

TRANSIT COOPERATIVE RESEARCH PROGRAM

TCRP SYNTHESIS 122

**Transit Supportive Parking
Policies and Programs**

A Synthesis of Transit Practice

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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, adapt appropriate new technologies from other industries, and introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the successful National Cooperative Highway Research Program (NCHRP), undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes various transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

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FOREWORD

Transit administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, "Synthesis of Information Related to Transit Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, *Synthesis of Transit Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

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Parking is a significant factor influencing transit access and ridership. Many communities and transit agencies have been revising their parking policies to encourage the use of transit and to minimize resources expended on parking

This synthesis documents transit agency parking policies and parking management at transit stations using three primary resources: a scan of current research on transit-supportive parking policies, an original survey distributed to a sample of transit agencies, and several brief agency profiles based on interviews and existing available data. Participating transit agencies represent a broad spectrum of service type, jurisdiction, ridership, mode, types of parking, and parking policy.

Lisa Jacobson, Nelson\Nygaard Consulting Associates, Inc., Boston, Massachusetts, and Rachel R. Weinberger, Nelson\Nygaard Consulting Associates, Inc., New York, New York, collected and synthesized the information and wrote the report, under the guidance of a panel of experts in the subject area. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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TRANSIT SUPPORTIVE PARKING POLICIES AND PROGRAMS

SUMMARY Parking is widely recognized as an important factor influencing transit access and ridership. As transit agencies work to attract customers, parking policies, in particular parking pricing, play a potentially critical role in transit agency decision making. An increasing number of transit agencies have begun to think carefully about how their parking policies encourage or discourage transit use and how to efficiently use resources engaged for parking.

This synthesis documents transit agency parking policies and parking management at transit stations using three primary resources: a scan of current research on transit-supportive parking policies, an original survey distributed to a sample of transit agencies, and several brief agency profiles based on interviews and existing available data. The survey was distributed to 46 transit agencies of which 37 (80%) responded. Participating transit agencies represent a broad spectrum of service type, jurisdiction, ridership, mode, types of parking, and parking policy.

A primary finding of this synthesis is that there is limited research that documents the impact of parking policies on transit ridership. Within the existing literature there are inconsistent findings regarding which parking policies support and promote the use of transit. The survey results also indicate that there are differing approaches to parking management to attract transit riders. Opposing approaches to achieve the same objective furthers the notion that parking management is highly contextual, as well as suggests that further research is warranted.

The literature, survey, and agency profiles revealed other findings. Overall, providing parking at stations is not as important to transit agencies as factors such as providing passenger amenities and operational efficiency; however, research shows that agencies spend substantial resources constructing, maintaining, and operating parking facilities. A majority of respondents indicated that they had excess parking supply, yet three-quarters of those respondents have plans to build yet more parking. The most commonly cited reasons for increasing parking supply include expansion of the transit system itself, response to the demand that exceeds supply at a specific station, and funding availability.

Besides parking expansion, transit agencies are thinking creatively about managing parking to increase transit ridership. A majority of agencies provide bicycle and other nontraditional types of parking, work with the private sector on joint development around stations, and coordinate with municipalities and others in the public sector on station area policies. Parking pricing is also used as a tool to manage parking, with some agencies offering free parking to encourage ridership and others using various forms of pricing, including uniform pricing at each station, varied pricing based on parking demand, and more complex tiered-rate structures.

Transit agencies also reported a strength and diversity of parking partnerships. As transit agencies are primarily in the business of providing transit service, agencies regularly coordinate and partner with the public and private sector to provide and manage parking facilities. Working in conjunction with other partners to provide transit customer parking allows for

flexibility and demand responsiveness in the parking system, as well as shares the success of the transit system among multiple parties.

As the demand for public transit increases, there is a need to evaluate the existing data to understand the impact of parking policies on transit ridership. There is also a need for further research to measure the impact of various parking policies in different station contexts and by transit service types, identify the most effective parking policies and programs to support transit ridership from transit agency and other parking owners and operators, and discern the most appropriate use of funding sources that could optimize access management and existing parking resources. Although this synthesis uncovers several patterns of transit agency parking policies, there is a need to more rigorously evaluate and quantify the impact of parking policies on transit ridership.

CHAPTER ONE

INTRODUCTION AND OVERVIEW**BACKGROUND**

Parking is a significant factor influencing transit access and ridership. An increasing number of communities and transit agencies have been revising their parking policies to encourage the use of transit and to minimize resources expended on parking. Some of these community and agency policies have included pricing, supply and demand management, shared parking, and preferential treatment for specific groups. Recent implementation of parking policies and programs by transit agencies affords the opportunity to assess how effective they have been and to inform local communities and transit agencies of successful practices.

This synthesis documents the current state of the practice in transit parking policies and programs. This information will help transit agencies determine how parking policies can most effectively serve their customers while optimizing transit access and ridership. This effort relies on information provided through a literature review on the state of the practice in transit agency parking policies, an original survey designed to gather comprehensive parking information from a diverse set of transit agencies, and several agency profiles to explore key topics in more detail.

PROJECT OBJECTIVES

The overall objectives of this synthesis are to document evolving parking practices among transit agencies and identify the complex factors involved in how parking and transit service intersect. The synthesis is intended to serve as:

- A knowledge base for transit agencies currently providing or considering providing parking facilities to riders, especially agencies that are evaluating the acquisition or leasing of land primarily for parking.
- A reference source for local governments exploring, developing, or implementing transit-oriented and transit-supportive land use policies, particularly with regard to parking regulation and management.

METHODOLOGY AND APPROACH

Three study efforts inform this synthesis. First, a review of relevant literature was conducted. This included a variety of sources with a focus on published literature from the past

decade. The literature review revealed the breadth of work to date on this topic; it also served to identify topic areas that are not documented. This is explored in chapter three.

The second data collection approach was an original survey distributed to transit agency staff. Rather than create a statistical sample, the agencies were selected with guidance from the project panel to ensure a broad representation of transit agencies in terms of geography, type of transit service, annual ridership, land use context, and other factors. Some survey respondents own, manage, and/or operate substantial parking facilities, other agencies have a more limited parking supply, and some respondents do not own, manage, or operate any parking facilities. The survey was distributed to transit agency staff only.

The survey was designed to cover specific concerns and challenges. It included 47 multiple choice and open-ended questions, incorporating topics such as agency structure and organization, transit services provided, parking inventory and utilization, parking management policies, and agency policies related to current and future parking goals. The survey questions are listed in Appendix A.

The survey was distributed by e-mail to transit agency staff. In addition to an online form, participants received the survey in a printable format to share with colleagues and assist in the collection of answers. Recipients had 2 weeks in February 2015 to complete the survey. Of the 46 survey recipients, 37 were fully completed, yielding a response rate of 80.4%. The survey respondents are shown in Figure 1 and listed in Appendix B. Survey data are supplemented by National Transit Database data from October 2014.

In addition, several brief agency profiles showcase transit agency parking policies based on the literature, documentation provided by the agency, responses to the survey, and telephone interviews. The agency profiles provide more detailed information illustrating major themes that emerged from the literature review and survey.

REPORT ORGANIZATION

The report is organized as follows. Chapter one introduces the study scope of work, methodology, and approach. Chapter two presents a summary of transit agency parking

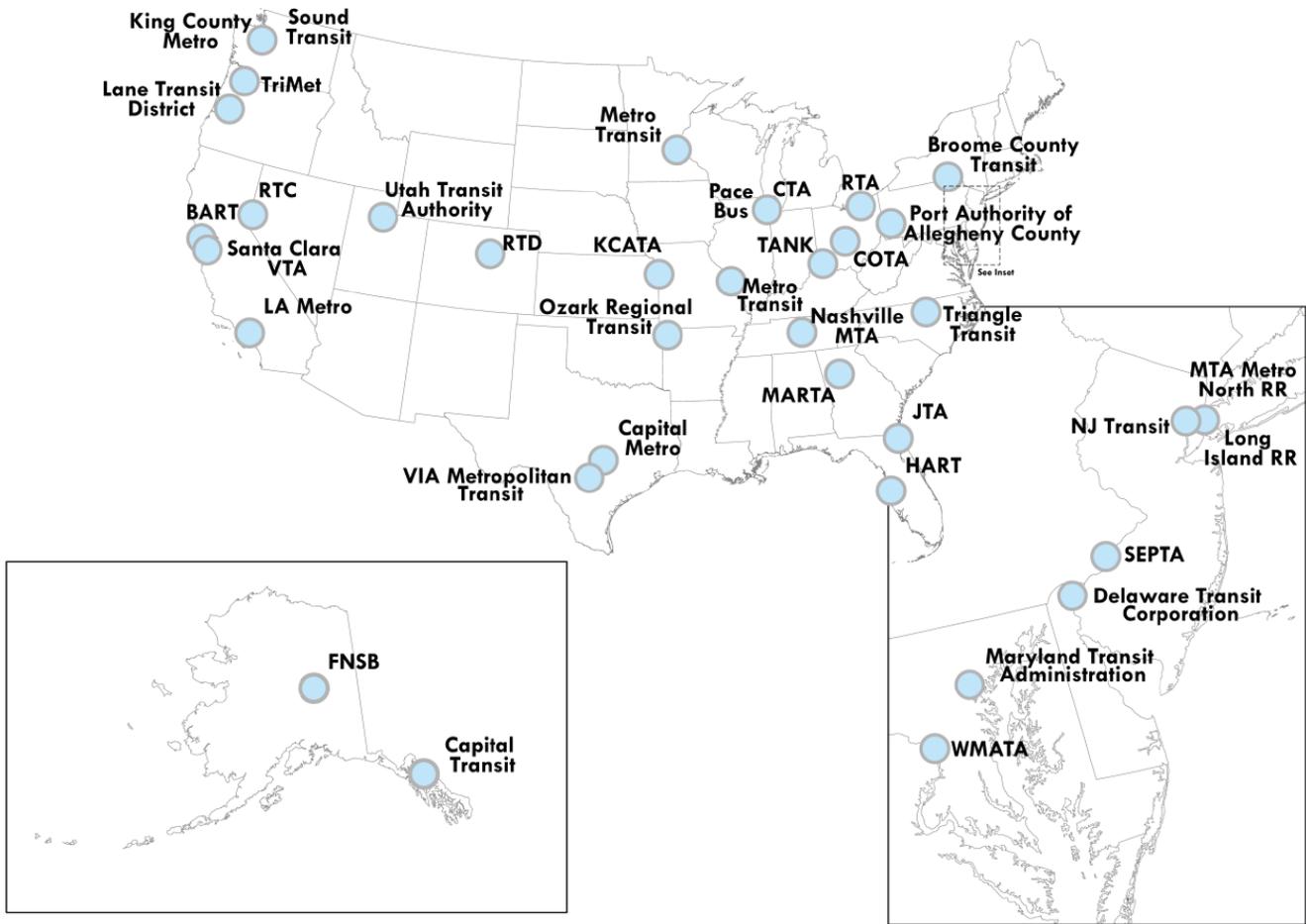


FIGURE 1 Map of survey respondents.

policies as gleaned from the literature review, survey, and agency profiles. Chapter three reviews relevant published literature and identifies gaps in the published subject matter. Chapter four summarizes the salient findings from the online survey responses and includes eight agency

profiles. Finally, chapter five recaps overall findings and opportunities for further research. Appendix A presents the survey instrument, Appendix B lists the survey respondents, and Appendix C displays a table of survey responses.

CHAPTER TWO

TRANSIT AGENCY PARKING POLICIES

Transit agencies have access to many tools to manage parking at stations; however, several factors complicate parking policies and decision making. Station context, land value and development opportunity, network service characteristics, community plans, state and local laws, and funding are just a few of the many issues to be confronted when developing and

implementing parking policies. In response to these challenges, transit agencies have adopted a variety of policies to manage parking at stations. Some agencies have formally adopted the policies outlined in Table 1; others have informally or periodically applied these approaches. The content included in Table 1 is a compilation of the literature review and the survey results.

