



**PENNSYLVANIA STATE TRANSPORTATION ADVISORY
COMMITTEE**

**TRUCK PARKING IN
PENNSYLVANIA**



**FINAL REPORT
DECEMBER 2007**

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The Pennsylvania State Transportation Advisory Committee (TAC)

The Pennsylvania State Transportation Advisory Committee (TAC) was established in 1970 by Act 120 of the State Legislature, which also created the Pennsylvania Department of Transportation (PennDOT). The Advisory Committee has two primary duties. First, the Committee "consults with and advises the State Transportation Commission and the Secretary of Transportation on behalf of all transportation modes in the Commonwealth." In fulfilling this task, the Committee assists the Commission and the Secretary "in the determination of goals and the allocation of available resources among and between the alternate modes in the planning, development and maintenance of programs, and technologies for transportation systems." The second duty of the Advisory Committee is "to advise the several modes (about) the planning, programs, and goals of the Department and the State Transportation Commission." The Committee undertakes in-depth studies on important issues and serves as a valuable liaison between PennDOT and the general public.

The Advisory Committee consists of the following members: The Secretary of Transportation; the heads (or their designees) of the Department of Agriculture, Department of Education, Department of Community and Economic Development, Public Utility Commission, Department of Environmental Protection, and the Governor's Policy Office; two members of the State House of Representatives; two members of the State Senate; eighteen public members, seven appointed by the Governor, and six appointed by the President Pro Tempore of the Senate; and the Speaker of the House of Representatives.

Public members with experience and knowledge in the transportation of people and goods are appointed to represent a balanced range of backgrounds (industry, labor, academic, consulting, and research) and the various transportation modes. Appointments are made for a three-year period and members may be reappointed. The Chair of the Committee is annually designated by the Governor from among the public members.



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1. Executive Summary

1.1 Study Objectives

Demand for truck parking, in Pennsylvania and nationwide, is increasing due to several factors. These include the growth in trucking which reflects population increases and economic markets—particularly the growing volume of imports that serve this massive consumer base. New federal hours-of-service regulations require more down time for drivers, which translates into an increase in demand for truck parking. The supply of truck parking is not keeping pace with the steadily growing demand.

This study provides an overview of the truck parking issues and trends facing Pennsylvania, the identification of regions in the state where parking demand is highest, and options for parking providers, drivers, and decision makers.

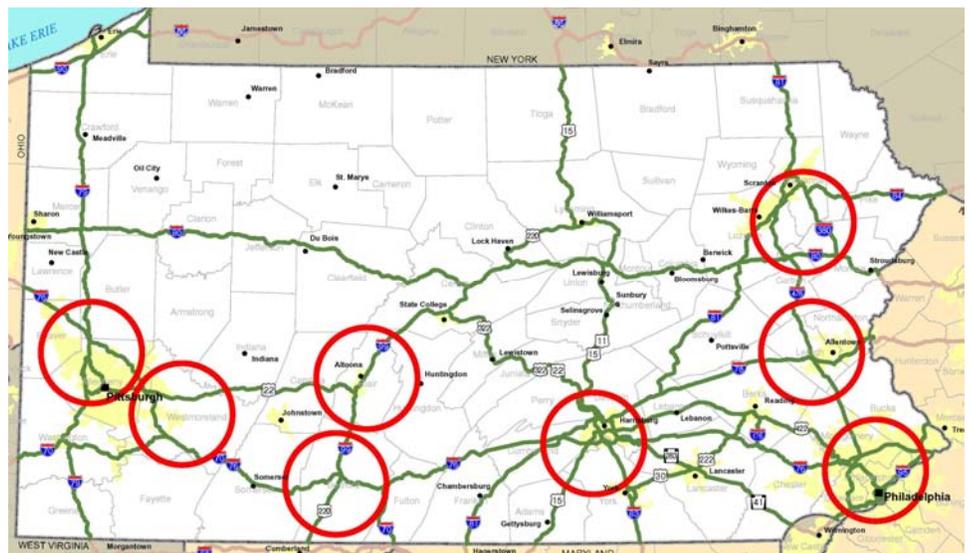
Through this study the TAC provides an analysis of the complex issues surrounding truck parking, and multi-faceted strategies to achieve adequate and safe truck parking across the state.

1.2 Significant Findings

- **There is a shortage of truck parking in Pennsylvania.** There are 11,500 truck parking spaces available at private truck stops, PennDOT rest areas and welcome centers, and Pennsylvania Turnpike service plazas. During the peak truck parking hour (3:00 a.m. to 4:00 a.m.), approximately 13,000 trucks require parking accommodations. The true need is greater than that state-level summary, because the demand for and supply of

Areas where parking demand exceeds supply

Though these are Pennsylvania's truck parking "hot spots," truck parking is an issue in all areas of the state.





truck parking must be assessed by corridor and region. The available truck parking capacity and the calculated demand within Pennsylvania's major trucking corridors results in a shortfall within the Commonwealth of nearly 4,400 parking spaces.

- **A shortage of truck parking compromises safety and contributes to other problems.** Truck parking on highway shoulders and ramps is common during overnight hours, and presents a significant safety issue. During a typical night approximately 1,100 trucks are parked along shoulders or ramps of Pennsylvania highways. This occurs for several reasons, lack of parking capacity being the most significant.

Trucks parked along highway shoulders and ramps

One-time surveys conducted during the overnight hours in May 2007 indicate the extent and statewide nature of the truck parking problem.



- **The causes of the truck parking problem are complex.** Federal hours-of-service regulations, Pennsylvania's location relative to major consumer markets in the northeast, increasing truck volumes, and reliable goods movement are among the contributing factors.
- **Truck parking demand will continue to grow.** In fact, data from the PA Statewide Freight Model estimates that statewide truck traffic will increase approximately 50 percent by the year 2030.
- **There is no clear champion or lead organization to address the problem.** The public and private sectors each have a role. But there is a limit to each partner's responsibility, legal authority, and capability to construct and operate facilities. Drivers are caught in the middle.



- **Strategies to address the problem must be multifaceted and involve the public and private sectors.** This approach is reflected in TAC’s 12-point strategy for addressing the truck parking problem, below.

1.3 Summary of Recommendations

Twelve-Point Strategy for a Comprehensive Approach to Meeting Truck Parking Needs	
PARTNERING	1. Advance TAC study recommendations by forming a public-private task force.
	2. Collaborate with neighboring states to forge regional solutions.
	3. Explore opportunities for expanding truck parking capacity and local economic development through dual-use facilities, brownfield re-use, and provision of parking at truck-oriented developments.
POLICY	4. Remove obstacles to public-private partnering for truck parking facilities and driver services.
	5. Develop a truck parking policy through the National Governor’s Association and the American Association of State Highway and Transportation Officials for the reauthorization of federal transportation legislation emphasizing partnership, innovative finance, and new funding programs.
PLANNING & FINANCE	6. Explore all funding opportunities, particularly for innovative pilot projects.
	7. Address truck parking through established statewide planning and programming processes.
	8. Reevaluate approaches for accommodating the growing truck parking demand on toll facilities, particularly the PA Turnpike mainline.
	9. Establish appropriate performance monitoring to track progress.
TECHNOLOGY & DESIGN	10. Develop complementary ITS applications that support more efficient operations and truck parking.
	11. Evaluate new truck parking design concepts to provide improved access to services, more parking at existing sites, and improved circulation.
	12. Integrate technologies and design principles into truck parking facilities to mitigate environmental impacts.



2. Introduction and Purpose

2.1 Background

Pennsylvania has extensive trucking activity, which is expected to continue to grow substantially. A corresponding increase in truck parking capacity, however, is not planned or expected. The current parking shortfall is evidenced by the many trucks parked along shoulders near rest areas and other locations. The issue has the potential to significantly impact safety and congestion.

Issues such as driver Federal hours-of-service (HOS) regulations, enforcement of highway/parking laws, public and private responsibilities, and competition among private truck stop operators all must be considered. These issues create a dynamic truck parking environment that can be difficult to understand, predict, and manage. The Pennsylvania State Transportation Advisory Committee has compiled this report with these in mind.

This study provides an overview of the truck parking issues and trends facing Pennsylvania, the identification of regions in the state where parking demand is highest, and options for parking providers, drivers, and decision makers. Clearly, this is an area that will very soon require public-private strategies. The alternative, as truck traffic increases, will be reacting to a crisis or more onerous mandates. Truck parking is a problem ripe for innovation, new partnerships, and new ways of funding facilities. Pennsylvania has an opportunity to help lead change.

2.2 Study Purpose

The public's primary issue with inadequate truck parking is safety. The Federal Motor Carrier Safety Administration (FMCSA) estimates that 8.15% of all fatal truck crashes are a result of fatigued drivers¹. There are also secondary issues such as truck idling which can lead to diminished air quality in areas with heavy truck parking.

Through this study the TAC provides an analysis of the issues and recommendations that provides the framework for a public/private partnership to ensure safe truck parking practices throughout the Commonwealth.

The truck parking problem has been long-term in its development. Its solutions may also be long-term going forward, but the window for being

¹ *Regulatory Impact Analysis and Small Business Analysis for Hours of Service (HOS) Options*, December 2002



proactive in solving these problems will decrease over time. The Commonwealth and the trucking industry have a near-term opportunity for innovation and collaboration. TAC's recommended 12-point strategy provides the foundation for moving forward to address this important and growing problem.

3. Approach

A three-part approach, including a review of current practices, interviews with other states and trucking interests, and data collection on truck parking practices, was undertaken to carefully assess this issue in Pennsylvania. These steps include:

1. Assessing the extent of the problem.
2. Identifying the corridors and regions with the greatest truck parking demand.
3. Identifying and evaluating options to address current and future truck parking demand.

3.1 Problem Identification/Verification

This step defines the problem and extent of truck parking issues in Pennsylvania by:

- Assessing the current utilization at truck parking facilities and on shoulders and ramps along the PA Core Highway Network.²
- Identifying potential current and future safety and congestion implications.

This step was accomplished through a review of previously-completed studies, collection of truck parking inventory data, targeted interviews with trucking-related organizations (public and private), and primary data collection of truck parking facility utilization and shoulder parking practices.

² As presented in *Defining a Core PA Transportation System*, Pennsylvania State Transportation Advisory Committee, Final Report, August 2006



3.1.1 Current and Future Parking Demand Estimation

In 2002 the FHWA developed an analysis³ of statewide truck parking needs for every state except Hawaii. The analysis estimated statewide demand for private and public truck parking facilities. The FHWA estimation method was used by TAC with some refinements. Most notable was a change from a statewide to a corridor analysis. This provides the necessary detail to determine those areas where truck parking demand is not met. Parking demand estimates are derived using the same methodology plus incorporating the PA Statewide Travel Demand Model truck traffic forecasts to estimate truck traffic growth for each corridor. This method is described in detail in Appendix 13.1.

3.1.2 Option Identification and Evaluation

A series of potential options were developed for addressing truck parking issues in Pennsylvania. The options were reviewed through a joint TAC Task Force and Industry Workshop to narrow the list to the most feasible solutions. The Workshop included government and industry participation that provided input on the feasibility of each option presented. Detailed recommendations were then developed for Task Force and TAC approval.

4. Pennsylvania Trends and Issues

Freight movement and related industries play a major role in the Commonwealth's economy. Pennsylvania's truck traffic is high due to:

- relatively affordable real estate prices for truck-oriented warehouse/terminal uses,
- access to a strong workforce,
- proximity to the Metro New York region (the largest consumer market in the world), and
- geographic location between the Midwest/Southeast and the Northeast.

³ *Study of Adequacy of Commercial Truck Parking Facilities - Technical Report*, Federal Highway Administration, March 2002



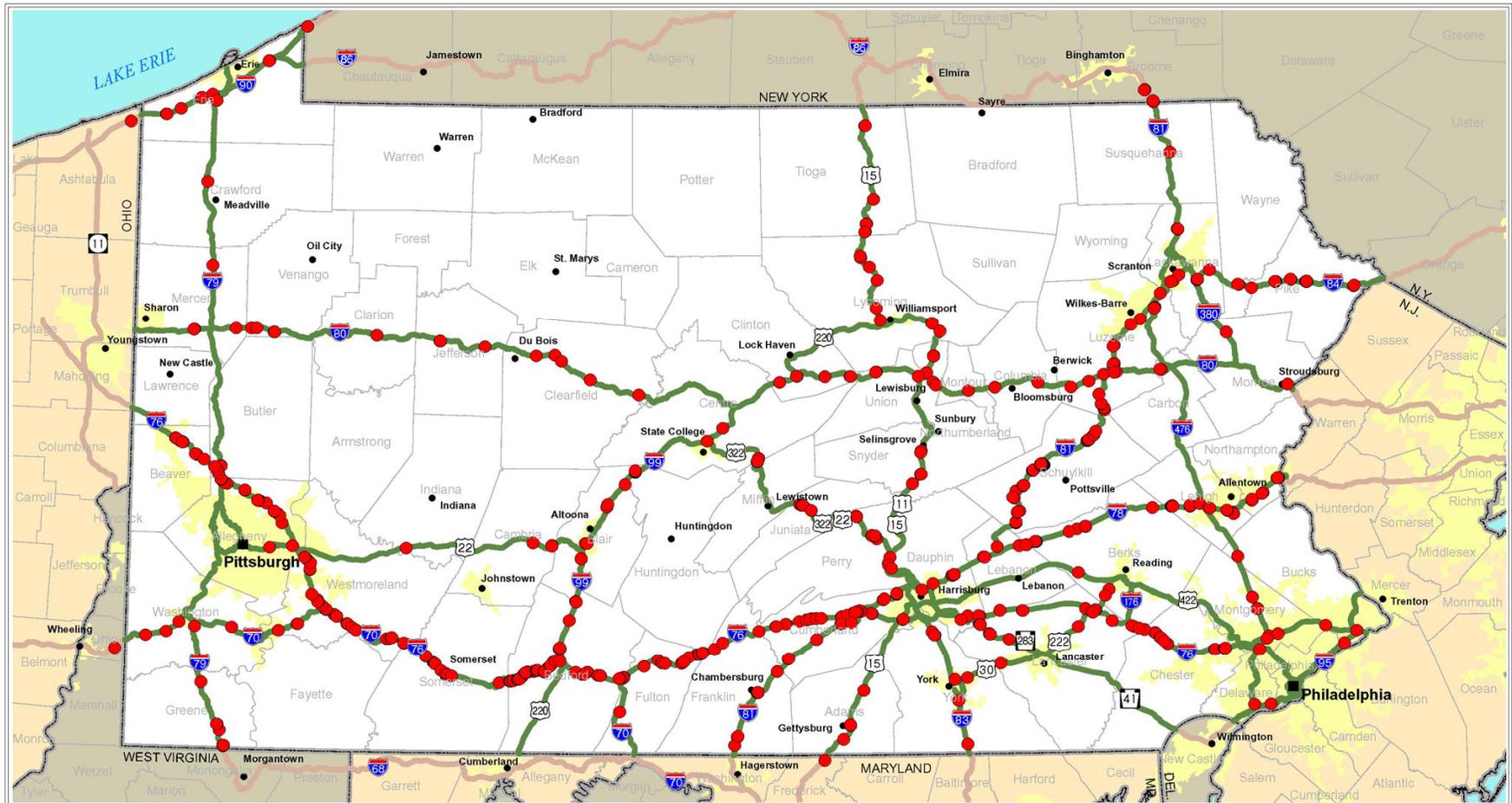
Truck traffic in the Commonwealth is expected to increase rapidly as goods are moved throughout Pennsylvania on critical highways. Data from the PA Statewide Freight Model estimates that statewide truck traffic will increase approximately 50 percent by 2030 with larger increases expected on the major truck routes throughout the state. Truck parking requirements are not just a function of the number of trucks but their time requirements as well. The time drivers are allowed to be behind the wheel, and congestion and increased travel times all have a significant impact on the distance a driver can cover. In turn, this impacts the route a driver takes and where they must rest.

Deficiencies in truck parking capacity at existing rest areas and service plazas have become apparent in recent years across Pennsylvania. The most visible evidence of this problem is at rest areas on I-70, I-78, I-80, I-81, I-83, and the Pennsylvania Turnpike, as well as truck parking on shoulders and along interchange ramps. To evaluate the extent of the problem, one time surveys documenting the location of trucks parked on highway shoulders and ramps were conducted on the Core Highway System during May 2007. The number of trucks parked versus capacity at truck parking facilities was also recorded. Figure 1 shows trucks parked on shoulders and ramps during overnight hours on Pennsylvania highways. Each dot represents one truck parked on a shoulder or ramp at that location.⁴ This survey recorded approximately 1,100 trucks parked along shoulders and ramps during overnight hours. The roadway with the largest number of trucks parked on shoulders is the PA Turnpike due to the number of emergency pull-out areas and wide shoulders, the relatively small lots for truck parking at service plazas, and the large number of daily trucks. Approximately 35 percent of all trucks on Pennsylvania shoulders and ramps are along the PA Turnpike Mainline between Ohio and New Jersey.

⁴ Map represents the number of trucks parked on shoulders and ramps on a given night from 10:00 p.m. to 5:30 a.m.



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Data Sources: PennDOT road data was obtained from PASDA. All other data was obtained from ESRI's Data & Maps Data CD.

