meet the need, and local government can take steps to help facilitate those plans. Several State partner groups have suggested that the Federal government create a program to supply low-interest loans to develop new parking spaces at commercial facilities located where a demonstrated parking shortage exists. The State or local government may choose to expand existing public rest areas or construct new ones to meet the parking shortage.

6.3 SUGGESTED FUTURE RESEARCH

6.3.1 Distribution of Parking Supply

This report has presented a discussion of the model's limitations and how the limitations hinder the ability of the model to accurately estimate demand at the segment level. While the demand model used in this study provides reasonable estimates of truck parking demand, improvements could be made to the model in the future to improve its ability to estimate parking at a more microscopic level. One specific limitation is that the model estimates demand for highway segments, ignoring variations in the parking supply that affect where drivers can park. Thus, there is currently a factor missing from the model that represents the geographic distribution of supply. Therefore, when field counts are compared to model estimates, as was done during calibration, it is not surprising that, in some cases, the estimates for one segment are too low, while the estimates for the next segment are too high. Additional research into how to add a factor to the model that represents the distribution of parking supply would make the model more accurate at the segment level and more useful for local planning purposes.

6.3.2 Commodity Flow Patterns

The model estimates parking demand as a result of truck drivers' needs to rest and obtain services. It does not consider other factors that might influence demand in a particular region, such as typical commodity flows or the desire to "stage" close to a shipper/receiver for more quick and easy access. In contrast, the model distributes demand evenly across the network without consideration of these types of factors. Research into commodity flow patterns (particularly where flows are heavy) and the location of large distribution centers, ports, etc., could provide insight into "loading" factors that could be used in the model to help distribute the demand in a more realistic fashion. Additional research into commodity flow patterns is especially important because just-in-time delivery is becoming the standard for the movement of goods and products in the United States.

6.3.3 Short-Haul to Long-Haul Ratios

The report discussed the short-haul to long-haul ratio, factors that might affect its variability, and how the variability was modeled (by classifying each highway segment as either rural or urban and using a different value for the ratio for rural and urban segments). This methodology, however, may not capture the true variation in this parameter, and a more realistic model for estimating this ratio for each highway segment would likely result in better demand estimates. Therefore, it is recommended that future research be performed to understand how, when, and where the short-haul to long-haul ratio varies and what factors affect its variance. This could be accomplished by conducting origin-destination studies at a variety of geographic locations and at different times of the day.

6.3.4 Model Validation

As discussed in the report, the model was calibrated using data collected along nine corridors in four regions. The demand estimates from the calibrated model were examined for face validity by analysts and State partnerships; however, no formal validation process was performed. It is recommended that more field observational studies be conducted and that the results of these studies be used for model validation.

6.3.5 Public-Private Partnerships

A number of States recommended the development of public-private partnerships to assist with the development and financing of additional parking spaces. However, public-private partnerships often represent new ground for States, as these partnerships may involve pooling funding, sharing risk, and accommodating the need for the private sector to show profit on investments. These types of funding and risk-sharing arrangements often are at variance with more conventional State procurement practices and can be difficult for States to implement. Candidate issues associated with the creation of public-private partnerships for providing additional truck parking spaces include the following:

- Differences between the public and private sectors' perception of what is important—the private sector's foremost goal is to make a profit. The public sector is concerned with improved operation of the transportation system.

- Legal issues such as the following: Does the public sector agency have the legal authority to undertake a public-private partnership? Do Federal and State tax laws prohibit a public agency from receiving compensation from participation in a public-private partnership?

The study team believes that moving this particular recommendation forward will require additional research that documents how a successful public-private partnership that implemented a similar type of project succeeded.[a] This research would include such issues as the following:

- Documenting how the partnership identified and addressed issues.

- Identifying statutory and regulatory issues that need to be addressed (i.e., revenue sharing and procurement) prior to the partnership being able to implement the project.

[a] An excellent summary of the types of issues encountered in developing public-private partnerships and recommendations on how to address these is presented in the ITS America/DOT-sponsored study *Choosing the Route to Traveler Information Systems: Decisions for Creating Public/Private Business Plans*. Although this report focuses primarily on Advanced Traveler Information Systems (ATIS), many of the issues will be similar to creating public-private partnerships for providing additional truck parking spaces.

- Observing how the partnership blended public- and private-sector goals (i.e., profit motive versus providing needed services).

The expected outcome of this research would be a case-study document that States would be able to use as a reference document to guide the development of other public-private partnerships.

6.3.6 Providing Information on the Availability of Parking Spaces

A common complaint heard throughout the course of the study was that drivers have a difficult time obtaining information on the location and whereabouts of facilities with available parking. This complaint was mirrored by similar complaints from commercial truck stop and travel plaza operators that they often have available spaces while drivers are parking on exit ramps and road shoulders. In the driver interviews, drivers indicated that they prefer not to park in overcrowded lots where driving can be difficult. A number of States recommended that providing information to drivers on the location of available parking facilities would help address these issues and help drivers find a place to obtain adequate rest.

Many States are studying how this type of information can be made available to drivers. Maryland, for example, received a grant from the I-95 Corridor Coalition to study the feasibility of using VMSs to provide information to truckers on the location of available truck parking.

Additional research in this area might include the following:

- Identifying which States are providing this type of information and how this information is being provided. This would include identifying what type of delivery system is being used by the State(s); the costs; the process used for obtaining, posting, and updating information; and who is responsible for system operation.

- Identifying any legal or regulatory issues that would need to be addressed in providing this information. For example, does posting information about the availability of parking spaces at commercial truck stops and travel plazas constitute advertising on behalf of that facility? Does a State have to provide equal access to all commercial facilities?

The expected product of this research would be a “lessons learned” report documenting issues that States would need to consider in developing and implementing such a service.

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