TABLE 1
TRANSIT AGENCY PARKING POLICY SUMMARY

| Policy | Opportunities | Challenges | Example Agencies |
|---|--|--|--|
| <i>Pricing</i> | | | |
| Free Parking | Encourage ridership, Reduce costs to riders | Expensive for agency, Limits opportunities for demand management | Capital Metro, COTA, Sound Transit |
| Flat Pricing (weekday) | Simple for riders, perceived as fair | Unresponsive to market conditions | SEPTA |
| Demand-Based Pricing (weekday) | Maximize revenue, Manage demand, Maximize efficiency | More complex for riders | BART, WMATA, CTA |
| Event Pricing (weekday) | Generate revenue, efficient use of facilities | Management challenges | WMATA, DART, JTA |
| <i>Partnerships</i> | | | |
| Leasing Parking (private partner) | Space-efficient, cost-effective; riders may support local business | Land uses/parking demand by time of day may change; opportunity for joint development partnership; lack of control | Capital Metro, LA Metro, King County Metro Transit |
| Leasing Parking (municipal partner) | Municipal support of transit; may be able to use municipal umbrella insurance | Do not control long-term rights to parking; could preclude flexibility | BCT, TriMet, RTD |
| Leasing Parking (other public entity partner) | Space-efficient, cost-effective; builds partnerships | Do not control long-term rights to parking; long lease terms | Port Authority of Allegheny County, UTA |
| Transit-owned Parking Shared with Other Uses | Potential additional revenue; space-efficient; build partnerships with neighbors | Potential management and/or liability issues | KCMT, VTA, TriMet |
| Partner with Localities to Manage Parking in Station Area | Efficient use of space around stations; build partnerships | Staff time required to set up and maintain partnerships | TANK, VIA, TriMet |
| <i>Nontraditional Parking</i> | | | |
| Bicycle Parking | Provide access choice; cost-effective | Compete with other uses for space | VIA, Capital Metro, MTA, Metro Transit–Saint Louis (also 84% of responding agencies) |
| Carpool/Vanpool Parking Spaces | Encourage more transit passengers per parking space | Compete with other uses for space; potential to under-/over-supply in specialty sub-markets | RTC (Nevada), Metro Transit (Minneapolis), JTA |
| Green/Hybrid Vehicle Spaces/Electric Charging Stations | Encourage low-emissions trips | Compete with other uses for space; potential to under-/over-supply in specialty sub-markets | WMATA, Sound Transit, TriMet |
| Carshare or Bikeshare Stations | Use parking spaces for shared economy use, increase space availability | Demand management and expansion policy | BART, CTA, WMATA |

TABLE 1
(continued)

| Policy | Opportunities | Challenges | Example Agencies |
|--|--|---|---|
| <i>Transit-Oriented Development/Joint Development</i> | | | |
| 1-1 Parking Replacement | Maintains parking opportunities; potentially generates revenue | Expensive; may crowd out space for other uses, such as development and placemaking | NJ TRANSIT, WMATA, Regional Transportation District |
| Site-Specific or Flexible Parking Replacement | Balances maintenance of parking opportunities with other goals | Often requires parking removal; complex transactions require time and effort from the agency/local government | BART, MARTA, CTA |
| Station Typology Application | General policy application to station types/station area types | Station area types may change over time; may be difficult to categorize unique contexts | Metro Transit (Minneapolis), UTA |
| <i>Parking Expansion</i> | | | |
| Expand Parking for Existing Service | Increase drive access opportunities | High cost; use of valuable space near stations; placemaking impacts | VTA, SEPTA |
| Expand Parking for New Service | Increase drive access opportunities | High cost; use of valuable space near stations; placemaking impacts | RTD, TriMet, MTA |

COTA = Central Ohio Transit Authority; SEPTA = Southeastern Pennsylvania Transportation Authority; BART = Bay Area Rapid Transit; WMATA = Washington Metropolitan Area Transit Authority; CTA = Chicago Transit Authority; DART = Dallas Area Rapid Transit; JTA = Jacksonville Transportation Authority; Capital Metro = Capital Metropolitan Transportation Authority; LA Metro = Los Angeles County Metropolitan Transportation Authority; BCT = Broome County Transit; TriMet = Tri-County Metropolitan District of Oregon; RTD = Regional Transportation District; UTA = Utah Transit Authority; KCMT = King County Metro Transit; VTA = Santa Clara Valley Transportation Authority; TANK = Transit Authority of Northern Kentucky; VIA = VIA Metropolitan Transit; MTA = Maryland Transit Administration; RTC = Regional Transportation Commission of Southern Nevada; Sound Transit = Central Puget Sound Regional Transit Authority; NJ Transit = New Jersey Transit; MARTA = Metropolitan Atlanta Rapid Transit Authority.

CHAPTER THREE

LITERATURE REVIEW

There is an array of research on parking at or near transit stations. However, it is not clear from the literature which policies support and promote the use of transit. A finding consistent with the Synthesis survey reveals that two agencies may have the opposite policy to achieve the same end; for example, some will price parking in order to boost ridership and others may provide free parking to achieve the same end. The most significant debate is over the question of whether to develop the areas surrounding the station, with one author arguing that development densities would have to be unacceptably high in most jurisdictions in order to surpass the transit ridership associated with park-and-ride (Duncan 2010) and others providing the counter argument that the best way to increase ridership is by developing such station areas (Willson and Menotti 2007).

This review examines reports and documents on the topic that were published between 1991 and 2014. Sources were found using online databases such as TRB’s Transportation Research Information Documentation (TRID), APTA, Springer Link, Science Direct, the Research Division of the Federal Bank of St. Louis, and Google Scholar. Following the major literature trends, the review of published works is organized around these themes:

1. Park-and-ride facilities
2. Transit-oriented development (TOD)
3. Nontraditional parking and station access.

PARK-AND-RIDE FACILITIES

The choice to provide parking at transit stations has “consequences for the viability of a rail project in terms of cost, ridership, political support land use impacts, and broad sustainability goals” (Duncan and Christensen 2013). Despite this importance, there is a paucity of literature on park-and-ride lots in the United States and little in the way of studies that have quantified the relationship between the provision of parking lots and transit ridership. A study of Bay Area Rapid Transit (BART) park-and-ride facilities indicated that more than one housing unit or job must be placed adjacent to the station for every parking space that is removed—at densities that most municipalities find either politically or practically unable to accommodate. “[T]hese results suggest that the provision of station parking usually represents the most practical way to maximize ridership” (Duncan 2010). This assumption appears

to use the same catchment area for providing parking and the built environment, regardless of station access. The finding also conflicts with the work of Cervero (2006), who showed that the greatest ridership payoff comes from intensifying station-area housing. It also is at odds with Willson and Menotti (2007), who show that the success, in terms of transit ridership of trading parking for development is highly variable, depending on proximate factors such as the local real estate market. However, another study of BART park-and-ride programs found that to generate the same ridership as a surface parking lot, housing development must be four to five stories, assuming the lot and housing are built on a 10,000-square-foot site, or 110–150 units per acre (Wilbur Smith Associates 2011). This analysis assumes that 25% to 35% of residential trips would involve transit, and that one parking space per unit is provided. Although not specific to station areas, supporting research shows that less parking provision on the residential side could result in even more transit ridership (Weinberger 2012).

Although Duncan’s analysis outlines the system ridership advantages of park-and-ride, he notes several disadvantages including that parking lots can be dangerous and unpleasant and deter nonauto transport modes, station area land optimal for TOD is instead used for parking, and emissions are higher for shorter trips—typical of those taken to access a park-and-ride facility (Duncan 2010).

Park-and-Ride Location

Multiple studies discussed the ideal locations for park-and-ride lots within a regional context and suggested that they belong on the outskirts of the region as a way to intercept drivers. An autocentric approach in which the authors recommend placing park-and-ride lots “ahead” of the congested portion of a road or highway to give drivers the choice between using a congested road or parking and taking transit is provided in *TCRP 153: Guidelines for Providing Access to Public Transportation Stations* (Coffel et al. 2012). The downside is possible upstream congestion on the transit system that prevents people from accessing the system closer to the central business districts (CBDs) that are typically most effectively served by transit. In a 2013 study of parking at GO Transit (a regional public transit service for greater Toronto and Hamilton) commuter rail stations in Ontario, a similar approach on a local scale was recommended, placing park-and-rides at stations on the edges of towns or activity centers. They suggest

focusing on nonauto access at stations within towns, such as walking, biking, and feeder bus service. In all situations, they suggest providing a “strong evidence base” to often-skeptical stakeholders on the benefits of providing less parking and offering alternatives to driving (Engel-Yan et al. 2014).

Policies for designing park-and-ride lots emphasize that a high-quality waiting environment where commuters feel safe and comfortable helps to promote the transit service. Shirgaokar and Deakin (2005) found that commuters in the San Francisco Bay Area preferred park-and-rides within a short walk of the transit station with amenities for waiting passengers, including restrooms, snack machines, and water fountains. Safety was also an issue, with commuters raising concerns about the frequency of theft and vandalism at park-and-ride lots and the desire for greater lighting and visibility (Shirgaokar and Deakin 2005).

When, Where, and How Much?

An overarching concern is determining whether to provide parking; weighing the tradeoffs between building park-and-ride facilities, allowing and promoting development, or providing access by other modes. The goal of parking policies in the station area is typically to maximize ridership and station access. Dunphy et al. (2003) noted that “As Goldilocks might say, parking around transit must be ‘Not too much, not too little, but just right.’” The authors suggest four key principles for good parking policy:

1. Move it away from the platform to conserve the most valuable real estate,
2. Share the parking (a station in San Diego is cited for sharing its parking with a multiplex theater),
3. Deck parking and charge patrons to provide financing for the facilities, and
4. Wrap it to improve attractiveness and provide space for mixed uses.

Too little parking can also be blamed as a deterrent to transit ridership. In Los Angeles, the MTA estimates that the Red Line loses as many as 1,500 riders a day because of the North Hollywood station parking lot filling up by 7:30 a.m. (Nelson 2014). It is unclear whether this is a problem of too little parking (a very subjective idea) or perhaps an opportunity for better access management. The San Francisco Bay Area examples indicate that increased parking user fees, for the same supply, are correlated with system growth. This relationship could imply that an access management strategy that favors more walking access for riders who are closer to the station leaves parking spaces available for those who must travel farther to reach the station.

Pricing

Pricing parking spaces provides a means of influencing the use of parking facilities, influencing access mode choice,

and recovering some of the construction and operating costs of the parking. All of the studies on park-and-ride policy acknowledged the possibility of charging for parking at such facilities, but did not agree on whether to charge or how much to charge. Shirgaokar and Deakin’s survey of park-and-ride users revealed that many customers were willing to pay \$1 or \$2 to park in a safe, secured lot, citing concerns about theft, vandalism, and visibility, or up to \$4 for reserved parking (Shirgaokar and Deakin 2005). Shaheen et al. (2005) noted that the guaranteed availability of parking at a transit station, even if it costs extra, gives drivers an incentive to use transit. The complementary analysis is that it also encourages driving to transit when other access options may be available. *Transit Parking 101* (APTA 2014) gives special consideration to local demographics and environmental justice, noting that there is “ongoing concern” that the implementation of parking charges can have disparate impacts on transit customers who can least afford them. In the San Francisco Bay Area, changes in parking fees require that BART conduct an environmental justice analysis to determine if there would be adverse impacts on low-income and minority populations.

The literature notes that charging for parking may also reduce both demand for parking and ridership (although in the case of BART, pricing has not). In cases where parking is more than 90% utilized, increases in parking pricing has shown no effect on occupancy rates although it is possible that price increases will stimulate a shift in users; when parking is less than 90% utilized, there is a 0.33 elasticity (Coffel et al. 2012), meaning that demand is reduced. This suggests that where parking is oversubscribed; that is, there is greater than 90% occupancy, there is a considerable amount of consumer surplus. As a general guide, to make park-and-ride an attractive option parking fees in combination with a round trip transit fare should be less than all-day parking costs in the CBD (Coffel et al. 2012).