Map Date: September 2007

Figure 1

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SHOULDER AND INTERCHANGE TRUCK PARKING STUDY

Scale in Miles

Legend

- Shoulder / Interchange Parking
- PA Roadways
- Regional Roadways
- Urbanized Area
- County Boundary
- State Boundary



Trucks parked on highway shoulders and ramps do not necessarily denote a capacity issue in that particular area. There are several factors as to why a driver may choose the shoulder over a designated location:

Personal Safety: Trucks on shoulders are less likely to be solicited by illegal activity than in truck stops or other designated parking locations. In addition it is less likely that there will be damage to the vehicle or trailer when parked on a ramp than in “close quarters” parking facilities.

Access: Parking along the roadway is faster, easier, and more convenient for a driver than driving a mile or more off the highway to the nearest truck stop.

Perceived Capacity: If a driver sees a truck parked on a shoulder adjacent to a rest area, they may assume that a parking facility is full. Rather than try to negotiate a facility perceived to be at capacity, they will park on ramps or shoulders. In addition, drivers may park a substantial distance from a location because their experience is that it is usually at or near capacity at a particular time.

Local Knowledge: A driver may opt to park on the highway to avoid any confusion or delays if unfamiliar with availability of parking closer to their destination or access to/from a facility.

Capacity: The factors described above point to a driver’s preference. Even if drivers prefer to park in a designated area, many still must park along highway shoulders and ramps because of a lack of capacity at existing facilities.

5. Truck Parking Facility Activity

There are 199 designated truck parking locations in the state within five miles of the Core Pennsylvania Highway System.⁵ These include:

- 22 Pennsylvania Turnpike Service Plazas
- 58 PennDOT-operated Rest Areas and Welcome Centers

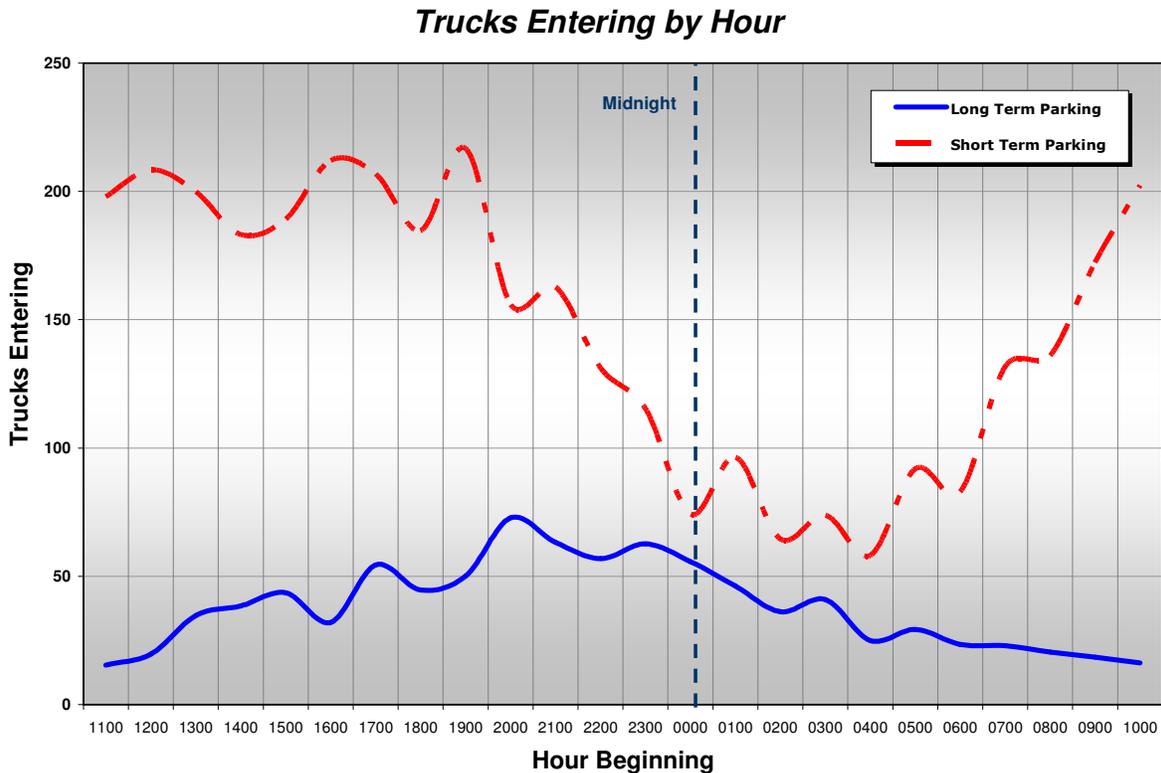
⁵Within five miles of the illustrative PA Core Transportation System because of drivers’ preferences for easy access to the highway system.



- 119 private facilities with enough capacity for 10 or more trucks along major roadways within the Commonwealth.

To better understand the parking activity at these locations, profiles were developed through a sampling across the three types of facilities. At the sample locations, 24-hour data was collected on vehicles in and out of the facilities.

The following chart is a collective summary of six separate facilities of various types (rest areas, Turnpike Service Plazas, and private truck stops) throughout the state where 24-hour profiles were derived. The chart shows that combined “activity” at these facilities which is the truck movements into and out of the facility. Profiles of each facility are shown in Appendix 14.2.



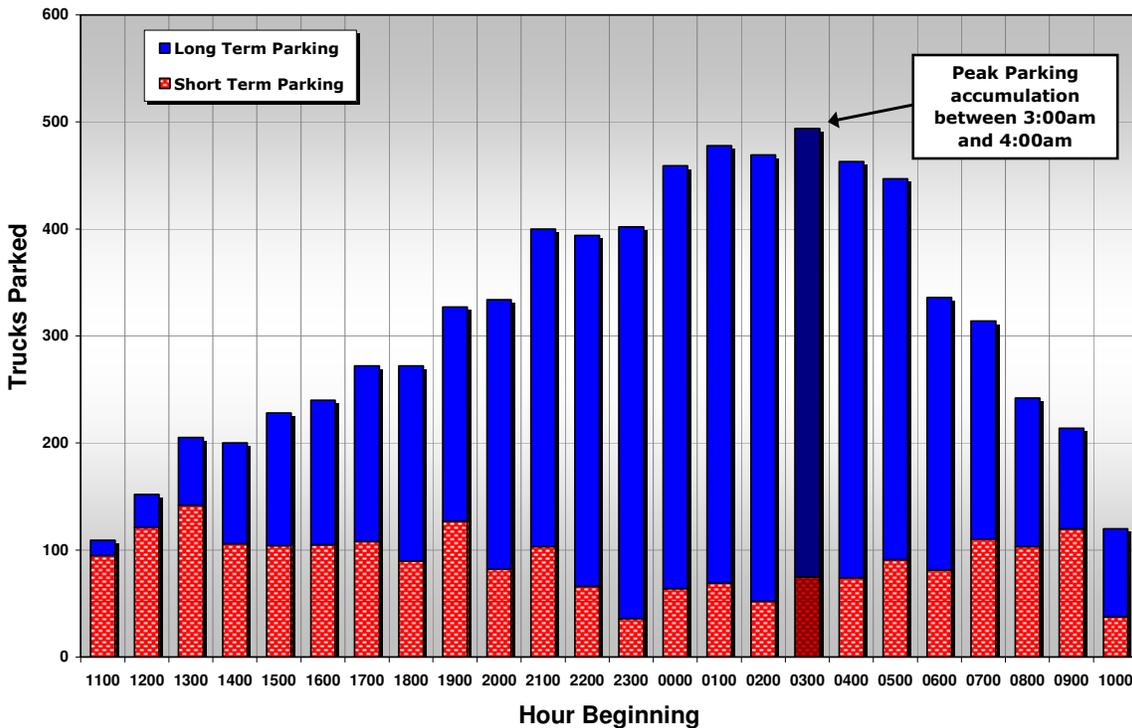


Truck parking locations generally have similar activity characteristics. Drivers who park less than three hours⁶ constitute the greatest amount of activity throughout the day in a given facility. Those drivers staying longer than three hours are the minority of all truck activity into and out of a facility, with the greatest activity taking place in the evening. Activity by both short- and long-term trucks tends to decrease during overnight hours.

Despite the fact that trucks parked long-term account for fewer “ins” and “outs,” their parking duration requires the majority of the capacity for each of the facilities surveyed. Short-term trucks account for relatively little required capacity throughout the day.

The following chart shows the accumulation of trucks in those facilities surveyed. The data show a sharp drop in trucks parked early in the morning as drivers begin their routes and then building volumes again in the evening hours. Peak accumulation is generally between midnight and 5:00 a.m.

24-Hour Parking Accumulation Profile



⁶ Trucks parked for three hours or less can still be on duty within the Federal driver rest requirements.



6. Truck Parking Locations and Utilization

The utilization of each of the 199 facilities was observed at a point in time during overnight hours (10 p.m. to 5:30 a.m.) during May 2007. This data collection, along with observations of shoulder and ramp parking, provides a picture of truck parking practices in the Commonwealth. The designated truck parking facilities and their utilization are shown in Figure 2.

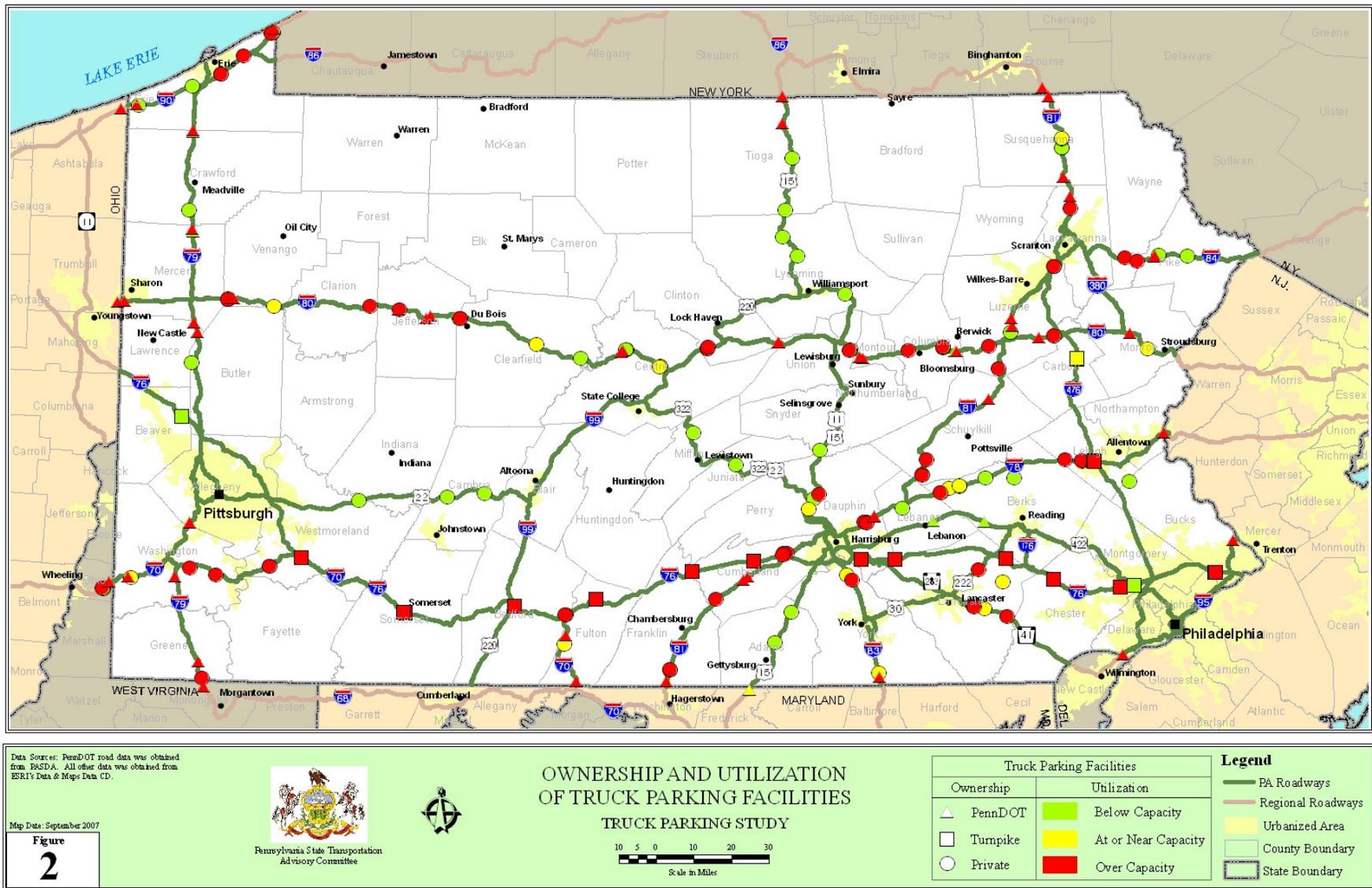
Of the 199 facilities surveyed, it is estimated that 62 percent operate over capacity during the peak period on a given night. Eleven percent operate at or near capacity and 27 percent operate below capacity.

Utilization of Truck Parking Facilities in Pennsylvania

Ownership	Below Capacity (<80%)	At or Near Capacity (≥80%, <95%)	Over Capacity (≥95%)
PennDOT	5	1	52
Turnpike	3	1	18
Private	45	20	54
Total	53	22	124
% of Total	27%	11%	62%



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7. Pennsylvania's Truck Parking Demand

Truck parking on shoulders and ramps is common during overnight hours. These trucks plus those parked within designated facilities equate to approximately 13,000 trucks requiring parking accommodations during the peak hour of the evening (3:00 a.m. to 4:00 a.m.). There are a total of 11,500 parking spaces available at private truck stops, PennDOT rest areas and welcome centers, and Pennsylvania Turnpike service plazas. Defining the shortfall as the need would not provide an accurate truck parking need assessment.

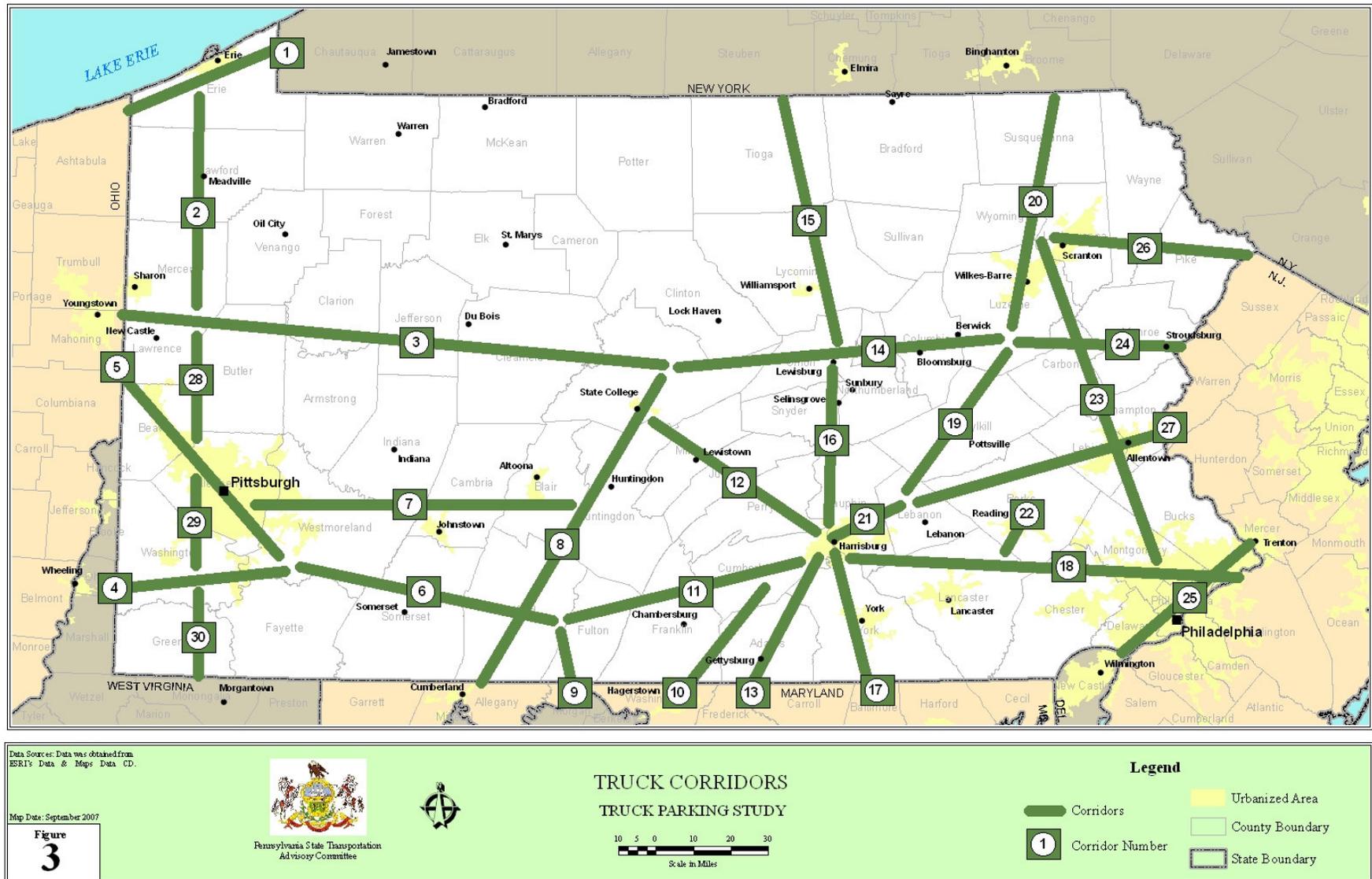
There are some parking locations that are underutilized, while others accommodate more trucks than for which they were designed. The location of truck parking facilities is the most critical factor in their utilization by drivers. A corridor—and ultimately regional—breakdown of truck parking demand provides insight into which areas are most strained for truck parking capacity.

