

FEBRUARY 2017



An Evaluation of Vacant Urban Land for Truck Parking



About the Mid-America Freight Coalition (MAFC)

The industries and farms of the Mid-America region can compete in the marketplace only if their products can move reliably, safely and at reasonable cost to market.

State Departments of Transportation play an important role in providing the infrastructure that facilitates movement of the growing amount of freight. The Mid-America Freight Coalition was created to support the ten states of the Mid America Association of Transportation Officials (MAASTO) region in their freight planning, freight research needs and in support of multi-state collaboration across the region.

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EXECUTIVE SUMMARY

Truck parking is an important element of the United States' transportation system, as it provides truckers with safe places to rest and stage for deliveries. Demand for truck parking spaces exceeds supply, and shortages are especially common in and around urban areas. These shortages jeopardize public safety as they are associated with truck parking on highway ramps and shoulders, parking in unsecure areas, and violations of truckers' maximum hours of service.

There are three types of operation and policy solutions for this parking shortage:

1. Truck Parking Information and Management Systems (TPIMS) collect and communicate information about parking availability through either detection and communication technologies or through social media applications
2. Construction or re-adaptation of additional parking spaces on the current or new right of way, such as closed weigh stations
3. Collaborative planning and rehabilitation of vacant urban parcels for use as parking areas.

This report seeks to examine the potential parking value of vacant urban parcels by establishing a methodology to identify potential parcels and examining whether the identified parcels are suitable for parking. In the three cities studied, St. Louis, Missouri, Columbus, Ohio, and Detroit, Michigan, the authors found that affordable, accessible parcels are available to accommodate truck parking. When used in conjunction with other policies like TPIMS and re-use of parking on the right of way, adaption of urban sites could help reduce the frequency and severity of truck parking shortages.

INTRODUCTION

Efficient trucking is an essential element of the United States' economic success: in 2015, trucks carried 63% of the nation's freight traffic, about 11 billion tons of goods worth over \$13.2 trillion. Truck tonnage is forecasted to increase 44% by 2045, while the value of goods carried by truck will increase by 84% (1). The trucking industry is an economic heavyweight, it employs 1.6 million drivers (2), and an additional 7 million people in the industries that support trucking (3).

One part of trucking infrastructure that is growing in importance is truck parking, which includes publicly-owned rest stops and private, commercial truck stops.

Truck stops and rest stops serve important safety and economic purposes:

1. They provide a safe stopping point for truckers to rest
2. They act as staging areas for drivers making scheduled deliveries

About 31,000 spaces are provided by the public sector, with an additional 167,000 to 284,000 held by the private sector (4) to support the 3.63 million class 8 trucks in operation today (5).

TRUCKER EXPERIENCES AND PERCEPTIONS

In the United States as a whole, demand for truck parking exceeds supply, and parking shortages are acute in certain areas. For example, all highways with an Average Annual Daily Truck Traffic (AADTT) count greater than 1,000 have about 31,000 spots, but there is demand for 287,000 spots on an average night, and 90% of truckers have experienced difficulty finding parking (4). In the Midwest, the focus region for this paper, 76% of drivers have reported difficulty finding parking on 30% or more of their trips (6). Parking shortages are often associated with urban areas, which often have greater concentrations of industry.

In a recent American Transportation Research Institute (ATRI) survey, these carrier results were confirmed. It was found that private truck stops are used for 56% of parking and public rest stops are used for 44% of parking (14). Perceived difficulty of finding parking at these locations continued to be an issue. The ability to find parking was rated equally difficult for both public and private locations by 62.1% of drivers; 23.7% of respondents said private truck stops were more difficult and 14.2% of respondents stated that public rest stops were more difficult.

ATRI posed the scenario where drivers could pay to reserve a parking spot. This question, which gauged driver willingness to pay, found that 48.2% of drivers would not be willing to pay for parking, 20% would pay \$1 to \$5, and 19.8% would pay \$6 to \$10. In a subsequent question, 46.8% of drivers indicated that the carrier should pay a parking reservation fee.