A case example of the Regional Transportation District in Denver demonstrates that parking pricing provides revenue, but also reduces the number of long-term parkers and shifts demand to facilities with unused capacity. The issue of parking pricing beyond the confines of the immediate station area—such as on-street parking—is considered important to “internalize” the artificially low cost of driving and encourages mode shift to public transit. However, one survey showed that most transit officials oppose or are neutral regarding parking pricing, because of a fear of losing riders (Yoh et al. 2013).

Smart parking technology allows commuters to reserve spaces and pay for parking; technology facilitates the introduction of parking pricing policies that may significantly reduce car travel and increase transit ridership. Shaheen et al. (2005) speculates that paying for parking at BART stations may be more palatable “if they feel they are getting an

advance benefit” and may “pay a premium for the luxury of knowing that they won’t have to circle for parking once they reach their destination.”

Parking Impact on Transit Ridership

Overall, the literature that documents the empirical relationship between parking capacity and demand for transit services is limited, although understanding the relative influence of the factors that affect transit ridership “is central to public policy debates over transportation system investments and the pricing and deployment of transit services” (Taylor and Fink 2003). In their review of the literature on the factors influencing ridership, the authors noted that the “relative importance of these various factors . . . is not well understood.”

Merriman (1998) studied the impact of increasing parking capacity at commuter rail stations in the Chicago area where parking was limited. Depending on the time period, definition of constraint, and other variables, between 0.6 and 2.2 additional boardings are associated with each additional parking space. Although there is some empirical evidence that increasing parking capacity slightly reduces boardings at adjacent stations, the net overall impact is positive.

Kuby et al. (2004) addressed ongoing questions regarding how many riders light rail transit can attract, given its resurgence in popularity and that many of today’s cities are low-density and autocentric. The presence of park-and-ride lots was studied as one of a number of factors influencing boardings. Regression analysis determined that land use and accessibility were the most significant factors in determining ridership; parking was less significant, along with other factors such as the percentage of renters within walking distance, employment, and population.

Cervero (2006) noted that TOD has been shown to produce an appreciable “ridership bonus” in California. Reasons for this include life-style preferences for transit-oriented living and employer-based policies that reduce free parking and auto subsidies. As noted previously, a study of nearly 1,000 residents living in 26 housing projects within ½ mile of California urban rail stations showed that the greatest ridership payoff comes from intensifying station-area housing, not parking or station-area design. Although parking provisions “might influence the attractiveness of station-area housing among tenants . . . [parking] appear[s] to exert minimal influence on whether station-area residents opt for transit or not” (Cervero 2006).

Willson and Menotti (2007) provide some insights into the quantitative relationship between parking and ridership in a paper that addresses the tradeoff between providing commuter parking and encouraging TOD. The model explores the effect of converting one acre of surface parking to a TOD, with no replacement parking at locations in the BART system. A surface parking lot of one acre provides approximately 124 spaces,

generating 136 daily boardings, according to the model, and the authors run several scenarios with various development densities, parking supply, and pricing alternatives. The paper concludes that “replacement parking and TOD depend on local real estate and transportation conditions” and “leaving transit agencies’ land resources in surface parking involves substantial opportunity costs” (Willson and Menotti 2007).

TRANSIT-ORIENTED DEVELOPMENT POLICIES

There is a significant amount of literature concerning questions of parking at TOD sites. Cervero (2006) asserts that TOD can create a balanced demand for trips throughout the day when it offers a mix of uses, such as housing, offices, and retail. This reduces the pressure on both the transit network and on parking. It also creates opportunities for shared parking on evenings and weekends. Thus, policies that make it easier to provide shared parking make TOD easier to build by reducing the capital and operating costs of overbuilding parking (Cervero 2006).

The literature recommends that the redevelopment of park-and-ride facilities for new construction not include one-for-one parking replacement; a finding borne out in the case example of the Lindbergh Station TOD in Atlanta. Additional parking adds both hidden costs (such as land) and direct costs (maintenance and operations) to housing and other uses in the station area, while also undermining the trip-reducing benefits of TOD (Willson 2005; Cervero et al. 2009). However, previous assumptions that development would generate fewer transit fares (and thus lower farebox recovery) than a park-and-ride lot has not discouraged efforts to provide one-for-one space replacement (Willson and Menotti 2007). In “Commuter Parking Versus Transit-Oriented Development,” the authors did a fiscal study of TOD and park-and-ride lots in different settings. They discovered that transit agencies are likely to find a net fiscal benefit in projects with medium- to high-density development and partial or no parking replacement, provided that they were built in urban or urbanizing locations. In suburban locations, it was found that TOD often had no or negative impact on transit ridership compared with park-and-ride lots (Willson and Menotti 2007).

In “Vehicle Trip Reduction Impacts of Transit-Oriented Housing” and related works, Cervero and Arrington (2008) reviewed several residential projects in TODs in California, Maryland, New Jersey, Oregon, and Pennsylvania, and found that the number of vehicle trips generated by each unit was dramatically lower than what was anticipated by the Institute of Transportation Engineers; in some cases 60% lower. They noted an inverse relationship between residential density and auto trip generation. Both Cervero and Arrington (2008) and Jacobson and Forsyth (2008) noted several variables in parking use, including proximity to the transit station, urban design of the station area, and the ability to make other trips in the surrounding area without a car such as to shopping, schools, or other amenities.

The land use around transit stations can also have an impact on parking demand and use. In “Office Development, Rail Transit, Community Choices,” Cervero (2006) studied ten office buildings in seven locations in California (Los Angeles, Orange County, Sacramento, San Diego, Alameda County, Contra Costa County, and Santa Clara County) to examine their parking use. The study found that workers are much more likely to commute by rail if their workplace is closer to a rail station than if their home is near a rail station. Office buildings with high transit use were in dense, mixed-use neighborhoods where parking was priced at market rates, whereas office buildings with free and plentiful parking (greater than one space per worker) had lower transit ridership. This suggests that one parking policy that could support transit use is to reduce parking requirements (or make them more flexible) for offices near transit, which might provide incentives for office development and increase ridership.

Design Standards and Policies

Parking has a direct relationship to the quality of urban design of transit station areas, because parking lots and garages at street level can have a deleterious effect on the walking environment, making it less safe or comfortable for walking. One study reviewed the impacts of parking on urban design in TOD. Looking at seven TODs in Missouri, Oregon, and Virginia researchers concluded that parking can undermine the benefits of TOD, and thus transit ridership, by reducing the density of station areas and increasing the distance from the station to housing, offices, shops, or other uses. However, it also noted that on-street parking can calm traffic on busy streets, making walking more pleasant, which might reinforce transit use (Jacobson and Forsyth 2008). This is supported by Shirgaokar and Deakin’s 2005 study of commuters in the San Francisco Bay Area, which showed a preference for park-and-ride lots within a short walk of the transit station and with amenities including restrooms, snack machines, and water fountains. Commuters also expressed a desire for increased lighting and visibility.

Zoning Policy

Several studies examined the use and availability of parking in residential and office projects in TODs. Multiple studies (Willson 2005; Cervero 2006; Willson and Menotti 2007; Cervero and Arrington 2008; Cervero et al. 2009) found that many TOD residential projects had overbuilt parking, possibly because of local zoning codes that mandated more parking, banks hesitant to lend to projects that had less parking, and developers concerned about market viability.

In addition, Manville et al. (2013) found that minimum parking requirements reduce housing and population densities while increasing vehicle density. This makes TOD less effective, as there are fewer residents living within the transit station area and those that do have easy access to cars, which encourages them to drive. That in turn encourages more auto-

oriented uses that make driving more convenient and walking or bicycling less so, further reducing transit use.

Multiple studies alluded to the importance of shared parking in reducing parking supply at TODs, particularly those with multiple uses that may be required to provide their own parking. In “Parking Policy for Transit-Oriented Development: Lessons for Cities, Transit Agencies, and Developers,” Willson (2005) emphasized the need for both developers and transit agencies to collaborate with municipal governments and lenders to find creative ways of reducing the parking in residential projects, noting that the parking is often overbuilt. He also recommends unbundling parking costs from housing costs, which allows residents to choose whether or not to purchase parking and provides an incentive to ride transit instead.

NONTRADITIONAL PARKING AND STATION ACCESS

Carsharing

Research shows that providing carsharing vehicles at or near transit stations can reduce the demand for parking in transit areas while supporting a car-free or car-light lifestyle. At transit stations, carsharing programs can be managed either by transit agencies or by the municipality, with spaces provided within a park-and-ride facility or on nearby streets. One study, “Carsharing Parking Policy” (Shaheen et al. 2010), provides a rundown of carsharing policies in North America and around the world. In most countries that have carsharing, vehicles can be kept in on-street or off-street spaces, and parking for carsharing vehicles is either provided for free or at a reduced rate. In the United States, the United Kingdom, and Australia carsharing vehicles also have access to dedicated parking zones.

Shaheen et al. (2010) also studied carsharing policies in 17 local governments, one state government, and eight public transit agencies in North America. Not surprisingly, the local governments had dedicated carsharing space on-street, whereas the public transit agencies set aside carsharing parking within park-and-rides. A handful of jurisdictions (Arlington, Virginia; Portland, Oregon; Washington, D.C.) and transit agencies [BART, Chicago Transit Authority (CTA), Washington Metropolitan Area Transit Authority (WMATA)] had a cap on the number of available carsharing spaces, which might have the unintended consequence of discouraging carsharing and thus transit use (agency profiles indicate that caps are often lifted if demand warrants additional carsharing supply). However, nearly all of the municipalities and some of the transit agencies [Metropolitan Atlanta Rapid Transit Authority (MARTA), New Jersey Transit, Translink, and WMATA] allowed carsharing vehicles to park for free, thus creating an incentive over private car use.

An intercept survey of carshare users in the San Francisco Bay Area found disagreement on whether carshare parking should be located in curbside spaces, an issue for transit

stations that lack park-and-ride facilities. More neighbors supported reserving some on-street parking spaces for car-sharing vehicles than for people visiting the area for work or errands (Shaheen et al. 2010).

Catchment Areas and Station Access

There is general agreement in the literature that providing park-and-ride facilities extends the radius of a station's catchment area by several miles, which can have an exponential effect on the potential ridership served. According to the 2000 U.S. Census, there were roughly 100,000 Bay Area households within a ten-minute walk (one-half mile) of a BART station, whereas there were nearly 1 million households within a ten-minute drive (3.5 miles) (Duncan 2010). The idea of a larger market should be considered with the question of market penetration; thus, an "expected value" for the catchment and penetration potential could be considered as a way to consider the issue more robustly. This has significant policy implications on a number of levels; a larger catchment area means that a greater number of taxpayers who subsidize a transit agency also have access to it, which is politically beneficial even if actual transit usage is low. Duncan (2010) states this succinctly: "A large service area population with a low individual rate of transit usage may produce more riders than a small service area population with a high individual rate of usage."

Studies found that bike parking is possibly the most cost-effective way to support transit ridership, as bicycling can extend the catchment area of a transit station, similar to park-and-ride lots and fixed-route feeder bus service, but in a way that requires less land than park-and-rides and is cheaper to implement than feeder buses. Other benefits cited include providing greater mobility to customers at the beginning and end of a transit trip; a benefit not available to drivers using park-and-ride lots. In a study of bicycling to BART stations, Cervero et al. (2013) found several characteristics of transit stations that had high rates of bicycling access. One was making bike parking available and free while charging for car parking, which creates an incentive to bike to public transit. Another was the availability of secure bike parking, such as bike stations, sturdy bike racks, and electronic lockers, which discourage theft and vandalism and reduces capacity issues with bikes on trains.

As part of an overall strategy to integrate bicycles and transit, bike parking is seen as good for marketing and community relations. Some transit agencies also worked with local municipalities to include bike parking in transit facility construction. Few agencies surveyed collect data about bicycle parking (Schneider 2005).