7.1 Corridors with Unmet Demand

For analysis purposes the Pennsylvania Core Highway System was segmented into 27 corridors throughout the state. These corridors are shown in Figure 3. Each direction was assessed for unmet truck parking demand based upon its calculated need (using a method developed by FHWA) and its current truck parking capacity. This method estimates the latent demand for parking within the corridors based on truck volumes and travel times. Those corridors (by direction) with unmet parking demand are shown in Figure 4.

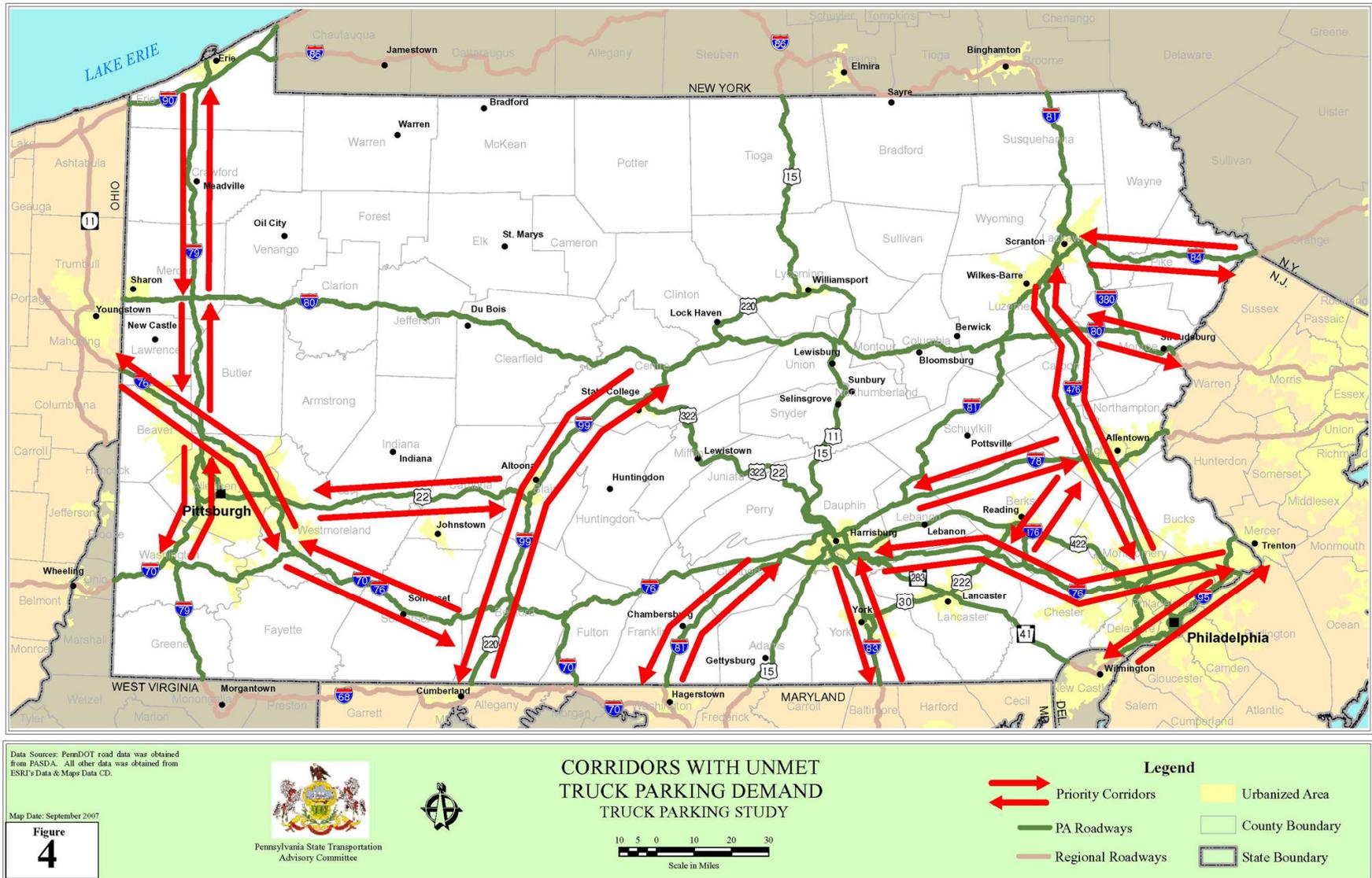


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The available truck parking capacity and the calculated demand within these corridors results in a shortfall within the Commonwealth of nearly 4,400 parking spaces. Each of the corridors with unmet demand and estimated shortfall is shown in the table below.

Unmet Parking Demand Summary

#	Corridor		Limits	Est. Parking Demand	Parking Capacity	Parking Shortfall
	Direction	Roadway				
18	EB	PA Turnpike	Harrisburg-Philadelphia	605	170	435
18	WB	PA Turnpike	Philadelphia-Harrisburg	599	180	419
6	EB	PA Turnpike	New Stanton-Breezewood	406	77	329
25	NB	I-95	Delaware-New Jersey	302	11	291
25	SB	I-95	New Jersey-Delaware	282	0	282
6	WB	PA Turnpike	Breezewood-New Stanton	406	131	275
23	NB	PA Turnpike (NE Ext.)	Philadelphia-Scranton	308	56	252
29	NB	I-79	Washington-Cranberry	248	17	231
29	SB	I-79	Cranberry-Washington	244	17	227
5	WB	PA Turnpike	New Stanton-Ohio	222	0	222
5	EB	PA Turnpike	Ohio-New Stanton	219	50	169
23	SB	PA Turnpike (NE Ext.)	Scranton-Philadelphia	290	136	154
17	SB	I-83	Harrisburg-Maryland	155	24	131
17	NB	I-83	Maryland-Harrisburg	155	37	118
24	WB	I-80	New Jersey - I-81	168	71	97
24	EB	I-80	I-81 - New Jersey	168	93	75
22	NB	US 422/222	PA Turnpike - I-78	70	0	70
27	WB	I-78	New Jersey - I-81	426	357	69
8	SB	I-99	I-80 - Maryland	67	0	67
22	SB	US 422/222	I-78 - PA Turnpike	65	0	65
8	NB	I-99	Maryland - I-80	62	0	62
28	SB	I-79	I-80 - Cranberry	83	29	54
28	NB	I-79	Cranberry - I-80	79	28	51
7	WB	US 22	Lewistown-Monroeville	106	63	43
7	EB	US 22	Monroeville-Lewistown	97	63	34
2	NB	I-79	I-80 - Erie	130	97	33
26	EB	I-84	Scranton-New York	107	76	31
10	SB	I-81	Harrisburg-Maryland	353	322	31
27	EB	I-78	I-81 - New Jersey	388	357	31
26	WB	I-84	New York-Scranton	106	78	28
10	NB	I-81	Maryland-Harrisburg	344	335	10
2	SB	I-79	Erie - I-80	108	101	7
15	NB	US 15	Williamsport-New York	76	73	3
Total Shortfall						4,396

The Pennsylvania Turnpike is estimated to have the largest truck parking shortfall, specifically between Harrisburg and Philadelphia, and New Stanton and Breezewood. The Pennsylvania Turnpike Commission has considered service plaza expansion in the past few years, including the provision of more truck parking.

Several heavily traveled corridors require additional truck parking, but are not among those ranked highest in terms of parking demand. Other



corridors have a surprisingly strong need. Interstate 99, for example, is not a heavily used truck route but there are no designated truck parking locations along its entire length. Therefore the corridor has a relatively high unmet demand.

Interstates 78, 80, and 81 are corridors with heavy truck traffic but unmet demand is not among the highest because there are a number of truck stops and rest areas within the defined corridors. Some of these are strained and overflowing because they satisfy the need not being met in other corridors (including those in Ohio and New Jersey).

7.2 Pennsylvania Regions with Unmet Demand

The corridors with unmet demand provide the basis for where truck parking is needed. Specific locations for such facilities require a regional designation for a subsequent implementation phase.

Regions are defined as those areas where corridors with unmet demand intersect, thus providing the opportunity to satisfy the parking demands of several corridors. These regions are shown in Figure 5.



8. Driver Interviews

In a separate effort from the overnight data collection, drivers were interviewed to understand their parking perspectives and preferences of both short-haul and long-haul drivers. The bullets below summarize the major findings of these discussions.

- Short-haul drivers need to stop for only short periods because they generally cover a small geographic region and eliminating the need to make long stops. Stops are kept short to maximize the 11-hour drive window.
- All drivers will park wherever there is a spot: highway shoulders/ramps, rest areas, service plazas, and wherever else they feel is safe.
- Rest areas and service plazas are often filled at night by long-haul drivers who need to meet their longer rest time requirements.
- Parking preferences of short-haul drivers (in ranked order): Turnpike service plazas, truck stops, rest areas, PTC emergency pull-off areas, and ramps.
- Drivers will not enter a parking facility if they believe it is full, because they want to avoid costly delays.
- Variable message signing at or before parking facility entrances would provide drivers with knowledge of available parking. This would eliminate the need to negotiate a facility that is at capacity.
- For longer periods drivers prefer truck stops because of the available amenities. These truck stops are often full by 7 or 8 p.m., so some drivers are forced to park on shoulders/ramps.

The drivers interviewed described parking availability along Pennsylvania's major roadways as follows:

- Turnpike—Parking is difficult because service plazas fill up very fast.
- I-81—The roadway is heavily congested and is getting worse; it is difficult to find stops.
- I-80—Usually can find a place to park because there are a number of truck stops; local knowledge helps in locating.
- I-78—Difficult to find parking locations.
- I-84—There are few locations between Scranton and New York State and they reach capacity early in the evening.



9. Universal Truck Parking Issues

There are many issues related to truck parking in Pennsylvania. The Keystone State sees a large number of through trucks to and from the Northeast consumer markets. In addition, there is a large number of warehousing and distribution centers in areas such as Harrisburg, York, and Allentown that generate a large number of trucks and provide substantial economic benefit to the state. Other issues such as the types of facilities (public vs. private), enforcement of highway safety laws, and idling restrictions all play a role in the truck parking dilemma. No issue impacts what, where, and how truck parking facilities are used more than the Federal Motor Carrier Safety Administration's truck driver hours-of-service regulations.

9.1 Federal Hours-of-Service Regulations

The Federal Motor Carrier Safety Administration (FMCSA) instituted revised hours-of-service regulations (49 CFR, Part 395) for truck operators in August 2005, reducing the allowable on-duty time for drivers. Under these rules, long-haul truck operators are:

- permitted to drive up to 11 hours in an on-duty window of 14 hours after being off-duty for a minimum of 10 consecutive hours;
- limited to 60 on-duty hours in seven consecutive days, or 70 hours in eight consecutive days; and
- permitted to restart the seven- and eight-day windows after a driver is off duty for 34 consecutive hours.

The new regulations also contain special short-haul provisions for truck drivers who operate within a 150-mile radius of their normal work location. These drivers:

- may operate their vehicles for a maximum of 11 hours after being off duty for at least 10 consecutive hours,
- are limited to a total of 14 hours after five on-duty days in a week and a total of 16 hours after two on-duty days in a week,
- generally close to work location limiting their need for long-term parking



An important change to the long-haul truck driver regulations impacts the need for truck parking significantly. Drivers may operate up to 11 hours within a duty window not to exceed 14 hours, followed by a mandatory off-duty rest period of at least 10 hours. Previous versions of the FMCSA rules permitted truckers to split their 10 driving hours between two different on-duty periods as long as they were separated by a rest interval of two hours or more.

Drivers or carriers who violate the HOS rules face serious penalties:

- Drivers may be placed out-of-service (shut down) at roadside until the driver has accumulated enough off-duty time to be back in compliance;
- State and local enforcement officials may assess fines;
- FMCSA may levy civil penalties on driver or carrier, ranging from \$1,000 to \$11,000 per violation depending on severity;
- The carrier's safety rating can be downgraded for a pattern of violations; and
- Federal criminal penalties can be brought against carriers who knowingly and willfully allow or require HOS violations, or drivers who knowingly and willfully violate the HOS regulations.

An impact of these new regulations is that truck drivers must park and rest for longer continuous periods of time even though they can drive more hours in a day. Truck parking demand associated with the hours-of-service rules is now heavily skewed toward overnight periods when most drivers prefer to rest, and facilities that are filled beyond their capacity late at night have excess capacity in the middle of the day.

As of this writing, the current regulations have recently been suspended due to a court ruling that their implementation did not follow the proper public involvement procedures. A final ruling on whether the new or old rules should be followed is expected at any time.

9.2 The Law Enforcement Dilemma

There has been a push from safety advocates for greater law enforcement of truck parking regulations. Trucks parking along limited access highways present a difficult





problem for law enforcement. Parking along the shoulder of a limited access highway is prohibited under Title 75 of Pennsylvania Highway Code, Chapter 33 §3353(a)(2)(vii). Vehicles parked in prohibited areas (specifically along highway shoulders) are a serious potential crash hazard to other motorists because they are unprotected fixed objects within the roadway cross-section.

Law enforcement officials encountering clear violations of these statutes are often reluctant to enforce them because a truck driver who must observe Federal hours-of-service regulations but yet may not be able to find a safe place to park off the highway. What makes this situation even more difficult for law enforcement officials is that a driver sleeping in a truck parked on the side of the highway may pose a greater hazard if awakened and ordered to move than if the truck is left on the side of the road. Police officers presented with this scenario often find themselves in the uncomfortable position of weighing the conflicting hazards of an illegally parked truck and a fatigued driver.

9.3 National Increase in Trucking Activity and Efficiency

Trucking activity has increased dramatically over the past two decades. The continued global trade in consumer goods coupled with the need to stage and distribute such goods to consumer markets is expected to continue.

Modern trucking operations, and the demand for truck parking areas throughout the nation's highway network, are heavily influenced by:

- the increasing need for reliable "just-in-time" deliveries to minimize inventory costs, and
- increasingly efficient processes within the supply chain to address capacity constraints.

The trucking industry is diverse with large national carriers, independent owner-operators with a single truck, and carriers in between. What differentiates truck operators from others in the supply chain is that their primary operations take place on public roadways, where rest areas and service plazas effectively become short-term storage facilities during driver down time.



Long-haul drivers often cross multiple state boundaries and require more than one “on-duty” time period. These drivers require a place to take their federally mandated 10 hour rest. Short-haul drivers can complete at least one movement within the same time frame. These drivers primarily require a place to take shorter rests to use the rest room, eat, etc.

9.4 Facility Types

The trucking industry utilizes rest facilities and supporting amenities provided by PennDOT and the Turnpike Commission along highway rights-of-way, and those provided by privately-run retailers near highway interchanges. Drivers prefer private facilities for extended rest because of the amenities offered and the number



and availability of parking spaces. They prefer public rest areas and welcome centers for short stops because of convenience and direct access to the highway. PennDOT rest areas do not have time limits, allowing a limited number of trucks to park for long periods of time. PennDOT Welcome Centers limit a truck’s parking time to a maximum of 2 hours.

Striking a balance between the needs of the trucking industry at public rest areas and the interests of private retailers in maintaining viable for-profit businesses has long been a challenge to both public agencies and private industry groups. Under Title 23, Section 111 of the U.S. Code of Regulations, public rest areas are prohibited from offering commercial services such as food and fuel at those built on the interstate highway system after 1959. The service plazas on the Pennsylvania Turnpike were established before 1959; so are permitted to offer these amenities. The retail industry has consistently resisted numerous attempts to allow commercialization of publicly-owned facilities.



9.5 Environmental/Economic Issues Related to Truck Parking

Beyond the industry and regional issues, there are environmental impacts and financial costs related to truck idling to be considered even in places



where parking capacity may not be a concern. Most emissions come from traffic on the highways, but the EPA estimates that a total of 3 to 4 percent of an area's total highway emissions is a result of idling traffic. Drivers will often keep their engines running while their vehicles are parked:

- to provide necessary electrical power inside the tractor without draining the battery,
- to provide necessary power for refrigerated trailers,
- to heat or cool the interior of the tractor while the driver is on mandatory rest periods in the sleeper unit, and
- to avoid problems restarting the engine in cold weather.

According to the U.S. Environmental Protection Agency, heavy truck engines burn an average of eight-tenths of a gallon of diesel fuel per hour while idling, resulting in excessive noise and emissions and non-productive engine wear. Nationwide it is estimated that nearly one billion gallons of diesel fuel is consumed annually from idling alone. This has financial implications for the trucking industry, particularly as fuel costs escalate.

Other impacts could be a localized increase in truck traffic of a new off-highway parking facility that would likely increase emissions aside from idling trucks. Noise and perceived nuisance are also environmental issues that should be considered.

Diesel engines in general (and the trucking fleet as a whole) are getting cleaner starting with the 2007 model year. Because these cleaner trucks account for only a small, but growing, percentage of the total fleet, emissions from trucks remain a short term issue.