As freight tonnages increase, parking shortages, and their public safety and infrastructure problems are likely to worsen. When truckers cannot easily find parking, they may engage in unsafe parking practices, each of which has its own problems. Parking on highway ramps is common. This practice is unsafe because it creates a collision risk for other motorists and it damages roadway shoulders not designed to support the weight of a parked truck. Drivers may also find parking in unsecured vacant lots like malls or abandoned gas stations. This exposes them to assault, robbery, and other crime. Finally, truckers unable to find parking may continue driving beyond their legal maximum hours of service (HOS), which means they are more likely to be fatigued and at risk of the dangers of drowsy driving (7). Regardless of payment for parking, a majority of drivers off all types (local, regional, inter-regional, and long-haul) would prefer to reserve parking in major metropolitan areas over rural or small metropolitan areas (14). This supports the perception that truck parking is more difficult to access in major metropolitan areas than in

other rural or smaller communities, and it plays an important role in staging for scheduled delivery times.

There are three public policies that impact the current parking shortage. First, are federal HOS regulations, which are designed to improve highway safety by keeping fatigued drivers off the road. HOS rules state that drivers may not drive for more than 11 hours after 10 consecutive hours off duty. Additionally, drivers may not drive more than 8 hours without a 30-minute, off-duty or sleeper berth break (8). These rules mean that drivers travelling greater than 7 hours from home will likely require some kind of parking facilities. The second policy is Jason's Law, a portion of the Federal MAP-21 spending bill passed in response to the murder of a trucker parked at an abandoned gas station. Jason's Law made truck rest areas and parking areas available for federal highway funding (9). Finally, with increasingly limited transportation funding, many states have sought to cut costs by closing rest areas and weigh stations, exacerbating existing parking shortages (7).

Market phenomena also have an effect on parking demand. The forecasted 44% future growth in truck tonnages will result in more trucks and increased demand for parking spots, worsening current shortages (1). The rise of just-in-time inventories and scheduled deliveries is also contributing to shortages, as drivers often need parking near destinations to wait for appointed arrival times (7).

The problem of truck parking shortages arises from a variety of causes, and has a range of negative effects on safety and infrastructure. However, a simple fact remains: in many areas there are not enough parking spaces. To solve these shortages, some policies seek to increase parking, while others seek to improve truckers' decision making with information on parking availability.

POLICY SOLUTIONS TO TRUCK PARKING SHORTAGES

Currently, there are three strategies being used to address the parking shortage.

Strategy One: Truck Parking Information and Management Systems (TPIMS)

The first approach is to improve utilization of available parking by collecting and communicating information about parking availability to drivers. In the Mid America Association of Transportation Officials (MAASTO) region, this is accomplished through a Truck Parking Information and Management System (TPIMS), which can provide truckers with information on availability of parking at specific locations. TPIMS systems show promise in “smoothing” parking demand along corridors, where some lots may be full and others open, reducing the time drivers spend off highway searching for spots. Additional information on the MAASTO TPIMS project can be found at: trucksparkhere.com.

Trucking has also increased productivity with the use of social media and trucker-supplied data. Software and mobile applications are created to serve this purpose. Mobile applications are attractive and easy to implement because of the high number of drivers who utilize the technology. In 2013, 50% of drivers had smartphones (11). HOS monitoring and reducing operating costs can be aided by these technologies (11). The search for truck parking is an inefficient use of a driver’s time and increases fuel and operating costs, impacting both HOS and the financial bottom line.

Drivers are being aided in their search for truck parking by a range of free iPhone and Android applications. Beyond including the location of parking, these applications often include information about the number of available parking spots. Depending on the program, these details are recorded by drivers logging their observations of parking areas or by parking providers reporting their availability in the application. Beyond this, some applications also allow drivers to share information about amenities located in and around parking areas.

These applications, created both by private companies and by industry bodies have been widely adopted to address this driver need. The National Association of Truck Stop Operators (NATSO) created Park My Truck, which provides drivers with information uploaded by parking providers (13). Trucker Path is perhaps the most widely used application, with a user base of over 500,000 (12). Beyond parking, the application provides information on truck stops, weigh stations, fuel prices, and has a communication system that is integrated with Facebook Messenger.