AREAS FOR FURTHER INVESTIGATION

It can be concluded, as does Steiner et al. (2010), that "overall, there is a shortage of literature that is able to quantify the effects of parking policies on transit performance." Hence, the following several related areas of useful inquiry are proposed that are largely absent from the literature:

1. Policies relating to land-banking parking areas (or set asides) and how this relates to strategies to avoid overbuilding parking supply and reducing environmental impacts.
2. When to provide parking and when not to. This appears to be an especially pertinent topic given the relatively high cost of land within transit agency service areas, the high costs of providing parking, and the increasing demands for transit agencies to control costs and help meet air quality targets.
3. Related to this and also absent from the literature is a comprehensive and detailed analysis of policies toward supply and demand and the quantitative relationship between providing parking and levels of transit ridership.
4. Shared and leased parking arrangements.
5. Station typologies and their catchment areas with regard to the role of parking and parking replacement. There is a lack of compiled data on individual station areas, their placement on the transit route or line, catchment areas and land use context, and how these variables can be used to manage parking supply and regulations. The investigators did not find any research that connected station typologies, parking policy, and transit ridership.
6. Exploration of the relationship of transit fares, cost of parking, and transit ridership.
7. Parking distribution in the transit system and how this impacts transit capacity.
8. Relationship of parking price change to parking supply and demand at a station level.
9. Evaluation of parking performance in relation to transit performance.

Some of these topics and others may be discussed and further investigated in TCRP Project H-52: Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation (expected to be completed in August 2016).

SUMMARY

The literature review summarizes the findings and conclusions of transit agency parking policies and programs. The existing literature has been categorized into three primary themes: park-and-ride facilities, TOD, and nontraditional parking and station access. The existing research is inconsistent in terms identifying parking policies that support and promote the use of transit. The literature shows, for example, that agencies may have the opposite policy to achieve the same end; some will price parking to boost ridership and others may provide free parking to boost ridership. The literature also presents differing findings on transit ridership impact when comparing development around a station with providing parking. One author argues that development densities would have to be unacceptably high in most jurisdictions to surpass the transit ridership associated with park-and-ride, whereas others provide the counter argument that the most effective way to increase ridership is by developing station areas.

CHAPTER FOUR

SURVEY RESULTS

This chapter presents findings from the survey conducted for this synthesis. The following sections identify parking policies and programs of responding transit agencies, including inventory and utilization, pricing, and management. Also included in this chapter are more in-depth agency profiles that explore issues raised in the survey.

TRANSIT AGENCY CONTEXT

This synthesis surveyed 37 transit agencies across the country representing a diversity of service types, jurisdictions, ridership levels, modes, and types of parking and parking policy. This section provides a summary of the types of agencies that responded to the survey and the context for conclusions drawn in forthcoming sections.

Service Area

The service areas represented by the agencies surveyed include a diversity of settings and land use types, spanning different states and regions of the country. They serve populations from ranging from 100,000 in Fairbanks, Alaska, to 8 million people across the state of New Jersey. Population densities vary as well, from 13 persons per square mile in the Fairbanks (Alaska) North Star Borough Transit service area to more than 12,000 persons per square mile in the Metro–North Commuter Railroad’s service area.

Nearly half of the agencies (46%, or 17 of 37 respondents) describe their service area to include suburban, small urban, and urban contexts. Most of the other agencies serve urban areas only. Nine agencies, including Capital Metro (Austin, Texas), Long Island Rail Road, and Ozark Regional Transit (Northwest Arkansas) reported that their service areas include rural or semi-rural areas. Several also serve specific populations, such as a university campus or central business district including the Delaware Transit Corporation, Maryland Transit Administration, and Triangle Transit (Wake, Durham, and Orange counties, North Carolina). The built environment context is a key factor in understanding transit agency parking policies and is explored in greater depth in subsequent survey sections.

Jurisdiction

Respondents were asked to provide a description of the different jurisdictions within their respective service areas. This is

important to understand, as transit parking policies are often context-specific and may be affected by local jurisdictional parking policy. This can sometimes result in a patchwork of parking policies within a single transit agency’s service area. Most transit agencies surveyed serve multiple counties (or parts of counties); only about one-third serve one city, one municipal jurisdiction, one county, or equivalent (Figure 2). Five agencies serve more than one state.

Agency Organization

Respondents were asked to identify agency organization, political structure, and authority. This helps to understand the extent to which respective agencies are able to set their own parking policies. Most respondents have autonomous authority and are not part of an elected government, but have similar powers such as taxing, bonding, or eminent domain. A smaller number of agencies are a department of state, regional, or local government, including metropolitan planning organizations. Others are more complex; for example, CTA is an independent governmental agency created by state legislation with an appointed board, and the Utah Transit Authority is a local district political subdivision of the state of Utah.

Transit Service Types

Many agencies provide an array of public transit services. More than 80% of the agencies surveyed provide local fixed-route bus service, whereas 22% offer urban heavy rail service. Almost half of the respondents provide either light rail or streetcar service (Figure 3). Three agencies provide commuter or heavy rail service only (no bus service). Most respondents indicated that they themselves provide demand-responsive services (possibly in addition to required complementary paratransit service).

Immediate Station Areas

Almost all agencies have a variety of types of station areas, ranging from suburban park-and-rides to downtown employment centers with no dedicated rider parking. Five of the respondents reported that they have the full range of identified station area classifications (Table 2). Fifteen agencies have some dedicated rider parking in the system, although seven agencies report that they have no park-and-ride station areas.

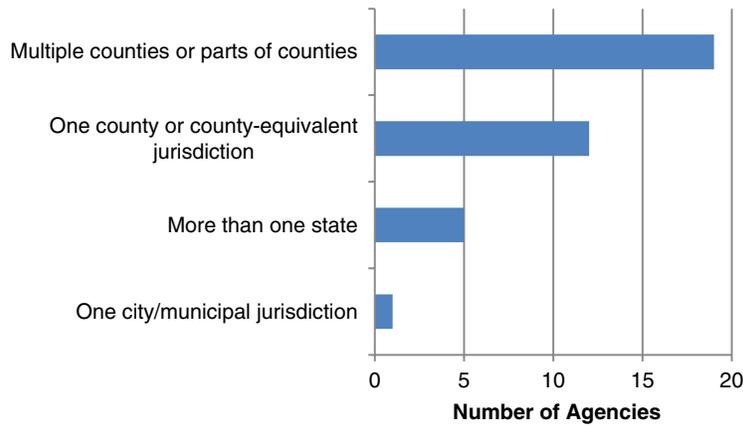


FIGURE 2 Survey respondent service area jurisdictions.

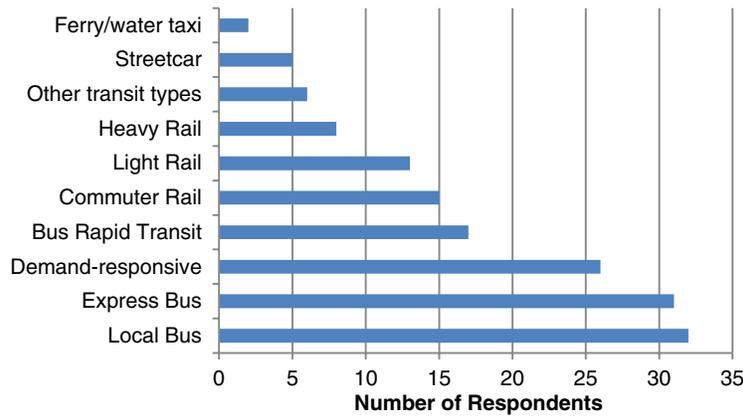


FIGURE 3 Number of respondents by transit service type.

TABLE 2
DESCRIPTIONS OF IMMEDIATE AREAS AROUND STATIONS BY AGENCY SERVICE AREA

| Types of Immediate Station Areas | Percentage of Respondents Within Agency Service Area Types (many respondents report more than one type) | | | | |
|---|---|------------|----------------------|-------|-----------------------|
| | Rural | Semi-rural | Suburban/small urban | Urban | Special targeted area |
| Park-and-ride/parking facilities available for transit rider use | 6% | 13% | 29% | 41% | 12% |
| Downtown or other employment center with some dedicated rider parking (either privately or publicly owned/operated) | 8% | 15% | 30% | 33% | 15% |
| TOD or other mixed-use districts with some dedicated rider parking | 3% | 10% | 23% | 50% | 13% |
| Downtown or other employment center with no dedicated rider parking | 4% | 11% | 29% | 45% | 13% |
| TOD or other mixed-use districts with no dedicated rider parking | 6% | 15% | 26% | 47% | 6% |

Of the 37 responding agencies, 32 reported that they own or manage park-and-ride facilities. Of the 31 agencies that describe their service area as urban, most (28) reported having some available park-and-ride facilities. Of these same 31 urban-serving agencies, 25 responded that they operate in a downtown or employment center with no dedicated rider parking. Less common among such agencies is some dedicated rider parking in a downtown or employment center area (13 of 31 respondents).

Five agencies describe their service area as semi-rural and four agencies their service area as rural/semi-rural. All nine of these agencies manage or own park-and-rides for their customers.

Park-and-Ride Mode Share

When asked what percentage of transit riders use park-and-rides to access transit, the responses vary by agency, mode, and number of parking spaces. The agency average of transit passengers who drive and park to use the system is a weighted average of 22%, which effectively means that for every five riders, there is about one parking space. The caveat to this generalization is that this auto mode split varies considerably among agencies, ranging from a reported 1% drive mode share for local bus and trolley for Southeastern Pennsylvania Transportation Authority (SEPTA) to a 75% drive mode share for the Kansas City Area Transportation Authority (KCATA) express and commuter bus service. Overall, the survey data show that agencies that serve suburban areas and those that provide more parking reported the higher percentages of commuters who use park-and-ride.

Types of transit service that traditionally provide greater coverage, such as commuter rail and express bus, have a higher percentage of riders who drive and park as compared with other modes (Table 3). Heavy and light rail modes also have higher percentages of those who park-and-ride.

PARKING INVENTORY AND UTILIZATION

Agency Parking Supply

Thirty-three of 37 respondents (89%) own or manage parking facilities. Table 4 shows a grouping of agencies by the number of parking spaces owned or managed; the remaining four agencies do not own or manage any parking spaces.

TABLE 4
PARKING SPACE QUINTILES

| | 0–999 Spaces | 1,000–2,999 Spaces | 3,000–9,999 Spaces | 10,000–24,999 Spaces | 25,000–62,000 Spaces |
|--------------------|--------------|--------------------|--------------------|----------------------|----------------------|
| Number of Agencies | 7 | 8 | 8 | 7 | 7 |

n = 37.

TABLE 3
PERCENTAGE OF RIDERS WHO PARK-AND-RIDE BY MODE (average)

| Modes | Number of Respondents | Percentage of Riders Who Park-and-Ride (unweighted mean) |
|---------------------|-----------------------|--|
| Commuter Rail | 15 | 41.6 |
| Express Bus | 31 | 30.4 |
| Heavy Rail | 8 | 23.3 |
| Light Rail | 13 | 20.6 |
| Local Bus | 32 | 11.1 |
| Other Transit Types | 6 | 9.3 |
| Bus Rapid Transit | 17 | 8.5 |
| Streetcar | 5 | 4.7 |

The surveyed agencies have a considerable range of parking inventory, as many as 62,000 parking spaces, although most own and manage fewer than 10,000.

Agencies were also asked to supply the number of agency-owned or managed parking spaces by transit mode. Although some spaces are used for more than one mode, the results generally show that the majority of the parking spaces are provided for heavy rail, followed by commuter rail, light rail, and express bus. Local bus and bus rapid transit have significantly fewer parking spaces than the other modes. Not enough data were provided for several other modes (streetcar, ferry and water, etc.).

The reported number of trips per parking space revealed by the survey data and NTD unlinked passenger trip data is compiled in Table 5. The modes show a wide range of trips per parking space from a variety of different factors including individual station context, development densities, and connecting transit service. The data show that at local bus stations there are many more trips per parking space than for other modes.