As of this writing, there are regulations proposed by the Pennsylvania Department of Environmental Protection undergoing public review that would limit the amount of time a truck can idle while stationary. A driver would need an alternate source of power to use in-cab amenities.

The environmental, financial, and energy impacts have prompted governments and private companies to explore the use of idle reduction technologies at rest areas and trucking terminals. Providing electrical, cable, and other service connections reduces the need for truck idling.



There are two categories of idle reduction technologies: 1) stationary and 2) mobile.

9.5.1 Stationary Idle Reduction

Stationary idle reduction systems are those at the truck parking site that provide power and/or services to the cab.

There are two prevailing stationary idle reduction technologies: 1) IdleAire and 2) Shurepower. Other vendors provide similar equipment that works in generally the same way.

IdleAire is a service that allows (requires) a truck to completely shut down its engine and insert a unit into an adapter that fits in the truck’s window. The units hang from a gantry system installed on-site and provide heating/cooling, satellite TV/radio, Internet, and phone to the cab. The benefit of these units is that they require no upgrades or additional equipment to be installed on the truck, such as a television, satellite dish, etc.

Shurepower units provide electricity to a truck cab to run its auxiliary systems. These are essentially outlets for truck electric power. Shurepower and similar systems require that additional equipment be installed within the cab such as an electric bunk heater/AC, TV, or other equipment.



IdleAire Units



Shurepower Unit

9.5.2 Mobile Idle Reduction

Mobile units are those that are attached to the vehicle. Generally these are Auxiliary Power Units (APUs) that provide the power necessary to run a truck’s power accessories, heating/cooling and trailer needs much like the stationary Shurepower system. It is essentially a gas or diesel powered generator that provides power much more efficiently than running the truck’s main engine. The primary benefit is the units use less fuel,



though they may not necessarily reduce particulate matter over the use of the main engine.

Mobile units are preferred by drivers because they can be used anywhere, regardless of whether a parking facility has stationary equipment. The units emit less noise and use less fuel than running the main engine. For most trucks on the road today, these units also have fewer emissions than using the main engine because of the small percentage of the new clean generation of diesel vehicles.



10. State and Federal Efforts

Other governmental entities have also recognized truck parking as an important issue. Opportunities for interregional coordination and funding may expand the feasibility of various options.

10.1 State Efforts

Agencies in New Jersey, New York, Connecticut, and Maryland have undertaken efforts to more clearly define their role in addressing truck parking issues. The components of a joint plan for the Greater New York area are currently being developed by the North Jersey Transportation Planning Authority (NJTPA), the New York Metropolitan Transportation Council (NYMTC), and the Connecticut Department of Transportation (CONNDOT). The result of this FHWA-sponsored effort will be a regional study on truck parking and potential methods to address the need for increased truck accommodation. Results are expected by Spring 2008.

The Baltimore Metropolitan Council (BMC) recently completed a study investigating the potential for truck parking partnerships between the public and private sectors. This study (completed in October 2006) lays out strategies to help the region formulate and engage public-private partnerships to remove barriers to providing adequate truck parking along I-95 and I-83 within the BMC region.

The I-95 Corridor Coalition is expected to begin an effort to study corridor-wide truck parking issues. This corridor is heavily traveled from Florida to Maine.



The most important aspect of these studies is the opportunity for multi-state, multi-regional problem solving as trucks traverse many states.

10.2 Federal Efforts

The federal government has not been directly involved with the development of truck parking facilities, but (as mentioned earlier) was the developer of a study that looked at the statewide truck parking needs throughout the U.S. In addition, there are federal funding programs specifically for truck parking facilities and designed for innovative approaches to infrastructure projects that could be used to develop new or expanded truck parking facilities.

10.2.1 Interstate Oasis Program: SAFETEA-LU Section 1310

The purpose of the Interstate Oasis Program is to enhance safety and convenience for Interstate highway users by allowing states to designate and provide signage to certain facilities off the freeway that will increase the provision of rest stops, restroom facilities, and basic services. The program does not provide funding specifically for the provision of truck parking, but does provide for general designation and signage.

An Interstate Oasis is defined as a facility near an Interstate highway, not within the Interstate right-of-way, that is designated by a state (after meeting certain criteria) which provides products and services to the public, 24-hour access to public restrooms, and parking for automobiles and heavy trucks.

To qualify for designation and signing as an Interstate Oasis, a facility must:

- be located no more than three miles from an interchange with an Interstate highway, except if required by state law or in rural areas;
- be accessible via a route that can safely and conveniently accommodate vehicles of the types, sizes, and weights that would be traveling to the facility, entering or leaving the facility, returning to the Interstate highway, and continuing in the original direction of travel;
- have physical geometry of site layout, including parking areas and ingress/egress points, that can safely and efficiently accommodate movements into and out of the site, on-site circulation, and parking by all;



- have restrooms and drinking water available to the public at all times (24 hours a day, 365 days a year);
- have parking spaces available to the public for automobiles and heavy trucks available at no charge for parking durations of at least 10 hours, in sufficient numbers for the various vehicle types, including heavy trucks, to meet anticipated demands based on volumes and the percentage of heavy vehicles in the Interstate highway traffic;
- provide products and services to the public including:
 - public telephone;
 - food (vending, snacks, fast food, and/or full service);
 - fuel, oil, and water for automobiles, trucks, and other motor vehicles; and
 - be staffed by at least one person on duty at all times (24 hours per day, 365 days per year).

10.2.2 Truck Parking Facilities Program: SAFETEA-LU Section 1305

The Truck Parking Facilities program is a pilot program that provides funding to address the shortage of long-term parking for commercial vehicles on the National Highway System (NHS). States, Metropolitan Planning Organizations (MPOs), and local governments are eligible recipients of program funds.

Funding priority will be given to applicants that:

- demonstrate a severe shortage of commercial vehicle parking in the corridor;
- have consulted with affected state and local governments, community groups, providers of commercial vehicle parking, and motorist and trucking organizations; and
- demonstrate that their proposed projects are likely to have positive effects on highway safety, traffic congestion or air quality.

Funds (over \$6 million annually nationwide) are available for projects on the NHS that may include the following activities:



- constructing safety rest areas that include commercial vehicle parking,
- constructing commercial vehicle parking facilities adjacent to commercial truck stops and travel plazas,
- opening existing facilities to commercial vehicles,
- promoting the availability of publicly or privately provided commercial vehicle parking on the NHS using an Intelligent Transportation System (ITS) and/or other means,
- constructing turnouts for commercial vehicles,
- making capital improvements to public commercial vehicle parking facilities to allow year round use, and
- improving the geometric design of interchanges to improve access to parking facilities.

10.2.3 SEP-15 Funding

The FHWA has established a Special Experimental Project (SEP-15) program to encourage tests and experimentation in the entire development process for transportation projects. SEP-15 is aimed specifically at increased project management flexibility, more innovation, improved efficiency, timely project implementation, and new revenue streams. The FHWA plans to use the lessons learned from SEP-15 to develop more effective approaches to project planning, project development, finance, design, construction, maintenance, and operations. In a meeting with the USDOT, these funds were identified as being the best alternative for funding of truck parking projects.

The goal of this funding mechanism is to increase private sector participation in project development, finance, design, construction, maintenance, and operations. The private sector has been recognized by the USDOT as having the expertise often not available to the public sector that can bring innovation, flexibility, and efficiencies to certain types of projects.

Its predecessor (SEP-14) was successful in advancing over 300 projects and facilitating greater private sector investment. Due to SEP-14, a number of contracting practices previously considered experimental have become a regular part of the highway program, such as design-build, cost-plus-time bidding, lane rental, and the use warranties.



10.2.4 SmartPark Demonstrations

The FHWA is currently funding two separate demonstrations on I-90 in Charlton, MA and I-95 in Attleboro, MA to use technology to provide real-time parking information to truckers. These demonstrations are using different technologies to determine the number of spaces available for truck parking at truck stops/rest areas. They are then planning to use highway advisory radio and variable message signs to transmit that real-time information to truck drivers before they arrive at a rest facility.

11. Summary of Core Issues

This study has examined the availability and usage of truck parking capacity within Pennsylvania. Through background research, data collection, and interviews with various organizations and truck drivers, this work has yielded an understanding of the problems and issues related to truck parking. The following points summarize an assessment of the problem:

- **There is a shortage of truck parking in Pennsylvania.** This is especially evident during the night time hours. There are 119 PennDOT rest areas, Turnpike service plazas and private truck stops which provide 11,500 parking spaces for trucks across the State. Observations at the 119 facilities showed that 73 percent are at, near, or over capacity. The Pennsylvania Turnpike is estimated to have the largest truck parking shortfall, while portions of I-95, I-79 and I-83 also require increased truck parking.
- **A shortage of truck parking compromises safety and contributes to other problems.** When drivers cannot find (or feel they are unlikely to find) parking at truck stops and other appropriate locations, they typically park along highway ramps or on the shoulder of the highway itself. Observations showed that 1,100 trucks were parked along shoulders or ramps during nighttime hours. Parking on shoulders and ramps of limited access highways is illegal because these vehicles are stationary objects within the cross-section of the roadway. Shoulders are designed to temporarily accommodate vehicles in the event of a breakdown—not to be used as parking facilities. There are also environmental impacts and congestion issues related to truck parking.
- **The causes of the truck parking problem are complex.** Federal hours-of-service regulations, Pennsylvania's location relative to major



consumer markets in the northeast, increasing truck volumes, and continuous goods movement are among the contributing factors.

- **Enforcement alone is not the answer.** Highway shoulder parking is a dilemma for law enforcement. Enforcement officials who encounter clear violations are often reluctant to enforce them because a truck driver must observe federal hours-of-service regulations. There may be no safe place off the highway to direct a truck driver to park, and waking a tired driver to move a truck may create more of a hazard than an illegally parked truck.
- **Truck parking demand will continue to grow.** Data from the PA Statewide Freight Model estimates that statewide truck traffic will increase approximately 50 percent by 2030 with larger increases expected on the major truck routes throughout the state. This growth, along with regulations and current parking inventories, will create an increasingly unsafe environment for both auto and truck traffic, unless steps are taken to reduce truck traffic or make additional parking available.
- **There is no clear champion or lead organization to solve the problem.** The public and private sectors each have a role. The Commonwealth is responsible for highway safety and maintenance. The trucking industry provides jobs, tax revenue, and the provision of goods to consumers. But there is a limit to each partner's responsibility, legal authority, and capability to fund the construction of facilities that essentially serve as short-term staging/storage areas for the trucking industry. Private industries such as warehouses and distribution centers are for-profit businesses that generate the need for truck parking, and often don't provide services or a place to rest for drivers. Drivers are caught in the middle.



12. Recommendations: A 12-Point Strategy

There are many different aspects to the truck parking problem. Numerous organizations, both public and private, can be a part of the solution. The TAC recommends that PennDOT provide overall leadership to eliminate unsafe truck parking practices and to assist in facilitating new and expanded facilities as well as innovative ways to foster partnerships. Through these efforts PennDOT's goal should be to provide adequate truck parking so that parking enforcement can occur without compromising safety.

In order to address this complex and evolving issue, TAC recommends that PennDOT undertake the 12-point strategy summarized on the following page. Each of the 12 points is then further detailed in one page descriptions which include benefits and other factors to consider. The 12-point strategy is organized around four categories: Partnering, Policy, Planning & Finance, and Technology & Design.

By undertaking this 12-point strategy, TAC believes that PennDOT can effectively address the truck parking problem in Pennsylvania, and in doing so, become a national leader in truck parking policy and overall truck safety.



Twelve-Point Strategy for a Comprehensive Approach to Meeting Truck Parking Needs	
PARTNERING	1. Advance TAC study recommendations by forming a public-private task force.
	2. Collaborate with neighboring states to forge regional solutions.
	3. Explore opportunities for expanding truck parking capacity and local economic development through dual-use facilities, brownfield re-use, and provision of parking at truck-oriented developments.
POLICY	4. Remove obstacles to public-private partnering for truck parking facilities and driver services.
	5. Develop a truck parking policy through the National Governor’s Association and the American Association of State Highway and Transportation Officials for the reauthorization of federal transportation legislation emphasizing partnership, innovative finance, and new funding programs.
PLANNING & FINANCE	6. Explore all funding opportunities, particularly for innovative pilot projects.
	7. Address truck parking through established statewide planning and programming processes.
	8. Reevaluate approaches for accommodating the growing truck parking demand on toll facilities, particularly the PA Turnpike mainline.
	9. Establish appropriate performance monitoring to track progress.
TECHNOLOGY & DESIGN	10. Develop complementary ITS applications that support more efficient operations and truck parking.
	11. Evaluate new truck parking design concepts to provide improved access to services, more parking at existing sites, and improved circulation.
	12. Integrate technologies and design principles into truck parking facilities to mitigate environmental impacts.



This TAC study was developed through a partnership that engaged state and regional officials with the trucking industry to assess the growing problem of truck parking. Addressing the problem will also require partnership. The first three recommendations cover key partnership elements to the overall strategy—partnership for evaluating and implementing TAC’s recommendations, partnering with neighboring states, and partnering for facility development and expansion.

PARTNERING	
	<p>Advance TAC study recommendations by forming a public-private task force.</p>
<p>Summary: The study recommendations can best be advanced through ongoing teamwork between the public and private sectors. The Task Force could be formed as an adjunct to the Motor Carrier Advisory Committee. Broad membership should be considered including representatives of the private truck stop industry. TAC recommends that this Task Force be established sometime in the first half of 2008 to continue momentum for addressing this issue and the study’s recommendations.</p>	<p>Benefits:</p> <ul style="list-style-type: none"> • Establishes this activity under an existing statewide body that addresses trucking issues. • Includes the private sector to assist in advancing public-private partnerships. • Encourages an ongoing statewide discussion. <p>Other Factors:</p> <ul style="list-style-type: none"> • Other potential members include Pennsylvania Motor Truck Association (PMTA), Owner-Operator Independent Drivers Association (OOIDA), State Police,, PA Turnpike Commission, and the Pennsylvania State Association of Township Supervisors (PSATS).



PARTNERING



Collaborate with neighboring states to forge regional solutions.

Summary:

Goods movement is inherently an interregional activity. Mandatory federal hours-of-service regulations, regional highway congestion, and large consumer markets all span the entire northeast and mid-Atlantic regions. PennDOT can work with other states through organizations such as the I-95 Corridor Coalition, the newly formed I-81 Coalition, and AASHTO to advance multi-state solutions.

Benefits:

- Neighboring states have already been addressing the truck parking issue.
- Makes the best use of limited resources by coordinating activities and logically matching the geographic scope of the approach with the geographic scope of the problem.

Other Factors:

- Current planning activities in Maryland, New Jersey, New York and Connecticut have been supported by the FHWA as excellent examples of coordinated planning for an issue that goes beyond state borders.
- Multi-state educational efforts could serve to inform the public of the necessary role that trucks play and the rest requirements placed on drivers.



PARTNERING



Explore opportunities for expanding truck parking capacity and local economic development through dual-use facilities, brownfield re-use, and provision of parking at truck-oriented developments.

Summary:

Large “big box” retailer parking lots, park-and-ride lots, sports facilities, county fair sites, or others that are used primarily during the day by autos could also be used at night by trucks. This “double duty” can be accommodated through the use of dual striping, heavier-duty pavement, basic driver facilities, and time limits for trucks. Clearly this arrangement would have to be acceptable to the property owners. PennDOT and the MPOs/RPOs could assist by helping to establish a model agreement or guidelines. Brownfield sites could be used to establish new truck parking facilities in urban areas.

Truck oriented developments present another opportunity to expand truck parking. Often they also generate large numbers of trucks, sometimes unable to immediately pick-up or drop off their loads due to scheduled time windows provided by the operator to reduce on-site congestion. Local ordinances within these districts to require parking facilities for these trucks would relieve some parking pressure from the highway facilities.

Benefits:

- Would reduce the amount of land consumed for parking facilities while greatly expanding parking capacity.
- Reuse of brownfield sites could be a good economic benefit to the local area and could be financially feasible for private truck stops.

Other Factors:

- Most existing facilities were not intended to accommodate trucks and could require pavement improvements as well as strict enforcement of time limits to minimize potential auto/truck conflicts.
- Basic amenities such as restrooms, water fountains, and trash collection would be necessary.
- Such sites need to be relatively close to major highway interchanges.
- To be done in tandem with environmental mitigation measures (Policy #12).



Truck parking is not only a regional multi-state issue for Pennsylvania, but national in several respects. Most significant is the need to advance national policies that recognize this problem and provide new approaches and greater flexibility to address the problem—particularly with respect to removing barriers to public-private partnership and collaboration. The multi-state dimensions of the truck parking issue also suggest the need for the FHWA and USDOT to partner to a greater degree in facility funding.

POLICY	
	Remove obstacles to public-private partnering for truck parking facilities and driver services.
<p>Summary:</p> <p>Private truck parking facilities can provide the needed capacity and services if locating such facilities is financially feasible for the private sector. New partnerships between the public and private sectors will be necessary to invest both public and private funds to increase capacity at existing facilities or site new facilities. Pennsylvania has an opportunity to affect beneficial change by advancing new ways of collaborating with the trucking and truck services industry. This may ultimately require legislative changes (see recommendation #5). Ideally, in the future public facilities will be flexibly operated with more services (than permitted today) by contracted private sector providers.</p>	<p>Benefits:</p> <ul style="list-style-type: none">• Combining public and private resources can be the most efficient overall solution to providing the convenience of a rest area and the amenities and capacity of a private truck stop. <p>Other Factors:</p> <ul style="list-style-type: none">• Federal funding may be available for the public purchase of property adjacent to existing private sites in an effort to expand capacity.