Second Strategy: Re-Opening Rest Areas and Purchasing Rights of Way

A second policy option is to increase availability of parking by re-opening closed rest areas or purchasing additional rights of way. However, available rights of way for parking is not always coincidental with areas of parking shortages, so opening closed locations may not have much impact on localized shortages. Other considerations include the cost of new rights of way as well as the availability and cost of amenities at re-purposed sites.

Third Strategy: Collaborative Planning Approach

A third policy option to improve truck parking availability could be collaborative work between state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and local governments to identify and readapt vacant urban sites and brown-fields for truck parking. This approach would provide additional capacity in urban areas where tightly scheduled delivery times and congestion place further demand on available spaces. The potential use of vacant industrial properties would require the purchase or lease of vacant paved sites of a minimum size, followed by the addition of appropriate assets like restrooms, lighting, fences, and access to highways, businesses, and warehouses. Vacant industrial or commercial properties with large square footages of pavement or concrete would be ideal options. These sites are likely to be relatively low cost in terms of both land value and infrastructure construction and are more likely to have immediate access to arterial roads.

This approach is also designed to avoid residential areas, hospitals, roads with clearance issues, areas with ordinances prohibiting truck parking, and potentially dangerous areas. Collaboration between state DOTs and MPOs is not required but is ideal because the organizations can defray the costs as well as share in the benefits. This paper evaluates this third policy, the Collaborative Planning Approach (CPA) as a viable alternative or addition to the traditional repurpose or purchase of ROW, and the newer TPIMS approach.

METHODOLOGY

To assess the CPA's potential to identify and develop urban truck parking areas, a GIS-based analysis of vacant urban land parcels in proximity to interstate highways and the centers of each city was used. This identified potential truck parking areas and their geometric suitability. Next, Google Street View functions were used to provide a wind-shield review of the lots, their surroundings, and any on-site amenities.

Urban areas in the ten-state MAASTO region were considered for this analysis. Three cities were identified based on major freight traffic volumes, presence of vacant industrial and manufacturing parcels, and the availability of easily obtainable GIS-based parcel records. Cities used for the evaluation included Detroit, Michigan, St. Louis, Missouri, and Columbus, Ohio. These cities were selected to provide variation in location across the region, landscape, population, and development history. These cities are comparable in size and level of traffic congestion. Detroit and St. Louis are both the largest cities in their states and Columbus is Ohio's second largest city. Drivers in all three cities face over 40 hours of congestion-related delay during peak auto hours per year (15).

Geographic data about parcel boundaries, land-use classifications, and road networks were obtained for each city. This data was collated in ESRI ArcMap, and parcels with land-use classifications of vacant were selected. After this initial selection, eligible parcels were identified using the spatial criteria outlined below. These factors were used to ensure sites were located near the city center and had easy access the interstate highway system.

1. Parcels must be within five straight-line miles of the city center.
2. Parcels must be within one mile of an interstate highway or other highway that provides direct access to the interstate highway system.
3. Parcels were subject to two, minimum-size thresholds: 5 acres and 2 acres. The 5-acre requirement was created to reflect the average size of existing truck stops in the three selected urban areas. A listing of urban stops was found using Truck Smart Parking Services, and the acreage of identified lots was calculated using Google Earth's "measure area" tool. The average truck parking lot area in the selected cities was 4.7 acres, so a requirement of 5 acres was selected to provide space for amenities such as bathrooms. The 2-acre requirement reflects stakeholder interviews with DOT staff, who identified a 1.4-acre area as the minimum size required for 14 trucks (10). This requirement was expanded to 2 acres to ensure selected parcels would provide the needed space.

Close proximity to the city center was desired to locate parking near high concentrations of industry and business. Locating parking close to industry can be beneficial for accommodating scheduled delivery times. Close proximity to highways was included to reduce the amount of time driving to and from parking facilities. The sites were also screened for social impacts by avoiding schools, housing, and public facilities.