Nonagency Parking Supply

Transit agencies are not the only providers of parking at and around stations. Nonagency parking supply refers to parking spaces that are not under the ownership or management of

TABLE 5
TRIPS PER AGENCY-PROVIDED PARKING SPACE

| Mode | Total Agency Parking Spaces (supply) | NTD Reported Trips (2014) | Average Number of Trips per Parking Space | Number of Agencies Reported |
|-------------------|--------------------------------------|---------------------------|---|-----------------------------|
| Local Bus | 8,454 | 687,726,197 | 81,349 | 15 |
| Bus Rapid Transit | 410 | 4,854,519 | 11,840 | 1 |
| Heavy Rail | 149,763 | 821,786,309 | 5,487 | 7 |
| Commuter Rail | 112,890 | 316,452,800 | 2,803 | 8 |
| Light Rail | 99,622 | 231,034,729 | 2,319 | 12 |
| Express Bus | 15,567 | 20,804,766 | 1,336 | 2 |

the transit agency, but provide parking for transit riders. This includes parking facilities primarily owned by municipalities, private landowners, and/or other transit agencies. These facilities are often a substantial complement to the agency parking supply. Of those agencies surveyed, 88% (33 of 37 agencies) have riders who regularly park in facilities not owned by the transit agency. All four of the agencies that do not own parking have riders that use parking facilities not owned by the agency. Although a minority of transit agencies reported that their riders do not use any nonagency parking, including BART, Central Ohio Transit Authority, Hillsborough (Florida) Area Regional Transit, and Metro Transit (Minneapolis), transit rider spillover parking demand may be difficult to determine.

Most agencies have riders who park in nonagency facilities and allow nontransit riders to park in transit agency parking facilities (Figure 4). In terms of the types of nonagency parking supply, most agencies (29 of 33 respondents, or 88%) reported that riders use municipal-owned parking facilities. Nineteen of 33 respondents or 58% have riders who access

single-use lots or structures owned by private entities. Demand for parking at most transit stations is significant enough for the private sector to support or subsidize the parking. Survey data also show that these private facilities are associated with an active land use (as opposed to a facility solely dedicated to general parking). Such private parking areas include facilities leased by the transit agency as well as facilities that are privately owned and independent from the agency, including private facilities dedicated to transit riders only, other facilities available for general parking purposes, and some lots and structures associated with another purpose, such as a church or residences. In addition, 12 of 33 respondents (36%) reported that riders use lots or structures owned by another transit agency.

Alternatives to Standard Vehicular Parking

All surveyed transit agencies that own or manage parking provide parking types other than standard vehicular spaces. Because space in proximity to transit stations is limited, this percentage or trend shows that parking policy is evolving to embrace nontraditional parking types including modes serving other than drive-alone commuters. The most common alternative parking type is bicycle parking; 31 of 33 respondents (94%) provide some type of bicycle parking. The prevalence of bicycle parking may also reflect that bicycle parking is space-efficient and comparatively more cost-effective than other types of parking. Other common types of parking include carpool and vanpool, electric charging stations, compact vehicle, large vehicle, motorcycle and scooter, carshare, and short-term/pick-up and drop-off spaces. The prevalence of alternative parking types indicates that transit agencies have made choices or adhere to policies to support parking for other than single-occupancy vehicles. The breakdown of the nontraditional parking supply is in Table 6.

Parking Utilization

An understanding of how much parking transit agencies own and manage is important because it quantifies the parking

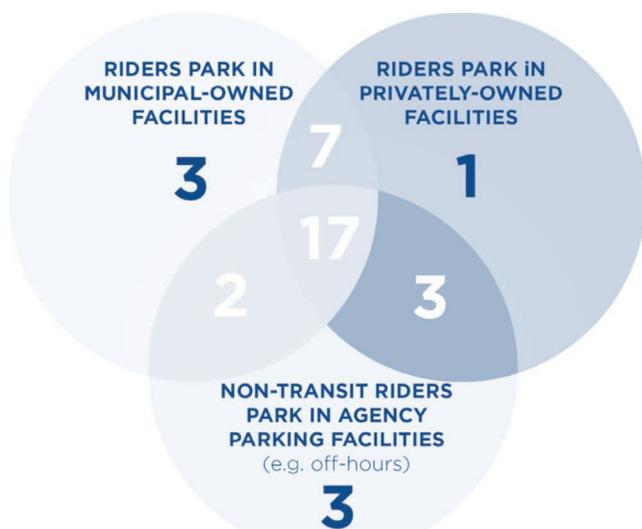


FIGURE 4 Parking supply and rider/non-rider use.

TABLE 6
PREVALENCE OF NONTRADITIONAL PARKING

| Agency | Bicycle Parking | Carpool or Vanpool | Green/Hybrid | Electric Charging Stations | Compact Vehicles | Large Vehicles |
|---|-----------------|--------------------|--------------|----------------------------|------------------|----------------|
| BART | | | | | | |
| Capital Metro | | | | | | |
| Central Ohio Transit Authority | | | | | | |
| Chicago Transit Authority | | | | | | |
| Delaware Transit Corporation | | | | | | |
| FNSB | | | | | | |
| Greater Cleveland Regional Transit Authority | | | | | | |
| Hillsborough (FL) Area Regional Transit | | | | | | |
| Jacksonville Transportation Authority | | | | | | |
| KCATA | | | | | | |
| King County Metro Transit | | | | | | |
| LA Metro | | | | | | |
| Lane Transit District | | | | | | |
| LIRR | | | | | | |
| MARTA | | | | | | |
| Maryland Transit Administration | | | | | | |
| Metro Transit–Saint Louis | | | | | | |
| Metro Transit (Minneapolis) | | | | | | |
| MTA Metro North Railroad | | | | | | |
| Nashville MTA/RTA of Middle Tennessee | | | | | | |
| NJ TRANSIT | | | | | | |
| Pace Suburban Bus Agency (Chicago suburbs) | | | | | | |
| Port Authority of Allegheny County | | | | | | |
| Regional Transportation District | | | | | | |
| Santa Clara Valley Transportation Authority (VTA) | | | | | | |
| SEPTA | | | | | | |
| Sound Transit | | | | | | |
| TANK | | | | | | |
| Triangle Transit | | | | | | |
| TriMet | | | | | | |
| Utah Transit Authority | | | | | | |
| VIA Metropolitan Transit | | | | | | |
| WMATA | | | | | | |
| Total Number of Agencies | 29 | 10 | 5 | 11 | 8 | 5 |
| Percentage of Agencies | 89% | 30% | 15% | 33% | 24% | 15% |

n = 33.

FNSB = Fairbanks North Star Borough; LIRR = Long Island Rail Road; TANK = Transit Authority of Northern Kentucky; TriMet = Tri-County Metropolitan District of Oregon.

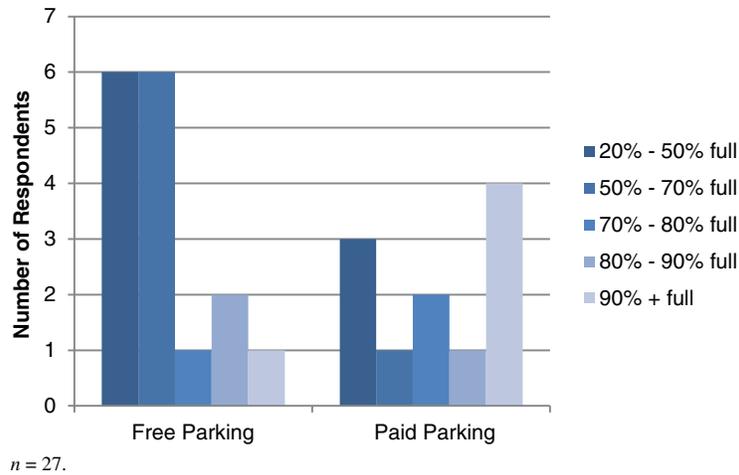


FIGURE 5 Reported peak parking utilization cross referenced with parking pricing.

spaces available for transit rider use. Equally important is parking demand and patterns of actual parking space utilization. Underused parking facilities are often a critical consideration for transit agencies, as they may represent potential lost revenues and lower cost recovery for maintenance, land, and construction. Both full parking and underused facilities reflect a mismatch between factors driving demand and supply.

Peak parking is the time of day when parking facilities are the most full. Based on the survey results, transit agencies reported an average of 65% utilization at peak (27 respondents), which would be considered underutilized based on parking industry standards. This suggests that, as a whole, on average, this sample of transit agencies has approximately 155,000 unused parking spaces on any given day. However, agencies noted a wide range of peak utilization, from 20% to 130%.

Figure 5 shows peak parking utilization in relation to whether or not parking is priced. Although a small dataset,

a pattern emerges when agencies have parking utilization of under 70%. Most agencies with free parking (12 of 16, or 75%) on average have parking facilities that are less than 70% full at peak. Of the agencies that have paid parking, four of 11 (36%), have parking systems that are less than 70% full, a pattern that may suggest that agencies with free parking have less demand than those that price.

Many agencies (41% or 15 of 37) reported that fewer than 25% of their facilities are full at peak (Figure 6); of these agencies, 11 offer free parking and four have paid parking. Eight agencies reported that more than 70% of their facilities are full at peak; of these agencies, five charge for parking and three offer free parking. For agencies that charge for parking, more facilities in the system are full than for agencies that do not charge suggesting that parking pricing may be being used as a tool to control parking demand. There are, however, many factors, besides price that influence the use of parking including transit service and ridership, availability of other modes, and ease of station access.

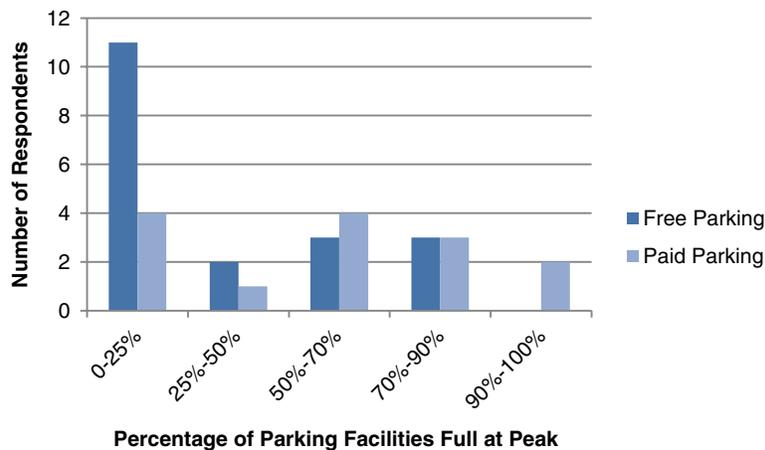


FIGURE 6 Percentage of parking facilities that is full.

PARKING PRICING

Parking pricing is commonly used to balance supply and demand. Whether or not to charge for parking and how much to charge are perhaps the next most critical aspects of parking policy after the decision of whether or not to actually provide parking. Parking pricing is understood as an effective tool not only for managing demand but also as an opportunity to recoup some of the costs of parking operations and maintenance. The cost to park, even if there is no cost, has an impact on user choice and the transportation network. This section explores parking pricing policies including relationship to parking utilization, rate types, revenue impact, and the reason(s) why agencies charge for parking.

Why Charge?

Fifteen of the 33 agencies that own or manage parking charge some type of fee. When asked why they charge for parking, multiple reasons were cited. The most common response (11 of 15 agencies or 73%) was to generate revenue (Figure 7). The second most common reasons were to manage demand and cover costs (53%, or eight of 15 respondents). Two agencies reported that they charge below market parking rates to attract riders. When asked how transit parking rates are determined, eight of the 15 agencies described their policies as being based on parking demand and market rates.

On weekdays, 60% of surveyed agencies have some type of parking pricing, and 40% do not. When examining parking pricing by transit service type, results showed that transit agencies that provide heavy rail service are more likely to charge for parking than agencies that do not (Table 7).

Agency Profile: Legislative Parking Restrictions for Denver Regional Transit District

Denver Regional Transit District (RTD) operates bus and light rail services in the Denver metropolitan area. The District is midway through a major expansion program known

TABLE 7
TRANSIT SERVICE TYPE
AND FREE/PAID PARKING

| Transit Service Type | Free Parking | Paid Parking |
|----------------------|--------------|--------------|
| Heavy Rail | 3 | 5 |
| Commuter Rail | 9 | 6 |
| Light Rail | 9 | 4 |
| Express Bus | 17 | 10 |
| Bus Rapid Transit | 9 | 6 |
| Streetcar | 4 | 1 |
| Local Bus | 16 | 12 |

n = 33.

as FasTracks, which is funded by a voter-approved sales tax. The program focuses primarily on expanding the light rail network, but also makes investment in bus and expanded parking capacity. RTD currently manages approximately 30,000 park-and-ride spaces. By the time the FasTracks program is fully built, the District estimates that the parking supply will expand by approximately 21,000 spaces.