POLICY



Develop a truck parking policy through the National Governor’s Association and the American Association of State Highway and Transportation Officials for the reauthorization of federal transportation legislation emphasizing partnership, innovative finance, and new funding programs.

Summary:

The current federal transportation legislation, SAFETEA-LU, contains several modest programs related to truck parking. The expected 2010 reauthorization of this legislation provides an opportunity to develop new and broader programs to address this emerging interregional issue. The existing statutory and regulatory structure governing truck parking will increasingly be a barrier to more flexible public-private approaches and collaboration.

Benefits:

- New programs could provide funding for solving issues across state lines.
- Pennsylvania could combine its political strengths with other states who share like concerns.
- Governor Rendell and Secretary Biehler will be holding leadership positions in NGA and AASHTO, respectively.

Other Factors:

- Pennsylvania has a strong history of influencing federal legislation.



The planning portion of this strategy recognizes PennDOT’s effective planning and programming process and contains recommendations to address the truck parking needs through that strong state-regional/public-private process.

PLANNING & FINANCE	
	<p>Explore all funding opportunities, particularly for innovative pilot projects.</p>
<p>Summary: Increasing truck parking will require resources. Traditional federal and state resources can be part of the solution. Several special federal programs can be explored, including the Interstate Oasis Program, the Truck Parking Facilities Program, and SEP-15 funding. Opportunities for public-private partnerships should be explored. The formation of new programs and flexible funding sources should be explored within the context of new federal reauthorization legislation.</p> <p>This study will provide the basis to document the parking shortage as required for applicants of the special federal programs.</p>	<p>Benefits:</p> <ul style="list-style-type: none"> • The FHWA has expressed interest in funding innovative pilot projects. • Pooling special federal funds with private resources can make new projects and programs financially feasible. <hr/> <p>Other Factors:</p> <ul style="list-style-type: none"> • Use of traditional funding sources will require competition with other high priority needs such as the reconstruction and preservation of state highways and bridges.



PLANNING & FINANCE



Address truck parking through established statewide planning and programming processes.

Summary:

PennDOT and its planning partners (MPOs and RPOs) have a well developed process for determining transportation needs and establishing investment priorities through long-range plans and near-term Transportation Improvement Programs.

Several planning partners have focused on various aspects of goods movement. Truck parking represents a particular issue that merits attention in each region following a generally uniform approach and timeline that would be established through the planning priorities from the PennDOT Office of Planning.

The implementation of these efforts could be developed in partnership with the PA Motor Truck Association as a means for promoting participation by trucking firms and operators.

Benefits:

- Establishes a uniform approach to partnering and problem solving statewide while developing solutions that make sense for a specific region.
- Makes use of an existing planning and programming process.
- Provides a forum for innovative approaches and the identification of potential dual use sites in each region.
- Provides a cost-efficient approach to addressing truck parking provision within existing project development.

Other Factors:

- Consider seeking FHWA support and participation in the process.
- Integrate with Long Range Transportation Plans (LRTPs) and Transportation Improvement Programs (TIPs)
- There will be a need to work with local governments and zoning authorities.



PLANNING & FINANCE



Reevaluate approaches for accommodating the growing truck parking demand on toll facilities, particularly the PA Turnpike mainline.

Summary:

The PA Turnpike has recently entered into a 30-year Public/Private Partnership Lease Agreement with the HMSHOST Family Restaurants LLC to reconstruct, expand, operate and maintain the Service Plaza facilities along the turnpike. The reconstruction and plaza expansion process is currently underway and will include reconfigured parking spaces and expanded truck parking areas where possible. Although the Turnpike is increasing efforts in truck parking solutions, this study’s data collection demonstrated that the parking need remains substantial. The recommendation is intended to encourage that truck parking issues continue to be addressed as part of the PTC capital facility planning.

This recommendation may also broadly apply to any new tolled facilities for the future. Ramp and shoulder parking tend to occur even more on toll facilities, because drivers prefer not to exit a toll facility for rest or services. Current hours-of-service limits make drivers even less likely to leave their route to seek appropriate parking.

Benefits:

- Improved safety—ramp and shoulder parking are very common on the Turnpike mainline.
- PTC may have greater flexibility (than PennDOT) from a regulatory standpoint to offer increased parking capacity as well as enhanced amenities.

Other Factors:

- PTC should participate in the regional process recommended in #7—at least in the applicable regions.
- Excess property adjacent to existing facilities but outside the closed system could provide access to services and amenities while providing additional parking.



PLANNING & FINANCE



Establish appropriate performance monitoring to track progress.

Summary:

The need for truck parking is growing, while capacity remains relatively static. The maxim that whatever is not measured is not addressed is true. As part of some basic goal setting and purposeful planning to address this problem, basic measures should be established as a means to monitor progress and the degree of the problem over time. These measures should be developed with the trucking industry and include basic quantitative information that relates supply and demand. Other indicators can be developed in terms of the number and types of facilities, private and public investment, drivers' perceptions of convenience and safety, and potentially safety benefits that have been realized.

Benefits:

- Fits with PennDOT's increasing focus on system performance and measurement and monitoring.
- Provides a means to determine if efforts to address truck parking are having the intended impact.

Other Factors:

- This would be a leading edge effort. FHWA support to fund the development of statewide performance measures is a possibility that should be explored.



The final strategy area is Technology and Design. The recommendations here cover the important areas of information technology—which is being used extensively by the freight sector—facility design, and key environmental aspects associated with truck parking.

TECHNOLOGY & DESIGN	
	<p>Develop complementary ITS applications that support more efficient operations and truck parking.</p>
<p>Summary: A broad truck parking strategy as is being advanced through this report would not be complete without consideration of information technology generally, and Intelligent Transportation Systems specifically. Truck operators will benefit significantly from variable message signs, highway advisory radio, and other information sources that provide advance information on available parking options—public or private. PennDOT and its partners continue to progress with ITS concepts and deployment. This recommendation simply calls on the Department to include current and future truck parking information needs with the overall ITS deployment.</p>	<p>Benefits:</p> <ul style="list-style-type: none"> • Increases utilization of existing truck parking. • Energy savings. • Time savings. • Takes advantage of available ITS platforms and system development. <p>Other Factors:</p> <ul style="list-style-type: none"> • Involve the trucking industry and private truck stop operators in the design of ITS applications specific to truck parking. • Build on technology demonstrations currently underway in other states.



TECHNOLOGY & DESIGN	
	<p>Evaluate new truck parking design concepts to provide improved access to services, more parking at existing sites, and improved circulation.</p>
<p>Summary: Current PennDOT Rest Areas provide parking for between 10 to 20 trucks and limited services. This recommendation is aimed at taking a broader view of truck parking as a design parameter for existing, expanded, and new parking sites. For some sites this may mean improving access in ways that connect parking with services areas adjacent to the parking facilities. There may also be opportunities to reconfigure sites to comfortably accommodate more tractor-trailers.</p>	<p>Benefits:</p> <ul style="list-style-type: none"> • Improved access between parking and services. • Improved circulation. • Additional parking spaces. <p>Other Factors:</p> <ul style="list-style-type: none"> • New design concepts should be developed with truck industry input and piloted at one or more locations. • Designs should accommodate both short-term (a few minutes) versus long-term (a few hours or overnight) parking.



TECHNOLOGY & DESIGN



Integrate technologies and design principles into truck parking facilities to mitigate environmental impacts.

Summary:

Truck traffic and parking bring with it air quality challenges. The trucking industry has been responsive, specifically advancing methods to reduce emissions associated with idling. Alternative technologies do exist, albeit with some limitations, to reduce idling, save energy, and reduce emissions. The advance of this technology and its application will likely need to become more rapid with the growth of truck traffic and the need to achieve air quality standards. As PennDOT and others advance efforts to increase available parking, it should be done with an eye on integrating emissions reduction technologies wherever possible. This will largely be a private sector for profit venture in most cases, but the public sector should be aware and involved of the opportunities to incorporate such features with facility design.

Other environmental areas to be addressed in truck parking facility design and construction include noise, water runoff, and use of recyclable materials.

Benefits:

- Environmental impact mitigation.
- Air quality.
- Energy savings.
- Opportunity for private sector investment in technologies and operation of same.
- Helps mitigate local and neighborhood concerns over noise and air quality concerns.

Other Factors:

- Recommendation should be implemented in coordination with DEP.
- Pending DEP regulations would limit the amount of time that a truck can idle and may increase the demand for idle reduction technologies.



13. Conclusion

There is a demonstrable truck parking shortage in Pennsylvania. The problem has safety, efficiency, and environmental impacts. There is no single action that can solve the problem. The solutions will take considerable time to further study and implement. PennDOT can champion this issue as lead agency and work on several fronts with other public and private partners to provide adequate truck parking capacity in the future.

Successfully addressing the truck parking problem has a lot to do with timing. If unaddressed, the problem will be worse in 2008, 2009, etc., than it is in 2007 based on continuous growth of truck traffic. This is not an easy issue from any perspective. However, the TAC believes that there is a “preferred window” for exploring new solutions that leads up to and includes the next surface transportation reauthorization. Pennsylvania will have an extraordinary leadership platform to shape that national legislation by beginning to advance the recommended 12 point strategy. The strategy, of course, is not only about the reauthorization. If Pennsylvania, however, begins to lead change in truck parking before the reauthorization it will be in a far better position than if this issue goes unaddressed in the reauthorization.

The bottom line is that 2008 is the time to start. The options and solutions will likely become more difficult -- and potentially fewer -- with the passage of time. The TAC Task Force demonstrated the interest and benefit of public-private collaboration that now can move with established momentum from study to implementation.



Appendix



Detailed Estimation of Truck Parking Demand

The Federal Highway Administration (FHWA) completed a study in 2002 to investigate and document the adequacy of commercial truck parking facilities that serve the National Highway System. This effort (*Study of Adequacy of Commercial Truck Parking Facilities*, Report #FHWA-RD-01-158, March 2002) provided a comprehensive examination of truck parking on a national basis, including an inventory of existing parking facilities (both publicly- and privately-owned), a model-based approach to estimating truck parking demand and identifying parking shortfalls, and a series of recommendations for addressing capacity shortfalls.

The methodology used in this FHWA study for calculating truck parking demand is built on a probability-based simplified model, where the theoretical truck parking demand (D) for any given roadway segment is a function of truck-hours traveled (THT) on that segment and the average parking duration (P_{avg}) per hour of truck travel:

$$D = THT \times P_{avg} \quad (1)$$

Truck-hours traveled for a roadway segment are computed as follows:

$$THT = T\% \times AADT \times (L/S) \quad (2)$$

Where:

- T% = percentage of trucks;
- AADT = annual average daily traffic
- L = length of the corridor; and
- S = average speed on the corridor

Example: If a truck travels at an average speed of 55 miles per hour along a 750-mile trip, it will take about 13.6 hours of running time to travel from start to finish. If the driver of the truck is prohibited from driving more than 11 hours in a day, then he must stop at least once on this 750-mile trip for an extended period of rest. The actual location where this truck would stop is based on a complex combination of different factors including parking availability, the driver's delivery schedule, need/availability of ancillary travel services (food, fuel, restrooms, etc.), and other factors.

This truck would spend 0.18 hours, or about 11 minutes, of this 750-mile trip on any given ten-mile segment of roadway, and the raw probability (i.e., aside from



the location of this ten-mile segment relative to the start and end points of this trip as well as the other considerations mentioned previously) that this truck would need to stop on this segment would be a function of its likelihood of reaching a point in its trip where a stop would be required for any number of reasons (food, fuel, mandatory rest under Federal regulations, or any combination of these and other reasons). Every roadway segment has a theoretical truck parking demand that includes the aggregate truck volume on the segment, regardless of the length of roadway or the actual parking facilities on or accessible to it. Combining the theoretical parking demand figures for multiple roadway segments provides a reasonable illustration of truck parking activity for longer corridors and over larger geographic regions.

This simplified FHWA model was expanded to include a number of other parameters, most of which are associated with deriving the average parking duration (P_{avg}) described above. Additional parameters used in the estimation process include:

1. Hours-of-service limitations under Federal Motor Carrier Safety Administration (FMCSA) regulations
2. Variation in parking characteristics for short-haul and long-haul trucks (with short-haul truck trips identified as those that can be made within a single day under hours-of-service regulations in place in 2002)
3. Ratio of long-haul to short-haul trucks in the vehicle mix (this varies widely by region, with short-haul trucks typically representing a larger portion of the vehicle mix in major metropolitan areas than in rural areas)
4. Time required for loading/unloading, staging, and other activities that occur off the roadway network while the driver is considered “on-duty” from a regulatory standpoint
5. Demand for parking at public rest areas vs. commercial truck stops
6. Peak parking factors for long-haul and short-haul trucks (i.e., portion of daily parking demand that occurs during peak hour)

Many highway departments and toll road authorities use some variation of a facility-based quantitative approach for studying parking demand at roadside rest/parking facilities, including a previous FHWA report⁷ and the rest area planning/design guidelines published by the American Association of State

⁷ *Commercial Driver Rest & Parking Requirements: Making Space for Safety*, Report #FHWA-MC-96-0010, May 1996



Highway and Transportation Officials (AASHTO)⁸. Under this approach, truck parking demand is modeled based on parameters such as truck volumes on the adjoining roadway, the types of amenities at the facility in question, and the proximity of other rest/parking facilities. This methodology uses current activity at existing sites to model future parking demand at these sites, and for identifying prospective locations for new rest/parking areas based on capacity constraints at nearby existing facilities.

The 2002 FHWA methodology is appropriate for analyzing truck parking issues in a regional context, since the theoretical parking demand on a defined roadway network is computed regardless of the types of facilities currently available to truckers on the existing highway system. This approach overcomes one key shortcoming of the facility-based approach described above in that it more accurately models latent parking demand that may not be included in a facility-based model where truck parking activity is heavily influenced by limitations in existing facilities or on long corridors in a study area.

Refinement of FHWA Methodology

The FHWA methodology for modeling truck parking is mathematically sound, but it was determined that some elements would have to be refined in order to apply it accurately to Pennsylvania. The underlying reasons for revising the base methodology include the following:

- While the calculated results of the FHWA model were very close to the observed parking demand on a national level (within 2%), there were some discrepancies between calculated and observed parking demand on a state-by-state basis. For Pennsylvania, the FHWA report indicated a surplus of parking capacity⁹ even though most of the truck parking/rest areas operate at or above capacity during peak overnight periods.
- The 2002 FHWA study was completed prior to the adoption of the current FMCSA regulations, which means the various factors that influence the parking duration parameter (P_{avg}) in the FHWA model are likely out of date.
- A wealth of data related to the various parameters in the FHWA model is available for Pennsylvania, so the accuracy of some of the FHWA's national parameters were improved.

⁸ *Guide for Development of Rest Areas on Major Arterials and Freeways* (Third Edition), AASHTO, 2001

⁹ Table 17 of 2002 FHWA report, p.33



Due to these factors, the FHWA model was refined for this study to more accurately reflect the current regulatory environment for the trucking industry and the unique characteristics of trucking activity in Pennsylvania. Specific enhancements to the base FHWA methodology include the following:

1. PennDOT's Statewide Travel Demand Model contains base year and future (2030) horizon year data (traffic volumes, travel speeds, etc.) and represents an improvement over some of the default values used in the FHWA model.
2. Some elements of the FHWA model related to driver preferences and other qualitative aspects of the methodology were not used in this study. In particular, it was determined that information such as driver preferences for public vs. private or on-highway vs. off-highway facilities would not be useful for this study because of the constrained parking availability in Pennsylvania. With most existing facilities in the region filled to excess and large numbers of trucks parked along highway shoulders during peak overnight periods, it is unlikely that preferences for one type of facility or another would have any bearing on the analytical component of this study (though industry outreach of this kind could help inform other recommendations and policy-related issues in this study).
3. The study area for this effort includes the PA Core Highway System as defined in the report *Defining a Core PA Transportation System*, Pennsylvania State Transportation Advisory Committee, August 2006.
4. Daily traffic volumes (AADT) and truck percentages were obtained from the Pennsylvania Statewide Travel Demand Model.
5. A comprehensive data collection program was undertaken in the spring of 2007 to develop a number of different parameters in the FHWA-based model specific to the North Jersey region. This effort included the following:
 - a. A detailed inventory of all the facilities in Pennsylvania including truck parking capacity and peak overnight utilization of each facility.
 - b. Peak period observations of truck parking activity on the shoulders of the major highways in the state.
 - c. 24-hour profiles of truck parking activity at six existing facilities in Pennsylvania that provide truck parking and various levels of amenities in different regions. These locations were selected to include different types of facilities (wayside rest area, toll road service plaza, and privately-owned off-highway travel center). The sites where detailed profiles were developed include: a) wayside rest areas on northbound and southbound I-81 near exit 80 in Grantville; b) eastbound and westbound Midway Service Plazas on the PA Turnpike, and; c) two off-highway truck stop along I-80 in western Pennsylvania.