A vacant lot is only one of the assets needed for truck parking creation. After sites were filtered based on the above spatial criteria, one parcel from each city was selected for further investigation. At a minimum, a completed truck parking area would need a durable surface like concrete, pavement, or gravel, lighting and fences for security, and restroom facilities. Therefore, sites with non-vegetative ground cover were sought using satellite images. The list of sites was further narrowed using Google Street View to identify security assets like fences and lights. The final study sites were picked based on a combination of access, security, and surface type. The findings for each site are discussed below. Alternate locations were available for each city, so a more refined analysis could be developed to prioritize a variety of factors. Table 1 shows the screening factors used to select sites for further study, and how each factor was measured.

TABLE 1: Screening Factors

Factor	Measure
Size	Acres
Cost per acre	Dollars
Distance to interstate (straight line)	Miles
Distance to city (straight line)	Miles
Surface material	Vegetation / Pavement / Concrete
Electric service (includes lighting)	No / Yes / Yes with lighting
Water / sewer service	No / Yes
Fencing	None / Partial / Complete
Soil contamination	Not Likely / Possible / Likely
Safety	Less Safe / Average / Safer
Social impacts	Low / Medium / High

RESULTS

Table 2 summarizes available parcels in the three selected cities that satisfy selection criteria. Overall, there are 2,998 acres of 2-acre parcels available across the three study areas, and 2,311 acres of 5-acre parcels available. The remainder of the results section describes the study site in each city.

TABLE 2: Summary of Vacant Industrial and Commercial Parcels

	2-Acre Minimum			5-Acre Minimum		
	Number of Parcels	Average Acreage	Total Acreage	Number of Parcels	Average Acreage	Total Acreage
Columbus	120	11.16	1339	60	19.20	1152
Detroit	171	5.23	694	58	9.56	554
St. Louis	171	5.64	965	46	13.15	605



FIGURE 1: Columbus study site. Photo: Google Earth

Columbus

Of the 180 total parcels in Columbus, one of the highest rated sites is the parcel at 1730 Stimmel Road. The potential lot is a 21-acre gravel lot listed as vacant commercial property. It is 1.2 road miles from an access point for I-71, and 2.6 miles from downtown Columbus. The parcel was estimated to have a market value of \$8,065 an acre. FIGURE 1 on page 9 shows an aerial view of the site, with parcel boundaries in yellow.

All sides of the parcel are bounded by a combination of chain link and wooden fences. No lighting is present at the site, or nearby. The northern boundary of the parcel is a larger gravel lot home to a car auction facility. To the west is the right of way for I-71, to the east is the Scioto River Greenway, a park area, and to the south is a vacant lot. The area is listed as "safer" by real estate site Trulia. Soil or groundwater contamination at the site is unknown, historical satellite images do not show industry having been on site. This site has the advantage of not being near residential development, and the access route to I-71 runs between the Scioto River and a sports complex, so disturbance to local residents would be negligible.

Converting this parcel into suitable truck parking would require grading the site. Maintenance on overgrown fences and construction of lighting and restroom facilities would also be required. The site is adjacent to electrical distribution lines, but may not have local sewer and water infrastructure.

Detroit

Of the 229 potential parcels in Detroit, the parcel at 5400 Livernois Avenue was selected for assessment. It features 12.15 acres of concrete and pavement, and was once home to a large industrial building. The site is within one-tenth of a mile of access to I-94, and is 4 miles from downtown Detroit. The parcel was most recently sold in January 2015 for \$26,532 per acre, and Figure 2 shows the entrance as of September 2015.



FIGURE 2: Detroit study site. Photo: Google Streetview

The western and northern boundaries of the parcel already have chain-link fence topped with barbed wire, and the southern and eastern bounds have intermittent remnants of fencing. No lighting is present at the site, however there is ample street lighting along Livernois Avenue, the parcel's western boundary.