RTD began investigating the possibility of charging for parking in 2006 as a way to help cover the costs of parking facilities. In 2007, however, the Colorado State legislature passed a bill placing restrictions on the District’s authority to charge for parking. Under these restrictions, RTD may not charge District residents for daily parking.

Today, all users may park for free at 40 park-and-ride facilities. At RTD’s 38 other facilities, out-of-district residents are charged \$4 for every 24 hours. In-district residents may park for free for the first 24 hours; however, each 24-hour period thereafter costs \$2. Since the implementation of the current paid parking system, RTD has not seen a decrease in the share of out-of-district parkers, and currently the parking system generates approximately \$1 million per year in gross revenue.

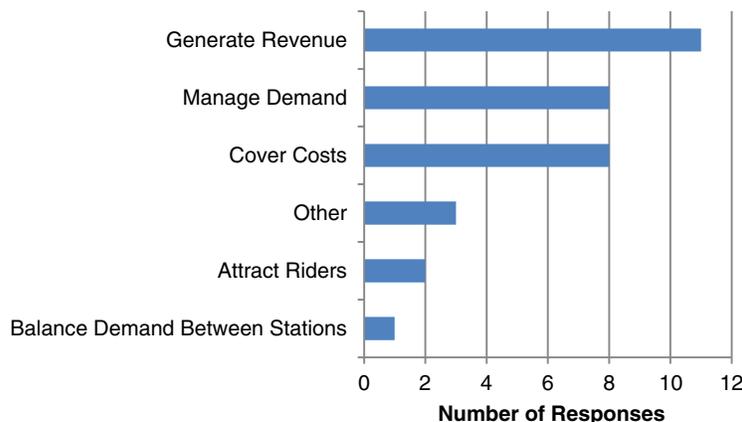


FIGURE 7 Why do agencies charge for parking?

TABLE 8
PARKING RATE TYPES

| | Hourly Rates | Daily Rates | Monthly Rates | Annual Rates |
|-----------------------|--------------|-------------|---------------|--------------|
| Number of Respondents | 3 | 12 | 6 | 2 |

n = 15.

A recent legislative change raises the possibility that parking charges could change at some RTD facilities. This change, which was backed by the RTD Board, was made after several municipalities lobbied to have parking structures (as opposed to surface parking lots) built at new FasTracks stations. As a way of potentially offsetting the cost of new parking structures, the legislature allowed that in-district residents could be charged for parking at agency stations as long as parking fees are paid to a third party, such as a developer or the city. The District has not yet formulated a policy on how it will respond to this legislative change.

Parking Rate Type

Parking rate types are the cost by time period. Agencies use several different rate types to manage parking at transit stations. The most common type is a daily rate, which is typically a flat rate for a traditional weekday (Table 8). This is not surprising, as traditionally park-and-ride facilities are used by commuters who are parking for a full workday. Twelve of the 15 agencies that charge for parking offer a daily rate. Six of these 12 agencies also offer a monthly rate option. A monthly rate indicates that there is an opportunity to pay for parking once for the month and that the agency may offer a discount. Some agencies offer both hourly and annual rates; however, these rate types are less common.

The prevalence of daily rates may mean there is an acceptance among industry professionals that smaller time increments (e.g., hourly and daily) are a more effective means of fine tuning the balance between demand and supply or that payment technology is more suited to hourly and daily payments.

Rate types are important because they influence parking behavior. An hourly or daily rate provides the greatest level of flexibility because it allows commuters to pay and park only when needed. Monthly or annual rates tend to encourage parking for the duration of the month or year because the parking is paid for in advance. The rate types offered, and the financial incentives that come with them, can influence how drivers behave.

Agency Profile: WMATA Tiered Daily and Monthly Rates

In Washington, D.C., WMATA is responsible for overseeing the operation of Metrorail, a 117-mile heavy rail transit network, and MetroBus, which provides fixed-route bus service. The WMATA District includes the District of Columbia; Montgomery and Prince George's counties in Maryland; the northern Virginia counties of Arlington, Fairfax, and Loudon; and the

cities of Alexandria, Fairfax, and Falls Church. WMATA owns and/or operates 62,000 commuter parking spaces at or near 44 of its 91 Metrorail stations. All parking is paid parking, with commuters charged various rates depending on the location of the station, ranging from \$4.00 (Wheaton Station) to \$5.10 (multiple stations). Despite the parking fees, most park-and-ride lots in the region fill to capacity on weekdays (Figure 8).

Parking rates are set by WMATA's Board through a mandated public engagement process. In general, parking prices are set by the Board to ensure that the combined cost of daily parking and the appropriate transit fare does not exceed the cost of parking in central Washington, D.C., although in limited circumstances the Board has provided agency staff with the flexibility to adjust parking fees (within limits adopted by Board policy).



FIGURE 8 WMATA surface parking (Branch Ave above) and structured parking (Franconia–Springfield below) at its heavy rail stations. [Source: WMATA (2006).]

To accommodate the limited share of park-and-ride commuters, the 44 Metrorail stations with parking offer either hourly or daily paid parking on weekdays, with parking free at all stations on weekends and holidays. Thirty-six of these stations offer reserved parking until 10:00 a.m. for transit riders who purchase monthly reserved parking permits, which can be purchased in advance online at a cost of \$45–\$65 per month. Permit holders are still required to pay all applicable daily parking fees in addition to this monthly reserved permit fee.

At select stations, WMATA uses a two-tiered parking pricing structure. For example, at the east end of the Orange line, parkers at New Carrollton who use a SmarTrip card to pay for parking and transit fare are charged \$4.75 per day for parking, provided they exit the parking facility within 2 hours of leaving the fare gates. Parkers who do not use a SmarTrip card that was used for travel to another station on the same day, or who stay longer than 2 hours after they exit the fare gates, are charged a higher parking rate of \$8.85 per day. This tiered pricing system allows WMATA to prioritize station parking for Metrorail commuters, while still permitting use of the facility by customers of nearby commercial establishments.

WMATA's systemwide parking occupancy rate of 94% indicates that even at the stations with the highest daily parking prices, the rates currently charged do not discourage use of Metrorail by park-and-ride commuters. Agency staff notes that most of Metro's paid parking facilities are filled every weekday regardless of changes in prices. In addition, fluctuations in parking prices, transit fares, and the cost of alternatives (including driving) do not appear to have impacted ridership over the past several years. In March 2008, demand for station parking increased at the same time the price of oil spiked well above \$100 per barrel. In 2010, parking was within 0.1% of the utilization in 2008 during the height of the gas price spike. However, system ridership today is 4% higher than in 2008.

Parking Rates

As identified earlier, most surveyed transit agencies charge for station parking to generate revenue, manage demand, and cover costs. There are high costs associated with providing parking; land, construction, maintenance, and external costs such as contracts with parking operators. Costs to provide parking vary significantly between the type of structure (surface lot, above ground, or underground structure) and its characteristics (area per space, geographical location, site challenges, and other on-site uses). With average costs of parking construction in the thousands of dollars per surface space (and tens of thousands for structured parking) it is difficult for a transit agency to recover its costs with the parking rate ranges shown in Table 9.

Of the respondents that charge for parking, daily rates (the most common rate type) range from less than \$0.50 to \$25.00 per day, with an average of \$4.54 per day. There is a wide range both overall and within agencies, implying that most agencies have variation in their rates.

TABLE 9
PARKING RATE RANGES (OF RESPONDENTS THAT CHARGE FOR PARKING)

| Parking Rate Ranges | | | | |
|---------------------|--------------|-------------|---------------|--------------|
| Level | Hourly Rates | Daily Rates | Monthly Rates | Annual Rates |
| Low | \$1.00 | <\$0.50 | <\$0.50 | \$15.00 |
| High | \$2.00 | \$25.00 | \$168.00 | \$250.00 |
| Most Common | \$1.00 | \$4.54 | \$35.50 | \$92.50 |

Transit agencies are not the only providers of parking in the vicinity of transit stations. Agency-owned or managed parking competes with other nearby parking facilities, primarily in terms of location or proximity to the station, by type of facility, and by price. Of the 14 respondents, seven reported that transit agency rates are lower than surrounding rates, three that their rates are about the same, one that it varies widely by station; only one agency reported that its rates are typically higher. Two agencies reported that there are no other direct comparisons; they are the only agencies that provide paid parking at station.

Agency Profile: BART Demand Responsive Parking Fees

BART operates heavy rail serving the San Francisco Bay area. The system carries more than 420,000 passengers per day. The BART District owns and manages more than 46,000 parking spaces at 33 stations, including 15 parking structures and 30 surface parking lots. The capital cost of most facilities has been paid entirely by the District. Until recently, the price charged for parking at these facilities has not offset the ongoing operations and maintenance costs of operation. In 2013, to help offset the costs of providing parking, the BART Board adopted a demand-based parking pricing policy.

Under the new parking program, parking at all BART facilities costs at least \$1 per day on weekdays from 4 a.m. to 3 p.m. Occupancy in parking facilities is evaluated every 6 months. If the lot is found to be more than 95% occupied during the a.m. peak period, BART may increase the parking fee by 50 cents. The maximum cost is capped at \$3 per day at all stations except at West Oakland, which is the last station in East Bay before the Bay Bridge for passengers traveling inbound to San Francisco. BART customers pay for parking using their BART fare ticket, cash, or their Clipper Card, the regional smart card that is also used to pay for BART fares. The data collected by parking validation machines are also used by BART staff to determine parking lots fill times. Passengers may also pay for their parking by purchasing an advanced monthly, single-day, or airport/long-term permit.

During a winter 2014 evaluation, daily-fee parking facilities were found to be more than 95% full at all but two stations. Beginning in January 2015, BART began charging a \$3 fee to

park at 23 stations, plus it instituted a \$7 daily rate at the West Oakland BART station. Lower fees were maintained at five stations. The remaining four stations had just begun implementation of the daily parking fee within the previous 6 months. As a result of the modifications to its parking policy, BART forecasts that it will collect more than \$30 million in parking fees in Fiscal Year 2016, doubling the revenue collected prior to adoption of the new policy. The additional revenue generated is exclusively dedicated to station access, rehabilitation, and modernization needs.

Contrary to expectations, BART has not yet noticed a measureable impact on the time at which parking lots fill. These pricing changes were implemented during a period of rapidly increasing ridership; therefore, demand for parking at most BART stations continues to exceed supply even at the higher prices.

With no cap on price in place at the West Oakland Station, BART will have the opportunity to test the impact of market prices. The \$7 per day fee at West Oakland is lower than the \$9 per day charged at adjacent commercial lots. However, with incremental price increases, the price of parking in this lot may reach or even exceed the price of nearby commercial lots before demand and supply balance.

Parking Revenue

Transit agency survey respondents generate a wide range of annual parking revenues. When normalized by the number of spaces owned and managed by the agencies, annual revenue per parking space ranges from a high of \$725 (WMATA) to \$0.42 (Triangle Transit) (Table 10). These figures indicate that most agencies heavily subsidize the cost of providing parking for their riders.