Over a 24-hour period a total of 4,472 trucks were observed entering the six sample facilities and pulling onto the highway shoulder in the area where shoulder parking duration was documented. Entry and exit times were documented and weighted on a facility-by-facility basis to reflect the total truck “entries,” and the parking duration characteristics determined for the aggregated total of trucks counted in this effort.

The information obtained in items (a) and (b) above was used to document a “snapshot” of peak truck parking activity in the region, while item (c) was used to establish parking durations by time of day, by corridor, and by facility type, and to determine the relationship between truck parking demand and overall truck traffic by time of day.

6. The 2002 FHWA study listed an industry-wide average park/drive ratio of 5 minutes per hour of travel, which serves as one of the key parameters in this study for all of the parking duration calculations not associated with mandatory rest periods under Federal hours-of-service regulations. This figure does not mean that an average truck driver typically stops once every hour for five minutes at a time, but is a general factor that indicates the portion of a driver’s work shift that is typically spent actually operating truck.

Application of Refined Methodology

The data collection program described in the previous section provided the study team with a detailed understanding of truck parking characteristics for a number of different facility types (as well as highway shoulders) across Pennsylvania region. While the data collected for these facilities has some independent value on their own, the aggregation of parking characteristics for all of these locations provides a comprehensive profile of parking activity that is invaluable to the modeling process. Particular applications of these data include the following:

- The parking duration figures obtained in the 24-hour profiles provided a reasonable estimate of the relationship between short-term and long-term parking activity in the region, which is used in lieu of the short-haul/long-haul relationship described in the 2002 FHWA report. Since current FMCSA regulations limit a driver to 11 hours of driving within a 14-hour duty window in a 24-hour day, a threshold of three hours was used to delineate short-term vs. long-term parking. This is based on the assumption that the FMCSA rules allow a maximum of 11 consecutive hours on the road, which means a trucker who parks for fewer than three hours may be stopping to rest for a short period of time under the Federal rules (or for any number of other reasons), while one who parks for more than three hours is very likely stopping for an extended rest period associated with these regulations.
- The parking duration data indicated that 79% of the observed trucks were stopped for less than three hours, and these trucks had a median stop/parking duration of about 20 minutes. The remaining 21% were stopped



for three hours or more, and these trucks had a median parking duration of 7 hours, 15 minutes. For this refined application of the FHWA methodology, the 79%-21% short-term vs. long-term split is used as a representative estimate of the overall short-haul vs. long-haul breakdown of truck trips in the study area. However, various roads have unique characteristics that make them more or less attractive to short-haul or long-haul trucks. Interstates, for example, tend to have higher rates of long-haul trucks than US highways.

- For modeling purposes in this study, peak hour characteristics were identified through a combined truck parking accumulation analysis based on trucks entering and exiting all of the locations (including the highway shoulders) and the duration for which they were parked. The peak hour for short-term parking occupancy occurred between 1:00 and 2:00 PM. The peak hour for long-term parking occupancy occurred between 3:00 and 4:00 AM.
- The FHWA model is based on the total peak parking demand by time of day, which occurs when the combined short-term and long-term parking demand is highest. The parking accumulation analysis indicated that in Pennsylvania, the peak parking activity occurs from 3:00 to 4:00 AM.

The applications of these figures to the truck parking demand model are described in *the Description of Short-Term Parking Calculations and Description of Long-Term Parking Calculations* sections.

The roadway networks used in typical travel demand models are generally too fine for this FHWA methodology. Because truck trips are typically much longer than the commuter-based auto trips that represent the key component of these models, and linear roadway distances between existing truck parking areas tend to be large, the vast majority of the links in these regional models will show some small level of theoretical truck parking demand and no available capacity. The statewide nature of the PA Statewide Travel Demand Model is an appropriate tool for this analysis.

Description of Short-Term Parking Calculations

The following is a detailed explanation of the calculations used to determine total truck peak parking demand. Eastbound PA Turnpike between the New Stanton and Bedford exits is used for this sample calculation.

The average speed and daily truck traffic estimates on highways analyzed for 2006 are extracted from the PA Statewide Travel Demand Model. The average speed and daily truck volumes for eastbound New Stanton to Bedford (segment #4) are 61 mph, and 6,595 daily trucks.

Daily trucks were then divided into short-haul trucks and long-haul trucks using the surrogate short-term vs. long-term splits described earlier in this section. The



Turnpike segment is a tolled interstate highway, so the 65%-35% short-haul vs. long-haul split was used. Using this split, the breakdown of short-haul and long-haul truck traffic on this segment is shown below:

$$\text{Short-Haul Trucks: } 6,595 \times 65\% = 4,286 \text{ Short - Haul Trucks } (3)$$

$$\text{Long-Haul Trucks: } 6,595 - 4,286 = 2,309 \text{ Long - Haul Trucks } (4)$$

Once the daily short-haul and long-haul truck volumes have been computed, a theoretical daily and peak truck parking demand was calculated for the trucks traveling on each roadway segment. This is a multi-step process involving a series of calculation to determine the truck-miles traveled (TMT) for each segment, the duration of time each truck spends on the segment in question (measured as truck-hours traveled, or THT), and a translation of this second measure into parking demand based on parking duration estimates and peaking characteristics developed through the 2002 FHWA study or as part of the extensive data collection process. The truck-miles traveled (TMT) for Turnpike segment are calculated using the TMT using the segment length (70 miles for the segment) and the total daily truck volume¹⁰:

$$\text{TMT: } 70 \text{ miles} \times 6,595 \text{ trucks} = 461,622 \text{ Truck - Miles Traveled } (5)$$

The truck-hours-traveled (THT) for Turnpike segment can then be computed using this TMT and the weighted average speed for the segment, as follows:

$$\text{THT: } \frac{461,622 \text{ miles}}{61 \text{ mph}} = 7,567.6 \text{ Truck - Hours Traveled } (6)$$

¹⁰ The *total* daily truck volume is used to compute short-term parking demand instead of the *short-haul* truck volume (which has been derived based on short-term vs. long-term parking durations) because both short-haul and long-haul trucks can make stops associated with short-term parking activity – including stops for food, fuel, access to rest rooms, etc.



Using the truck parking/operating relationship of 5 minutes parked to 55 minutes of travel per hour, an estimated short-term parking demand as measured in truck-hours parked per day can be determined as follows:

$$\text{Truck-Hours Parked: } \frac{7,567.6 \text{ hr} \times 5 \text{ min}}{60 \text{ min}} = 630.6 \text{ Hours} \quad (7)$$

Equation (7) provides an estimate of the theoretical short-term parking demand (measured in terms of time only) for the aggregate of all the trucks operating on the Turnpike segment. The median short-term parking duration measured as a result of the data collection program was 22 minutes, or 0.367 hours, which means the typical truck operating in Pennsylvania that stops for purposes associated with short-term parking stops once every four hours for a period of about 22 minutes. Using this median stop duration and relationship, the time-based parking duration computed in Equation (7) can be converted to an actual number of estimated theoretical stops for trucks traveling along the Turnpike segment using the following calculation:

$$\text{Daily Truck Stops: } \frac{630.6 \text{ hr}}{.367 \text{ hr per stop}} = 1,718.3 \text{ Daily Truck Stops} \quad (8)$$

The final step is to compute an estimated short-term parking accumulation for the peak hour, using the peak accumulation factors described earlier. The 24-hour profile of parking activity at the sample facilities in the study area indicate that 2.11% of the trucks that are parked for less than three hours over the course of a day in the study area are in these parking facilities during the hour of peak overall parking activity (3:00 to 4:00 am). Therefore, the peak short-term parking demand for Segment #4 can be calculated as follows:

$$\text{Peak Demand (Short-Term): } 1,718.3 \text{ stops} \times 2.11\% = 36.26 \text{ Stops} \quad (9)$$

Description of Long-Term Parking Calculations

The procedure for calculating theoretical long-term truck parking demand is similar to the calculations for short-term demand, but only long-haul trucks as computed in Equations (5) and (6) are included in these computations. The aggregate TMT for long-haul trucks on the Turnpike segment is computed as follows:



$$\text{TMT: } 70 \text{ miles} \times 2,309 \text{ trucks} = 161,602 \text{ Truck - Miles Traveled } (10)$$

THT is then calculated as follows:

$$\text{THT: } \frac{161,602 \text{ miles}}{61 \text{ mph}} = 2,649.2 \text{ Truck - Hours Traveled } (11)$$

To accurately estimate how long-term parking activity can be derived from computed truck-hours traveled for any given roadway segment, a lengthy calculation was made using information provided by a variety of sources, including current Federal hours-of-service restrictions and information documented in the 2002 FHWA study from trucking industry surveys. The computation of this ratio is described in the table below:



Variable	Description	Derivation/Source
F_D	Driving hours permitted in a daily on-duty window	11 out of 14, or 0.786 (FMCSA Regulations)
OD_8	Maximum <i>on-duty</i> hours permitted over 8 consecutive days	70 (FMCSA)
DR_8	Maximum <i>driving</i> hours permitted over 8 consecutive days	55 ($OD_8 \times F_D$)
H_T	Total hours in 8-day period	192 (24×8)
H_H	Avg. hours at home (off-duty and away from truck) for long-haul truckers in 8-day period	42 (2002 FHWA Study)
H_R	Average hours with truck (on-duty or off-duty) for long-haul truckers in 8-day period	150 ($H_T - H_H$)
D%	Fraction of time on the road (on-duty and driving) for long-haul truckers in 8-day period	0.367 ($DR_8 \div H_R$)
P%	Fraction of time long-haul truckers must be off-duty and/or parked in 8-day period under FMCSA regulations	0.633 ($1 - D\%$)
P	Parking Ratio (hours parked for FMCSA regulations for every hour driving)	1.725 ($P\% \div D\%$)

This parking ratio is then used to calculate the aggregate truck-hours parked per day, based on the THT computed in Equation (11), as follows:

$$\text{Truck-Hours Parked: } 2,649.2 \text{ hr} \times 1.725 = 4,569.9 \text{ Hours} \quad (12)$$

The median long-term parking duration measured as a result of the data collection program for this study was 435 minutes, or 7.25 hours, which corresponds to the estimated typical parking duration for trucks in Pennsylvania that stop for extended periods of time to meet minimum rest periods under hours-of-service regulations. Applying this value to the result of Equation (12) yields the



following number of theoretical daily long-term parking stops for the Turnpike segment:

$$\text{Daily Truck Stops: } \frac{4,569.9 \text{ hr}}{7.25 \text{ hr}} = 630.3 \text{ Daily Truck Stops} \quad (13)$$

As with the short-haul truck parking procedure, the final step in calculating long-term parking demand is to compute an estimated long-term parking accumulation for the peak hour, using the peak accumulation factors described early in this section. The 24-hour profile of parking activity at the sample facilities in the study area indicated that 45.35% of the trucks that are parked for three hours or more during a typical day in the study area are in these parking facilities during the hour of peak overall parking activity (3:00 to 4:00 AM). The peak long-term parking demand for the Turnpike segment can therefore be computed as follows:

$$\text{Peak Parking Demand: } 630.3 \text{ stops} \times 45.35\% = 285.84 \text{ Stops} \quad (14)$$

Aggregation of Computed Parking Demand

The combined short-term and long-term peak parking demand is computed by simply adding the results of Equations (9) and (14). For the sample segment, the combined peak theoretical parking demand is 322.1 trucks, which includes 36.26 parking for short-term periods and 285.84 parking for long-term periods.

This calculation was completed for each segment to determine a modeled peak parking demand within Pennsylvania. Each segment was then assigned to one of 28 corridors (by direction). The total truck parking demand was aggregated for all of the individual segments within each of these corridors, and compared to the truck parking capacity available in existing facilities within these corridors¹¹. A corridor-level summary of the peak truck parking capacity, computed demand, and computed parking shortfall is shown in the table below

¹¹ For facilities accessible from both directions of a roadway, 50% of the parking capacity was assigned to each of the directional corridors they serve.



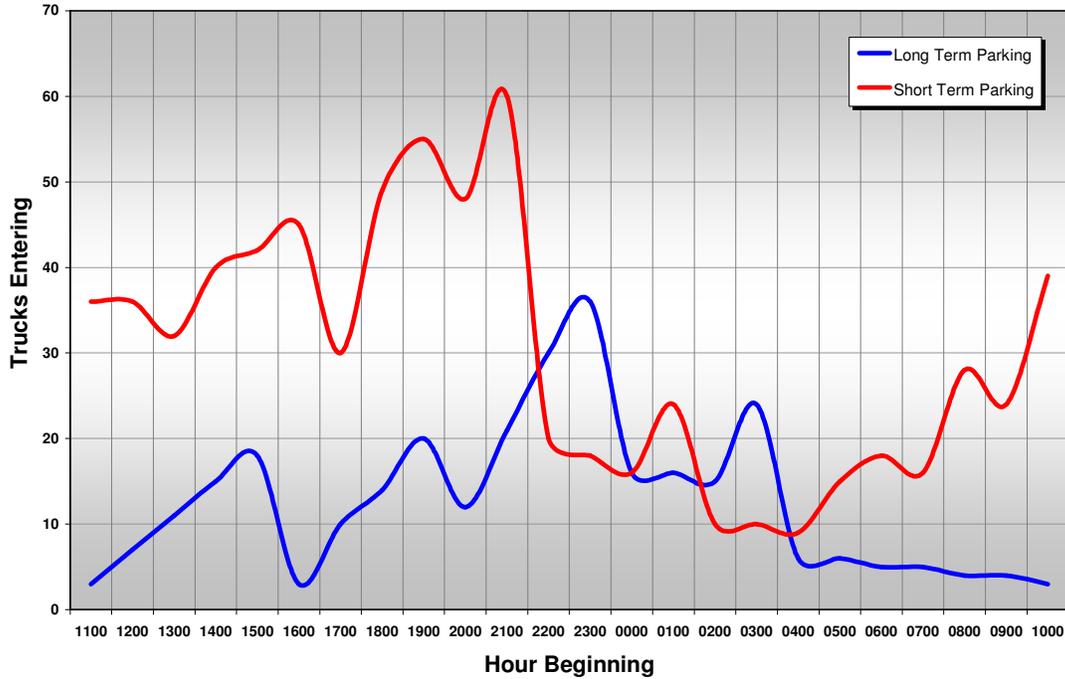
**Pennsylvania State
Transportation Advisory Committee**

Corridor	Limits	Parking Demand	Parking Capacity	Parking Shortfall	Rank	
1E	I-90 E	OH to NY	139	269	-130	51
1W	I-90 W	NY to OH	147	472	-325	59
18E	PA Turn E (4)	I-283 to I-95	605	170	435	1
18W	PA Turn W (4)	I-95 to I-283	599	180	419	2
3E	I-80 E (1)	OH to US 220	681	831	-150	52
3W	I-80 W (1)	US 220 to OH	668	766	-98	46
4E	I-70 E (1)	WV to PA Turn.	203	491	-288	57
4W	I-70 W (1)	PA Turn to WV	201	404	-203	56
6E	PA Turn E (2)	New Stant. To Breeze.	406	77	329	3
25N	I-95 N	DE to NJ	302	11	291	4
25S	I-95 S	NJ to DE	282	0	282	5
6W	PA Turn W (2)	Breeze. To New Stant.	406	131	275	6
23N	PA NE Ext N	PA Turn to I-81	308	56	252	7
29N	I-79 N (3)	I-70 to PA Turn	248	17	231	8
29S	I-79 S (3)	PA Turn to I-70	244	17	227	9
5W	PA Turn W (1)	I-70 to OH	222	0	222	10
9E	I-70 E (2)	PA Turn to MD	36	155	-118	47
9W	I-70 W (2)	MD to PA Turn	37	157	-120	48
5E	PA Turn E (1)	OH to I-70	219	50	169	11
23S	PA NE Ext S	I-81 to PA Turn	290	136	154	12
11E	PA Turn E (3)	Breeze. To I-283	288	454	-166	53
11W	PA Turn W (3)	I-283 to Breeze.	293	391	-98	45
12E	US 322 E	US 220 to I-81	76	96	-19	37
12W	US 322 W	I-81 to US 220	60	96	-35	44
13N	US 15 N (1)	MD to Harrisburg	22	42	-20	38
13S	US 15 S (1)	Harrisburg to MD	22	56	-33	43
14E	I-80 E (2)	US220 to I-81	394	724	-330	60
14W	I-80 W (2)	I-81 to US 220	444	750	-306	58
15N	US 15 N (2)	I-80 to NY	76	73	3	33
15S	US 15 S (2)	NY to I-80	70	93	-23	39
16N	US 15 N (3)	Harrisburg to I-80	38	62	-24	40
16S	US 15 S (3)	I-80 to Harrisburg	35	62	-26	41
17S	I-83 S	I-81 to MD	155	24	131	13
17N	I-83 N	MD to I-81	155	37	118	14
24W	I-80 W (3)	NJ to I-81	168	71	97	15
24E	I-80 E (3)	I-81 to NJ	168	93	75	16
19N	I-81 N (2)	I-78 to I-80	152	166	-14	35
19S	I-81 S (2)	I-80 to I-78	144	176	-32	42
20N	I-81 N (3)	I-80 to NY	273	448	-175	55
20S	I-81 S (3)	NY to I-80	268	440	-172	54
21N	I-81 N (4)	US 322 to I-78	202	325	-123	49
21S	I-81 S (4)	I-78 to US 322	182	310	-128	50
22N	US 422/222 N	PA Turn. To I-78	70	0	70	17
27W	I-78 W	NJ to I-81	426	357	69	18
8S	I-99 S	I-80 to MD	67	0	67	19
22S	US 422/222 S	I-78 to PA Turn	65	0	65	20
8N	I-99 N	MD to I-80	62	0	62	21
28S	I-79 S (2)	I-80 to PA Turn	83	29	54	22
28N	I-79 N (2)	PA Turn to I-80	79	28	51	23
7W	US 22 W	US 322 to I-376	106	63	43	24
7E	US 22 E	I-376 to US 322	97	63	34	25
2N	I-79 N (1)	I-80 to I-90	130	97	33	26
26E	I-84 E	I-81 to NY	107	76	31	27
10S	I-81 S (1)	US 322 to MD	353	322	31	28
27E	I-78 E	I-81 to NJ	388	357	31	29
26W	I-84 W	NY to I-81	106	78	28	30
10N	I-81 N (1)	MD to US 322	344	335	10	31
2S	I-79 S (1)	I-90 to I-80	108	101	7	32
30N	I-79 N (4)	WV to PA Turn.	38	44	-6	34
30S	I-79 S (4)	PA Turn to WV	37	55	-18	36