Adjacent to the parcel on the east is an active metals distribution center, on the north are abandoned industrial facilities, to the west by Livernois Avenue, which is fronted by three blocks of commercial properties and one block of residential homes. The south end of the property is adjacent to a vacant grass field and I-94. Soil or groundwater contamination is possible, given the site's former industrial use. The immediate neighborhood around the site is listed as "safer" by real estate site Trulia.com, and placing a truck parking area here could have a moderate social impact, as there are neighborhoods to the west of the site.

Converting this parcel into a suitable truck parking facility would require minor grading to remove debris, and herbicide application to prevent plant growth. The chain-link fencing must be reinstalled along the south and east sides of the property, and existing fencing may require minor maintenance. A gate or other means of limiting access to a single point on Livernois Avenue may also be desired. Some form of lighting and restrooms would be required, and given the parcel's previous history as a developed industrial site, it may be possible to provide sewer and water access for the site.

St. Louis

The analysis identified 217 potential parcels that met or exceeded the 2-acre minimum in St. Louis. A series of three parcels between 6800 and 7000 Hall Street owned by the Burlington Northern and Santa Fe Railroad (BNSF) have been vacant since before 2002, according to historical satellite data. The surface of the largest parcel, 6800 Hall Street is a mixture of gravel with weedy overgrowth. This particular parcel is valued at \$6,495 per



FIGURE 3: St. Louis study site. Photo: Google Streetview

acre. The parcels are 1 mile from access to I-70, and within just 5 miles of the city center. Figure 3 shows the condition of the parcels.

The site is located in the middle of the North Riverfront industrial area and is bounded by a BNSF intermodal terminal to the east, a BNSF railyard to the north, an electrical substation to the south, and an empty lot belonging to the BNSF to the west. The three parcels as a whole are secured by chain-link fence, and a gate is present. Soil and groundwater contamination is likely, as the parcels were previously home to a railroad roundhouse and maintenance shops. The area's public safety is rated as "safer," and the social impact of placing parking here would be minimal, as the parcels are within an industrial area.

Conversion to parking would be similar to the other sites, with some grading and herbicide application necessary to prepare the site. If only one parcel was used, additional fencing would need to be constructed on the northern and southern boundaries. Lighting and restroom facilities would also be required.

The above GIS and site analysis demonstrates that there are accessible, available urban parcels that meet the technical requirements for truck parking. Table 3 compares each of the three study sites, and their feasibility for parking.

TABLE 3: Comparison of Studied Parcels

	Columbus	Detroit	St. Louis
Size	21.0 acres	12.15 acres	5.25 acres
Cost per acre	\$8,065	\$26,532	\$6,495
Distance to interstate (straight line)	1.2 miles	0.1 miles	1.0 miles
Distance to city (straight line)	2.6 miles	4.0 miles	5.0 miles
Surface material	Gravel	Concrete, Pavement	Gravel, Vegetation
Electric service	Yes	Yes	Yes
Water / sewer service	No	Yes	Unknown
Fencing	Complete	Partial	Partial
Soil contamination	Not likely	Possible	Likely
Safety	Safer	Safer	Safer
Social impacts	Low	Medium	Low

DISCUSSION

Agencies interested in creating truck parking on vacant industrial or commercial parcels will likely need a means of ranking sites based on their adaptability as well as their social and environmental impacts. Adaptation of sites for truck parking will require more than acquisition of land or partnership development. There are additional capital and maintenance costs associated with even the most basic truck parking operation. These costs are likely to drive the majority of discussions on parking placement and are discussed below.

The cost of land for potential truck parking varied widely across our study cities, with a low cost of about \$6,500 per acre in St. Louis to \$26,500 per acre in Detroit. However, it is important to note that the cost of land acquisition could be mitigated or eliminated through partnerships with other government agencies or the private sector. For example, some of the vacant parcels found in Detroit were already owned by the Michigan Department of Transportation, and MPO or city partnership with the DOT could reduce or eliminate the upfront cost of land acquisition.