TABLE 10
ANNUAL PARKING REVENUES BY SPACE AND AS A PERCENTAGE OF AGENCY OPERATING EXPENSES AND PARKING EXPENSES

| Transit Agency | Total Reported Parking Spaces | Total Gross Reported Parking Revenues (annual) | Annual Revenue per Parking Space | Operating Expenses (NTD 2014) (by \$1,000)* | Parking Revenues as a Percentage of Operating Expenses | Parking Revenues as a Percentage of Parking Expenses |
|---------------------------------------|-------------------------------|--|----------------------------------|---|--|--|
| WMATA | 62,000 | \$45,000,000 | \$725.81 | \$1,581,104 | 2.8% | 66% |
| BART | 47,000 | \$26,250,000 | \$558.51 | \$535,986 | 4.9% | 51% |
| CTA | 5,600 | \$2,284,317 | \$407.91 | \$1,277,926 | 0.2% | 37% |
| NJ TRANSIT | 47,000 | \$17,500,000 | \$372.34 | \$1,983,325 | 0.9% | 34% |
| Delaware Transit Corporation | 6,300 | \$2,000,000 | \$317.46 | \$105,713 | 1.9% | 29% |
| MTA Metro North Railroad | 25,000 | \$5,000,000 | \$200.00 | \$1,077,417 | 0.5% | 18% |
| SEPTA | 24,500 | \$4,500,000 | \$183.67 | \$1,160,054 | 0.4% | 17% |
| Santa Clara VTA | 5,300 | \$747,957 | \$141.12 | \$316,924 | 0.2% | 13% |
| MARTA | 25,350 | \$2,552,000 | \$100.67 | \$455,383 | 0.6% | 9% |
| Jacksonville Transportation Authority | 2,957 | \$200,000 | \$67.64 | \$83,511 | 0.2% | 6% |
| Port Authority of Allegheny County | 6,687 | \$305,879 | \$45.74 | \$358,983 | 0.1% | 4% |
| Regional Transportation District | 30,000 | \$1,000,000 | \$33.33 | \$447,172 | 0.2% | 3% |
| Pace | 1,024 | \$12,000 | \$11.72 | \$198,190 | 0.0% | 1% |
| Triangle Transit | 2,400 | \$1,000 | \$0.42 | \$18,274 | 0.0% | 0% |

*National Transit Database (2014).

As indicated previously, 73% of respondents (11 of 15) reported that they charge for parking to generate revenue. To put annual parking revenues in context with transit agency expenses, Table 10 shows parking revenues as a percentage of annual operating expenses. BART's parking revenue contributes to the highest percentage of operating expenses at nearly 5% when compared with other surveyed agencies. Parking revenue covers less than 3% of operating expenses for all other agencies in this sample.

Table 10 also shows parking revenues as a percentage of estimated parking expenses. Parking expense assumes a conservative capital cost of \$18,038 per space (Cudney 2014)—inflation adjusted estimates from ITE's Parking Generation 3rd edition suggest as little as \$1,300 and as much as \$46,000 in construction costs for structured parking (this does not include the real estate costs, which can be considerable). Further, annual operations and maintenance are assumed to be \$500 per space and the lifespan of a facility at 30 years (Litman 2013).

Using these assumptions, WMATA has the most efficient expense-to-revenue ratio, losing only 34% of their parking investment.

Why Agencies Do Not Charge

The survey identified agencies that do not charge for parking at stations. Twenty-two of the 33 respondents (67%) reported that they have no parking fees. When asked why agencies do not charge for parking, most respondents (14 or 64%) reported that they offer free parking to attract more riders.

Other reasons why agencies do not charge for parking are that enforcement costs are too high (11 respondents or 50%), there is public or rider resistance or pushback on parking fees (11 respondents or 50%), and that other nearby parking is free (10 respondents or 45%). Similarly, others indicated that parking payment technology costs are a barrier (nine respondents or 41%) and that there is not enough parking demand to warrant fees (eight respondents or 36%).

This range of responses indicated that there are a variety of reasons why many agencies do not charge for parking. There are also other complicating factors, such as lots that are owned by multiple owners, which can get complex owing to revenue sharing and legislatively mandated requirements for public hearings for parking fee changes.

Agency Profile: Central Ohio Transit Authority: Free Park-and-Ride to Promote Ridership

The Central Ohio Transit Authority (COTA) provides public transit (bus) service for greater Columbus and central Ohio, with a service area that includes 1.2 million residents in Ohio's Franklin County, and parts of Delaware, Fairfield, Licking and Union counties. COTA provides 19 million pas-

senger trips annually on Local, Crosstown, Circulator, and Express buses.

COTA currently operates 27 park-and-ride lots with 2,354 spaces, all in Franklin County. These lots provide passenger access to Express bus routes that primarily serve downtown Columbus and Ohio State University. There are also a few lots designed to serve Local routes. All parking is free and the stated purpose of the lots is to "reduce central Ohio traffic congestion during peak period travel times and to help improve the region's air quality." The agency estimates that roughly 30% of Express bus riders use the park-and-ride lots.

Most park-and-ride lots include enclosed shelters, bench seating, and posted bus schedules. Many lots also have bike racks and, as new facilities are acquired and updated, more bike racks are being added. COTA owns some of these facilities, but many are leased. In some cases, this has been accomplished through partnerships with churches and shopping centers.

Peak period occupancy of these facilities is typically well below capacity. As of 2014 (the last period for which complete data are available), park-and-ride occupancy averaged 646 of the 2,354 spaces, a 27% rate. Average occupancy of individual lots varied considerably, between 5% and 70%.

Despite the low occupancies in existing facilities, COTA sees the acquisition of new parking lots as a way to create a greater presence in the community and raise the visibility and convenience of transit. These parking facilities are used throughout the year for many of Columbus' special events, including to support the 500,000 people who attend the city's 4th of July celebration and for Ohio State fans to attend home football games (promoted as "Bus it to the Buckeyes") (Figure 9). COTA's special event services are popular and also provide significant visibility for COTA within the



FIGURE 9 Ohio State Buckeye's fans aboard COTA's "Bus it to the Buckeyes" service. [Source: COTA (2015).]

community, particularly by introducing people to COTA who are typically not regular transit riders.

In 2014, COTA created a new, permanent 88-space park-and-ride facility in the city of New Albany, replacing a smaller 26-space lot that was leased from a nearby church. This change was carried out in partnership with New Albany and will provide park-and-ride access not only to Express buses bound for downtown Columbus, but also to a new shuttle service operated by New Albany to serve reverse commuters headed to job sites in the surrounding business park. COTA may further expand this facility as demand requires.

In its 2015–2019 Short-Range Transit Plan, COTA has targeted four potential park-and-ride lots for relocation or acquisition. Key factors in the creation of new park-and-ride locations are outreach to the community and identification of accessible, visible, and safe locations that provide transportation that is competitive with driving. COTA does not have plans to price parking at these lots.

PARKING MANAGEMENT

Management Approach

Role of Parking

Most transit agencies pursue a wide range of strategies to promote ridership, one of which is parking. Most but not all of the agencies surveyed for this synthesis consider parking to be an important part of their transit strategies. Thirteen of 35 agencies (37%) rated Parking at Major Stops as a Very Important strategy for promoting access, and an additional 13 agencies rated it as “Moderately Important” (Figure 10).

Parking at major stops ranked 10th out of 13 ridership promotion strategies in terms of the number of agencies considering it a top priority. The most commonly prioritized

strategies are passenger amenities (35 agencies ranked this as very important or moderately important), improved operational efficiency (34), station area planning (33), improved station access (33), and real-time arrival information (32).

Organizational Structure

A variety of functions are required to provide park-and-ride facilities including planning, finance, enforcement, operations and maintenance, and capital projects. In large organizations, these functions tend to be carried out by several different departments. Ultimate responsibility for management of the parking system can be housed in one of these departments or in a stand-alone parking or access division.

Of the 37 agencies surveyed, the most common department for housing parking management is planning (eight agencies), followed by maintenance or facilities (five), finance (five), operations (four), real estate (three), and a stand-alone parking or customer access division (three) (Figure 11). The choice of department responsible for parking management does not appear to have any bearing on the agency’s management approach, such as whether customers are charged for parking or whether the agency is planning to build new parking.

Policy Vision

When asked if agencies have a long-term plan or defined vision for station parking, two-thirds (22 of 33 respondents) reported that they have or are working on a plan or vision. Agency policies vary from parking expansion policies to TOD policies. Five agencies have tailored park-and-ride policies, including the Port Authority of Allegheny County, whose Transportation Development Plan proposes additional park-and-ride locations; Hillsborough Area Regional Transit, which has a plan to expand local-serving park-and-rides to regional park-and-rides to serve multiples routes

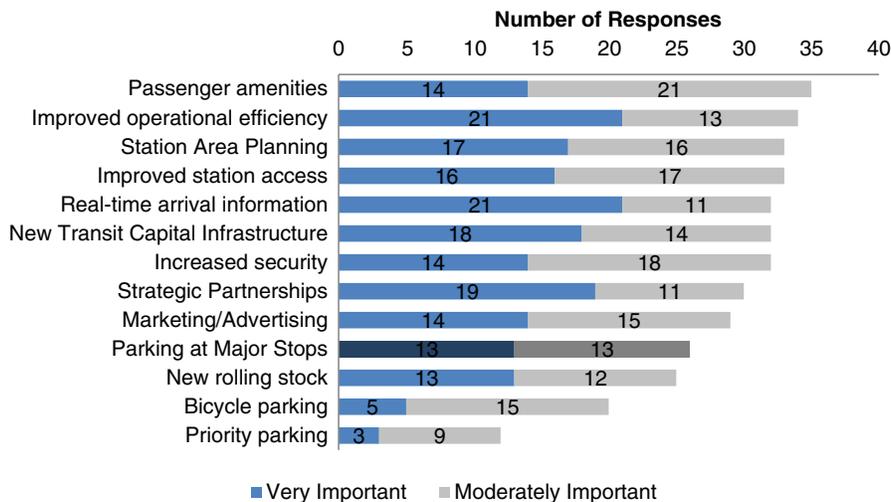


FIGURE 10 Ridership promotion strategies.

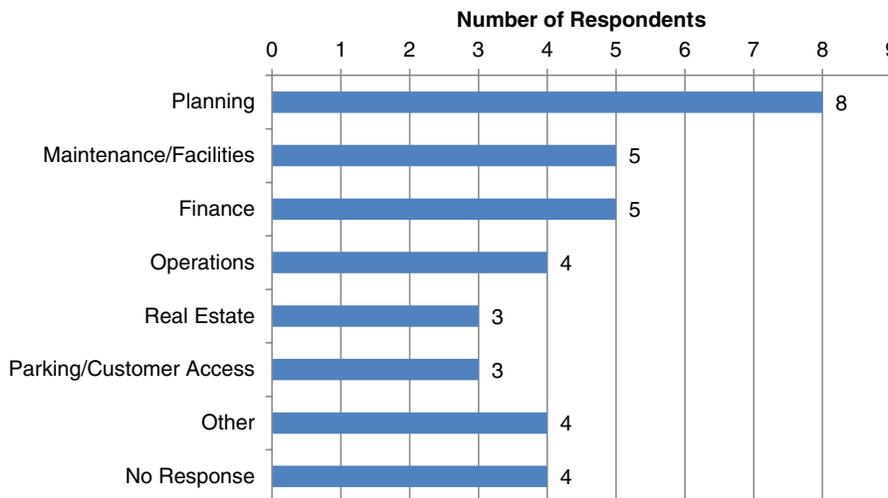


FIGURE 11 Division responsible for parking management.

and destinations; and Metro Transit (Minnesota) that has a corridor-specific park-and-ride policy.

Other agencies have long-term parking plans that are focused on TOD. KCATA has a policy that encourages surface lots in the CBD to develop; Capital Metro’s 2013 TOD Strategic Plan includes strategies to build transit facilities to support TOD. It recently worked on two TOD concept stations (Leander and Lakeline) that envision future mixed-use development on existing park-and-ride lots.

Eight agencies noted that their parking visions and plans are currently being updated or developed, some of which are part of a larger planning process.

Policy Application

Of the agencies surveyed, 29% (10 of 37) have a uniform approach to parking management; they apply the same policies to all parking facilities. Of these, most (7 of 10) are agen-

cies that do not charge for parking at any facility (Figure 12). Roughly one-third (13 agencies) have a specific station-by-station approach to parking management; they consider local conditions and decide on regulations and pricing on a case-by-case basis. Three responding agencies use a “typology” system; transit stations are divided into groups based on their character and managed on that basis.