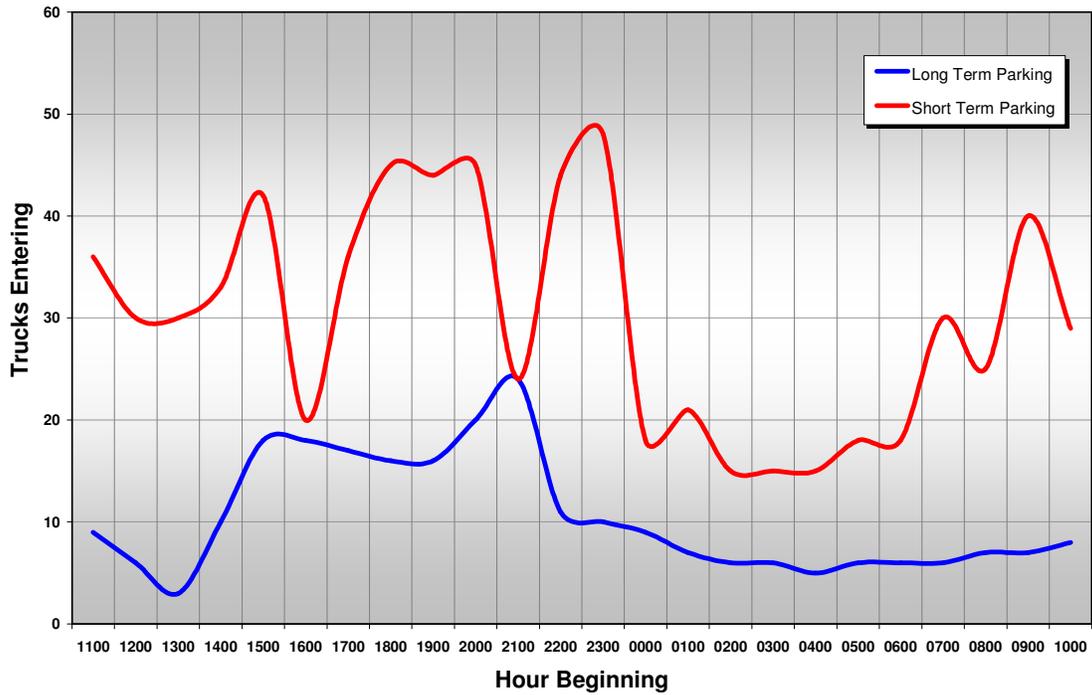


Truck Parking Activity Summaries

TA Truck Stop (Brookville) Volume -- Trucks Entering by Hour

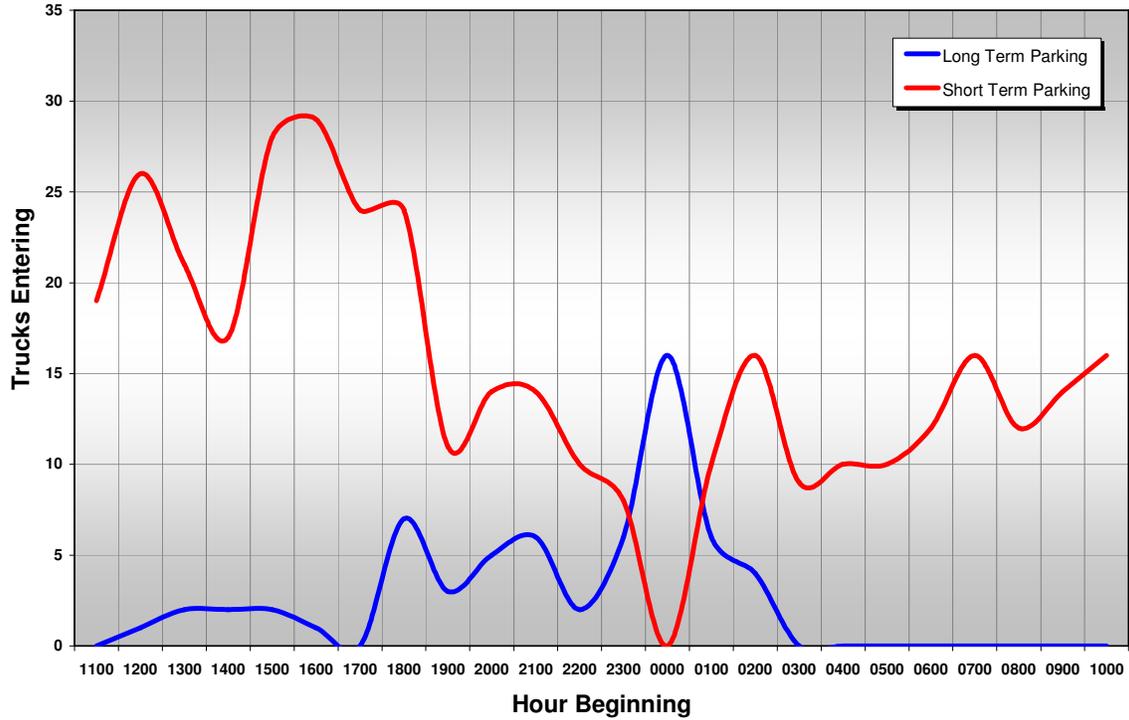


Flying J (Brookville) Volume -- Trucks Entering by Hour

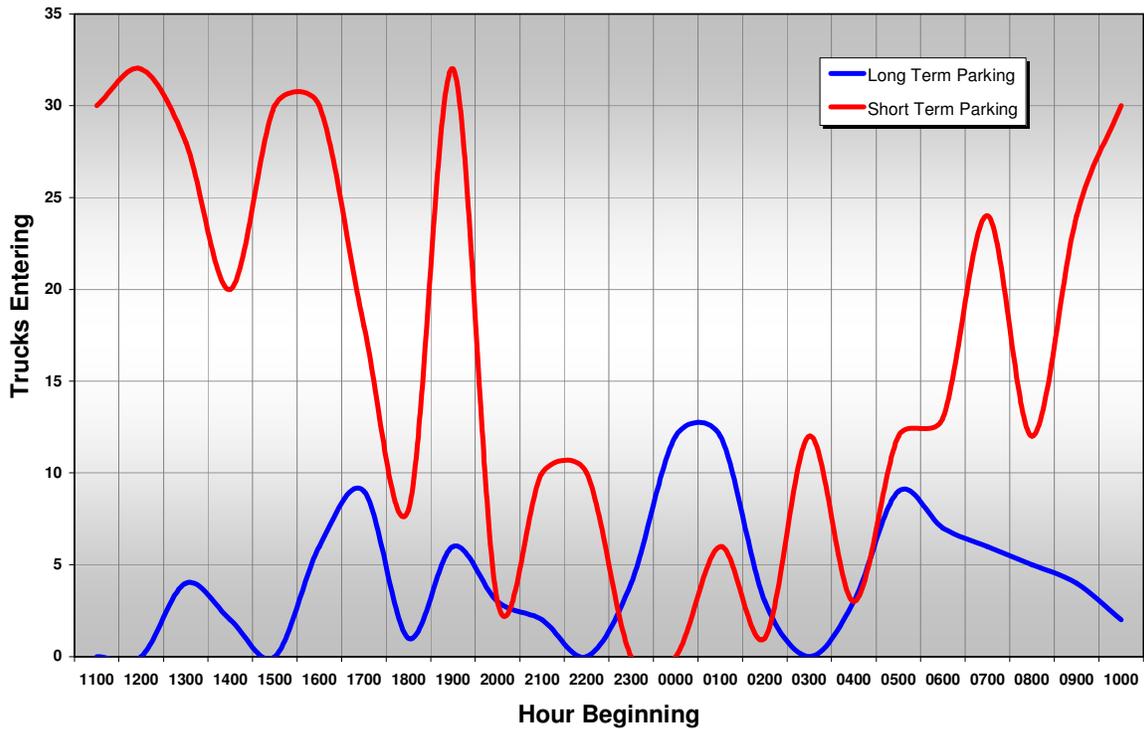




I-81 NB (Grantville) Volume -- Trucks Entering by Hour

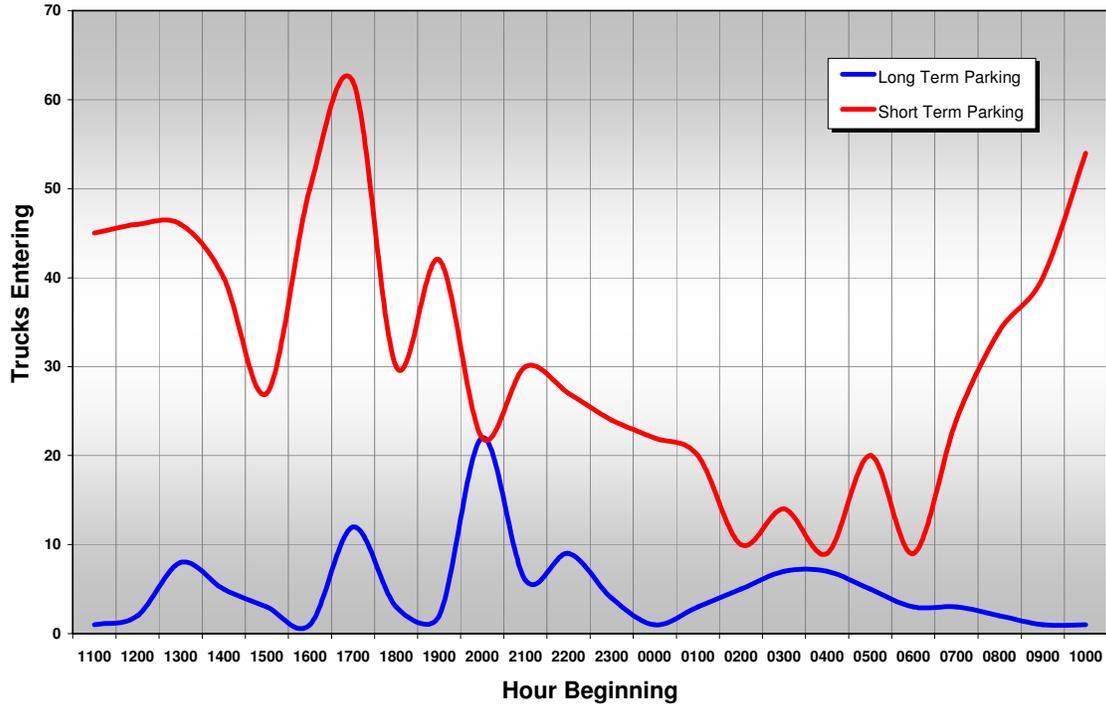


I-81 SB (Grantville) Volume -- Trucks Entering by Hour

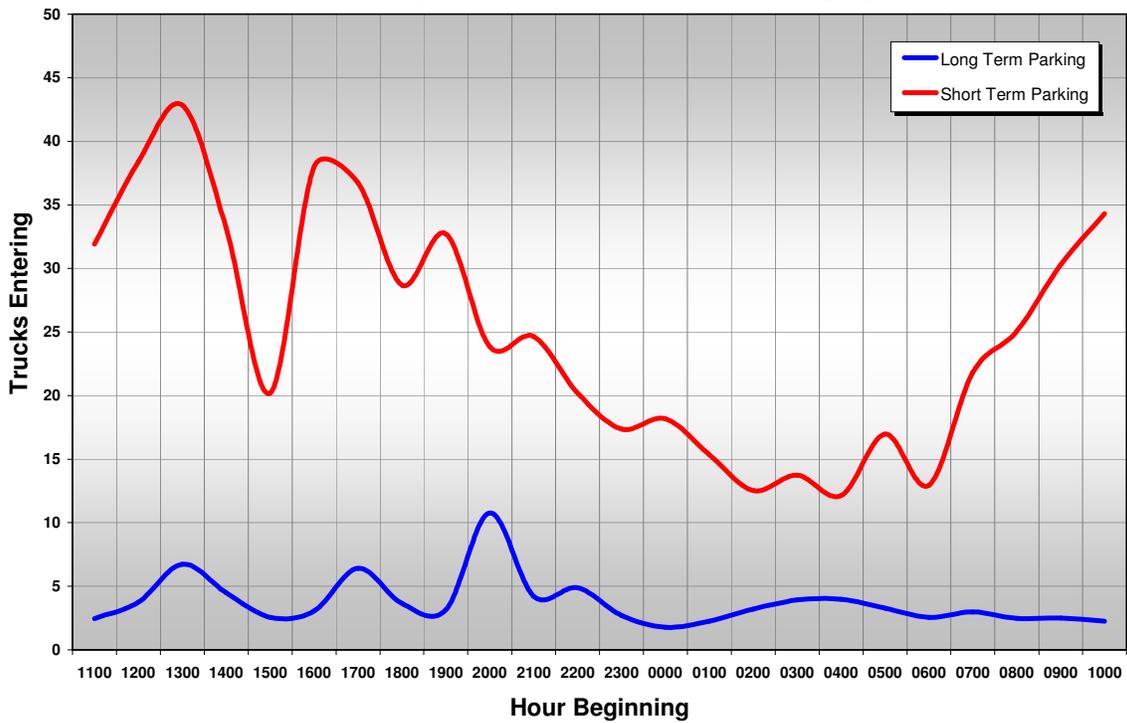




I-76 EB (Midway) Volume -- Trucks Entering by Hour

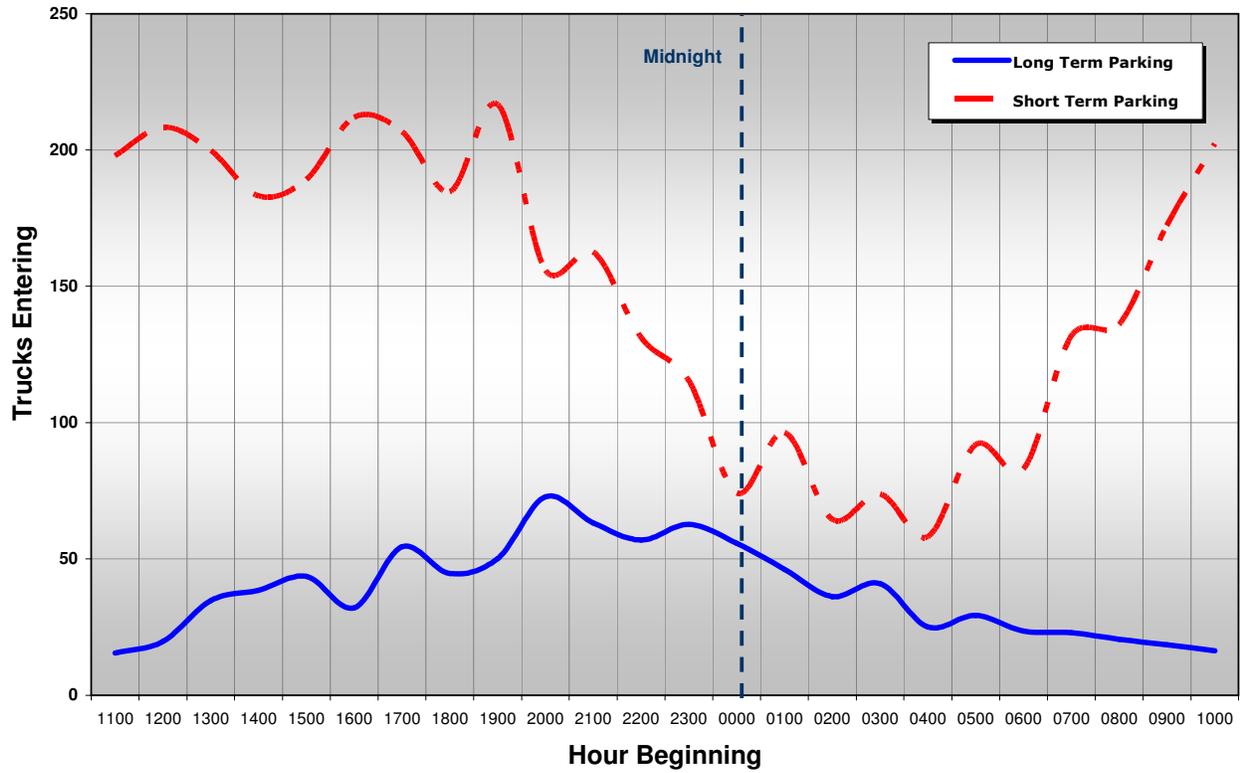


I-76 WB (Midway) Volume -- Trucks Entering by Hour



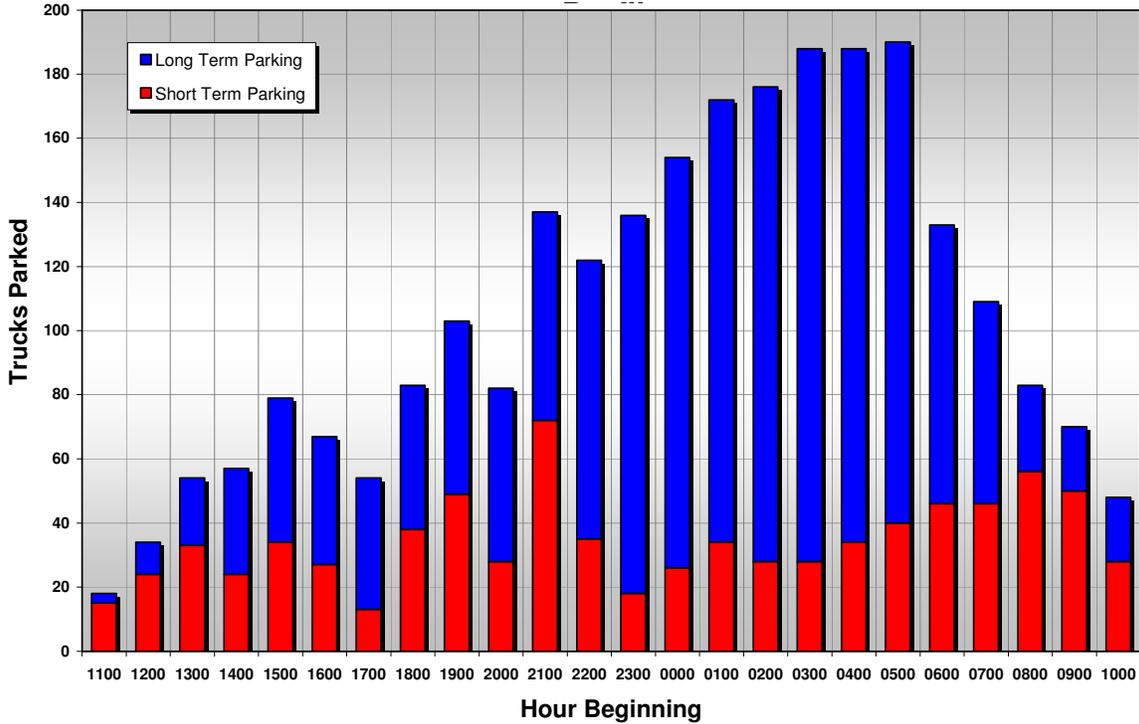