The three sites examined already had connections to electrical distribution lines, but connections to city sewer and water services could not be determined. To save on upfront capital costs associated with new sewer and water hookup, site visits could be conducted to verify the presence or absence of these services. Further, states could examine the installation of vault toilets in lieu of full-service bathroom facilities. Local ordinances regulating sewer hookups and limiting truck traffic would also need to be examined. An additional consideration is that many modern trucks are outfitted with bathroom facilities, microwaves, and iceboxes, making services unnecessary for some truckers.

Public safety is a major consideration for sites, since they will be located in more densely populated urban areas. Lighting, fencing, and security services like cameras or staff can reduce the probability of criminal activity, and make the lots more attractive to truckers, but these elements increase the potential costs of construction and operation. Security costs will vary by site based on the relative security of the surrounding area. Relatively safe areas may only require lighting, fences, and camera installations, which require upfront investment but relatively low operating costs. Less safe areas may further benefit from the addition of full-time security personnel or patrols, which have a low upfront cost, but continuing operating costs. Partnerships with local law enforcement to provide security check-ins or include lots on routine patrols could reduce the cost faced by the parking operator.

Aside from cost-sharing partnerships, utilizing economies of scale may be another means to ensure that urban truck parking lots are cost effective. It will be less expensive

to provide fencing, lighting, security, and restrooms to one large consolidated lot than to multiple smaller facilities. However, multiple smaller lots across the metropolitan region may serve industry more effectively. Agencies must balance financial limits with enhanced services. Table 4 and Table 5 compare some of the capital and maintenance costs associated with parking services.

TABLE 4: Truck Parking Capital Costs

Capital Cost	
Land purchase	\$0 - \$35,000 per acre
Vault toilet installation	\$47,000 (High)
Fence installation or repair	Medium
Lighting and camera installation	High

TABLE 5: Truck Parking Operation Costs

Operation Cost (per year)	
Toilet maintenance	\$14,400 (High)
Electricity	Low
Surface grading, dust and plant suppression	Medium
Security camera	Low
Security staff	High

The benefits of establishing new parking in urban areas include improved parking capacity for the region as well as more convenient and efficient urban truck parking. Urban parking also supports scheduled urban deliveries. Increased parking capacity should reduce the three undesirable truck parking behaviors associated with parking shortages: 1) parking on shoulders and ramps, 2) parking in insecure areas, and 3) driving past legal time limits. Reduction of these behaviors should, in turn, improve public and driver safety.

Increased parking capacity may have additional benefits including increased support for logistics operations by removing truck parking in neighborhoods or on shoulders. Easier parking can make freight movements easier, and can make the city and region more economically attractive to manufacturers and distributors.

CONCLUSION

This research demonstrates that there is potential value in rehabilitating vacant urban parcels for use as truck parking facilities and that a CPA process based on GIS screening provides an effective method to identify potential parking areas.

A minimum of 120, 2-acre parcels and 46, 5-acre parcels were identified for the cities of Columbus, Ohio, Detroit, Michigan, and St. Louis, Missouri. A case study of one site from each city found that the selected sites have potential value as truck parking facilities.

These findings are especially relevant for truck parking in urban areas due to the increased need for parking close to the city center and industry, the congestion delays impacting delivery schedules, and the increased concentration of trucks in industrial and commercial zones.

A GIS-based parcel approach combined with partnership efforts including MPOs, DOTs and city leaders can support safe truck parking and reduce the incidence of unsafe parking practices.

This approach can be modified to suit the community. For example, a more focused approach could be developed to avoid socially-sensitive areas or major highway bottlenecks. Alternatively, the screening process could focus on parcels close to urban police stations or well-traveled areas to increase the safety of the new facilities.

It should be noted that the problem of parking shortages extends beyond urban areas, and urban parking solutions like the one described above must be seen as a complement to, not a replacement for, the other policies of TPIMS, mobile applications, and opening of facilities along existing rights of way. Full solutions to the United States' truck parking shortage will require collaborative action between multiple levels of the government and the private sector, and application of all of the policies described above. This CPA action will not only help solve shortages but has the ability to lower costs of creating truck parking by splitting costs across multiple agencies.

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