Trucks Entering by Hour -- Combined Facilities

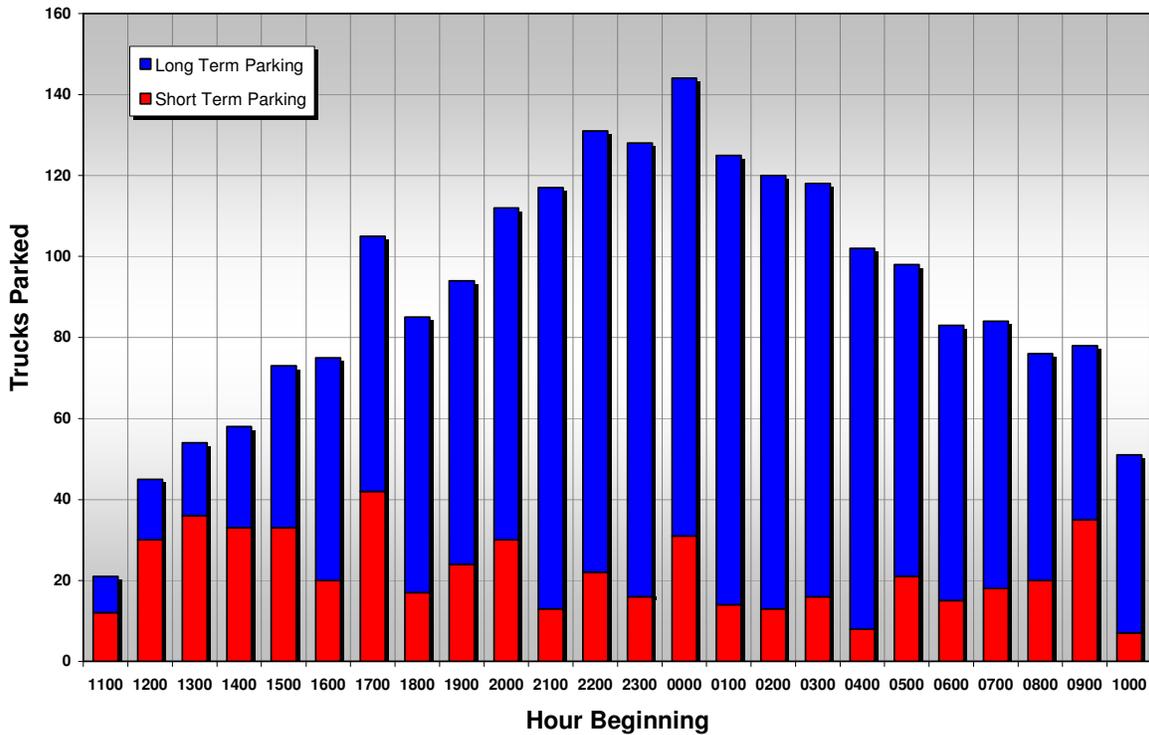




TA Truck Stop (Brookville) -- 24-Hour Parking Accumulation

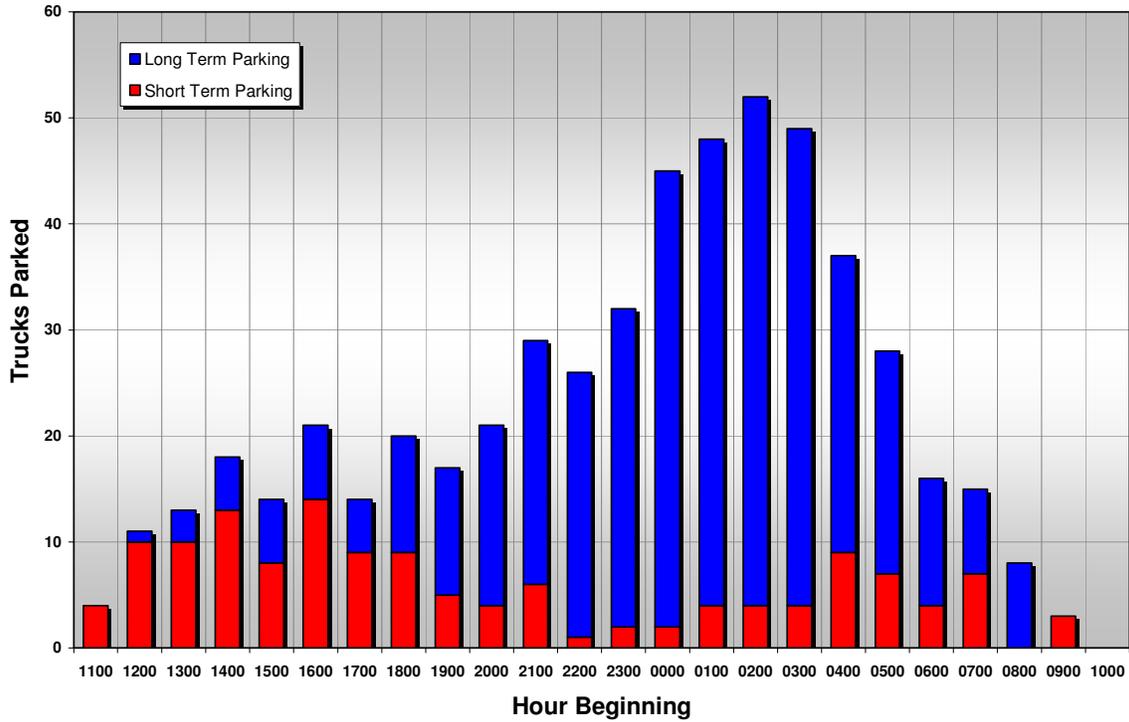


Flying J (Brookville) -- 24-Hour Parking Accumulation Profile

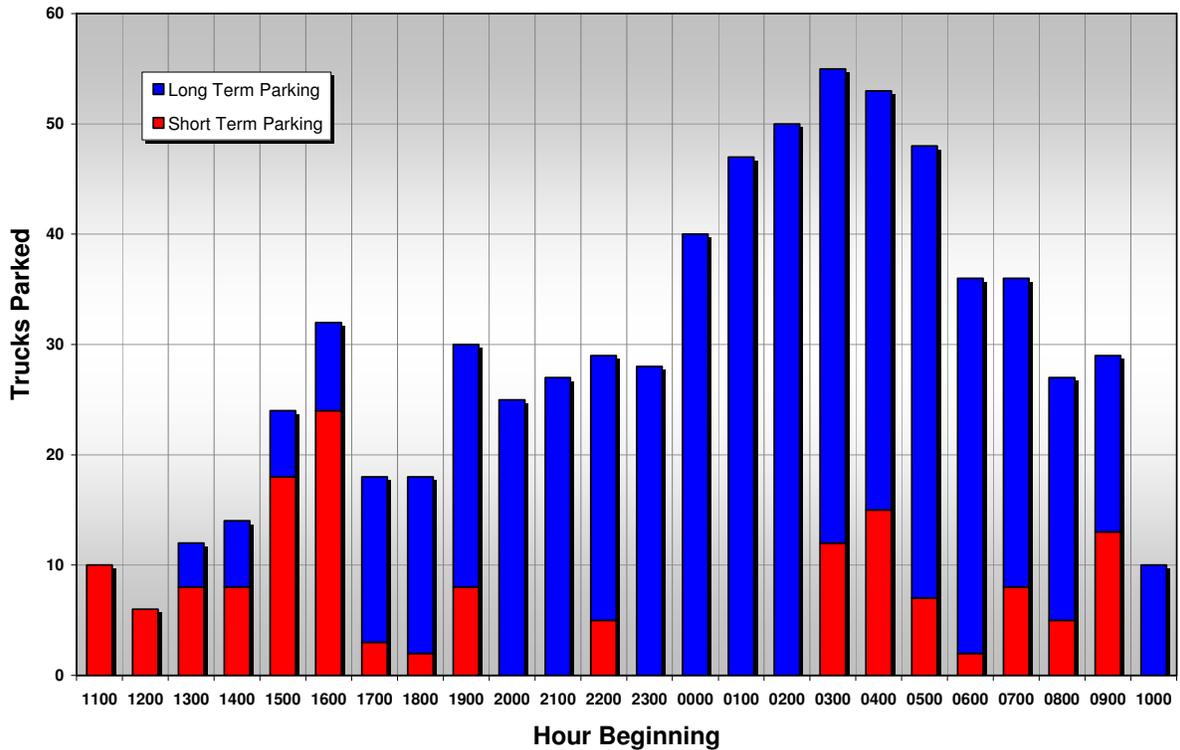




I-81 NB (Grantville) -- 24-Hour Parking Accumulation Profile

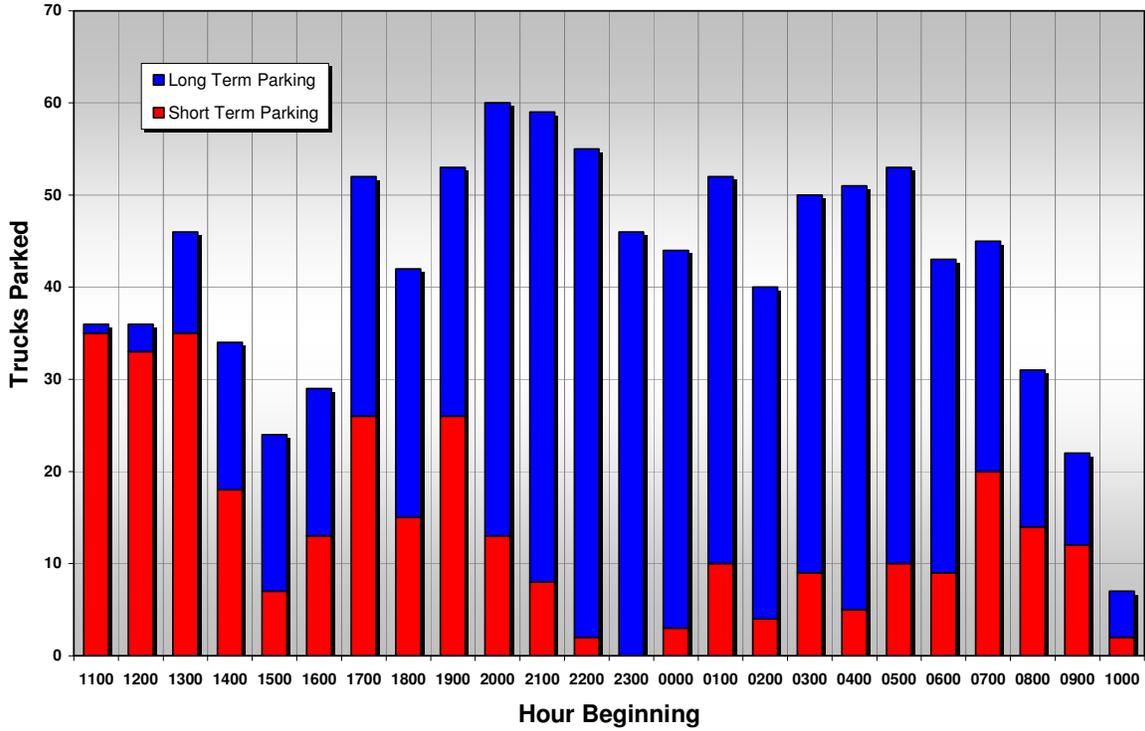


I-81 SB (Grantville) -- 24-Hour Parking Accumulation Profile

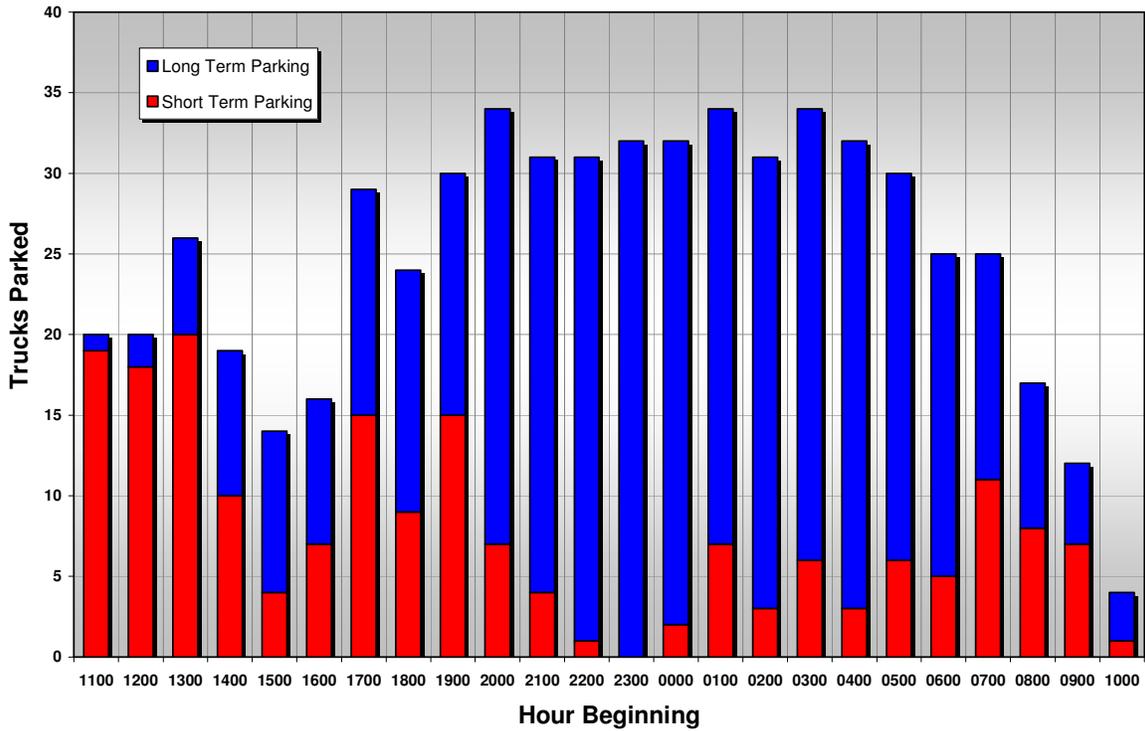




I-76 EB (Midway) -- 24-Hour Parking Accumulation Profile



I-76 WB (Midway) -- 24-Hour Parking Accumulation Profile





24-Hour Parking Accumulation Profile -- Combined Facilities