The remaining nine agencies use some mix of these approaches. For example, Los Angeles County Metropolitan Transportation Authority (LA Metro) has an overall set of parking rules and regulations that are applied systemwide, but tailors approaches such as demand management, preferred parking, maintenance, and improvements that are done station by station.

Policies on Bicycle Parking and Nontraditional Vehicle Parking

Although transit parking facilities are devoted mostly to storing typical motor vehicles, many agencies also reserve space

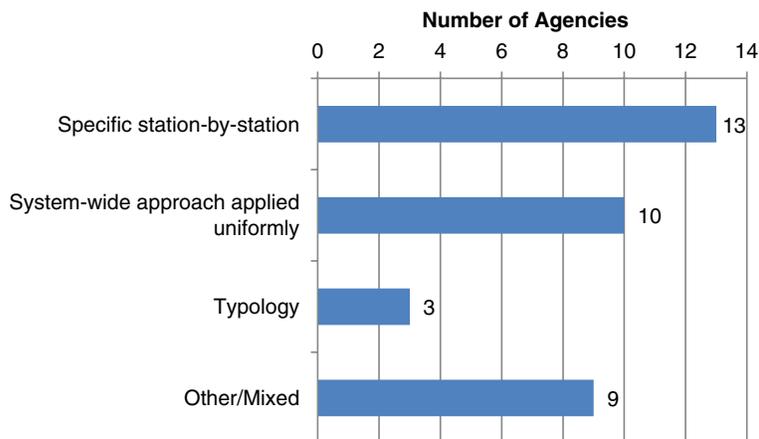


FIGURE 12 Parking management approach.

in those facilities for bicycle storage, carpool vehicles, and electric or other low-emissions vehicles.

All survey respondents that provide vehicle parking also provide some form of nontraditional parking, with the most common type being bicycle parking. However, bicycle parking provisions are often not codified in a policy and are frequently arranged on a demand- or location-specific basis, when funding is available, and/or in coordination with municipal or other partners.

Just 11 of 33 agencies (33%) reported having a specific policy around nontraditional uses of parking facilities, with most of these focused on bicycle parking. One of these, King County Metro Transit’s Strategic Plan for Public Transportation 2011–2021, Strategy 3.3.2, outlines support for bicycle and pedestrian access to jobs, services, and the transit system. It states that “Metro provides three-position bike racks on transit vehicles and is working to increase the availability of secure bicycle parking at new and existing Metro transit facilities.” At stations, Metro also offers leased bike lockers, on-demand eLockers, and bike racks. Electric vehicle charging stations are also available at transit hubs in King County.

Parking Expansion

Expansion Planning

Twenty-five of 36 surveyed agencies (69%) reported that they are currently expanding their parking supply or have plans to do so. Of these, 14 are providing expanded parking to provide access to existing services, whereas 11 are expanding parking supply specifically to provide access to new transit service now under development (Figure 13). The most commonly cited reasons for parking supply growth include expansion of the transit system itself, in response to the demand that exceeds supply, or simply the availability of funding.

One agency is planning to expand parking supply not by building new facilities, but instead working to share

TABLE 11
EXISTING PARKING UTILIZATION
VERSUS FUTURE PARKING EXPANSION

| Typical Peak Parking Utilization (agencywide) | Expansion Plans | No Expansion Plans |
|---|-----------------|--------------------|
| Less than 50% Full | 2 | 4 |
| 50%–75% Full | 9 | 2 |
| 75%–90% Full | 5 | 0 |
| 90%+ Full | 5 | 0 |
| Total | 21 | 6 |

n = 27.

or lease already existing lots and structures. Two agencies are considering parking supply expansions pending current studies. Nine agencies, or 25% of those surveyed, have no current plans to expand their parking supply.

Several agencies have parking expansion plans, although the current parking supply has not been fully utilized (Table 11). Sixteen of 21 agencies (76%) have existing parking facilities that are under capacity and also plan to build more parking. Five of the 21 agencies that plan to build more parking (24%) own or manage parking facilities that are more than 90% full at peak.

Funding for Parking Expansion

No transit provider charges parking fees that cover the full cost of parking garages. Parking expansion is paid for using a variety of sources and often several different sources for the same facility. Overall, agencies cite the use of federal, state, and local grant funds, or simply note that parking facilities are paid for out of the agency’s own capital program, which is typically funded using a similar mix of federal, state, and local revenue sources as well as fare revenue and other user fees (Figure 14). Often federal funds are available when parking is being expanded as part of the construction of a new transit line or station. In this case, FTA funding (along with a local match) may cover the cost of parking facilities.

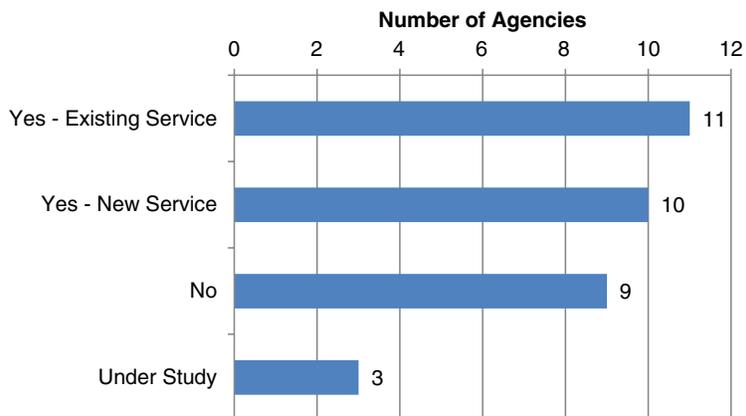


FIGURE 13 Planned expansion of parking supply.

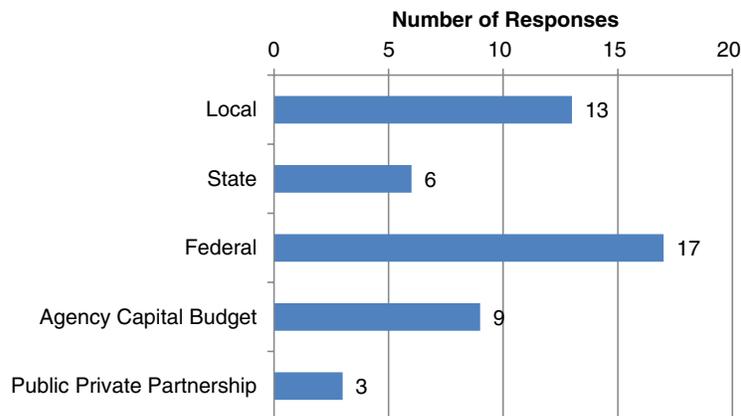


FIGURE 14 Funding sources for parking expansion.

Three agencies reported on the use of Joint Development Agreements or other public-private partnerships to fund parking facilities. NJTRANSIT mentioned the use of financing backed by parking revenue in addition to the agency’s capital program.

Shared Parking

Transit Customer Use of Nonagency Facilities

Many transit agencies collaborate with other entities to manage parking at and around station areas. Half of these agencies (18 of 36) have agreements or arrangements with other entities that allow for transit riders to use nontransit agency-owned parking. When asked specifically with whom agencies work, most agencies reported that they coordinate and communicate most often with municipalities, private organizations, and state agencies (Figure 15).

Some agencies have formal programs; for example, King County Metro operates a lease-lot program where private lots dedicated to other uses (theaters, churches, etc.) are used

for transit riders as park-and-rides. The agency pays the lot owners a small monthly fee. For Triangle Transit, the city of Durham requires any new development that provides more than 400 parking spaces to include at least 5% of the required spaces (or 100 spaces, whichever is smaller) for on-site park-and-ride. Other agencies do not have a formal program but have arrangements with some private partners, such as Pace, which has several arrangements with churches, big box stores, and others such as Metro Transit (MN) and NJTRANSIT. Overall, agencies reported that they most typically work with churches and shopping malls to provide parking for transit customers.

The other half of the respondents do not have these types of official arrangements, although in some cases riders use non-agency parking. Three respondents (Broome County Transit, City and Borough of Juneau, and Ozark Regional Transit) do not own or manage any parking and also do not have agreements with other entities to provide transit rider parking. Regional Transportation Commission in Reno does not own parking, but does have several arrangements with private parking operators for transit customer use.

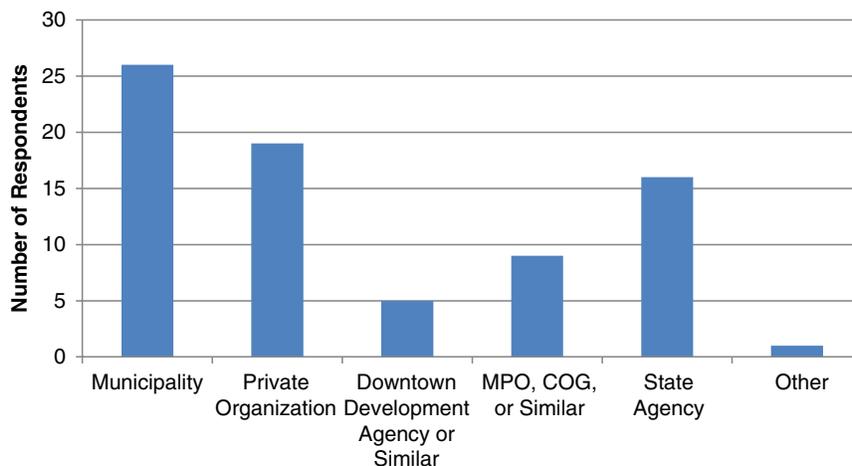


FIGURE 15 Common entities that provide transit rider parking.



FIGURE 16 Mound Transit Center includes a three-level municipal parking ramp that has 50 spaces reserved for Metro Transit park-and-ride customers. (Source: Metro Transit.)

Agency Profile: Metro Transit Joint Use Agreements

Metro Transit is the primary public transit operator in the Twin Cities region of Minnesota. The agency operates bus, bus rapid transit, light rail, commuter rail, and paratransit. Each year the agency, in partnership with county governments, MnDOT, and suburban transit providers, conducts an annual park-and-ride census to track parking trends at the facilities, which helps plan for system expansions and transit service levels (Figure 16). As of its 2014 park-and-ride census, Metro Transit and suburban transit providers manage 108 park-and-ride lots and structures regionwide, primarily served by suburban express bus, as well as light rail and commuter rail. Park-and-ride lots in the Twin Cities are typically larger facilities: 48 of the 108 facilities have more than 200 spaces, comprising 86% of the 32,000 spaces in the system.

The region has significantly expanded park-and-ride capacity in recent years, guided by the *2030 Plan and Ride Plan*. Over the past decade, the park-and-ride parking supply grew 78%, from approximately 18,000 to 32,000 spaces.

During the same time period, parking utilization increased 51%, from approximately 12,000 to 18,000 parked cars. Express bus ridership grew as well, but less so; a 23% increase from approximately 650,000 to nearly 800,000 riders (Figure 17).

The size and nature of park-and-ride facilities in the Twin Cities has changed over time. The system originated in the 1970s with shared-use surface lots, typically at churches. Over time, the system was expanded to include larger facilities that could support more frequent service and were sited at locations near transit advantages to provide faster travel times. Today, 44 of the 108 parking facilities have shared or complementary uses, comprising 40% of the facilities and 20% of the park-and-ride spaces in the region. Metro Transit relies on joint-use agreements with parking lot owners for park-and-rides. Many of these agreements are with landowners who host facilities that need parking at complementary hours compared with traditional weekday transit ridership needs. These parking facilities may be used for park-and-rides on weekdays, and on nights and weekends, but primarily support churches, movie theaters, parks, and shopping centers.

For Metro Transit, feasible joint use facilities must meet several criteria to be considered, including a visible location, easy to access near transit stations, and sufficient parking capacity, which is evaluated on a site-by-site basis. Some lots allow for a portion of the site to be used for park-and-ride parking, others the entire facility; the number of spaces available for transit customers' needs to help the agency meet demand. Operationally, the joint use agreements would benefit both the landowner and Metro Transit. The agency negotiates joint agreements with various stipulations (shared maintenance, etc.) and the needs of both parties must be mutually satisfied. Metro Transit has different types of arrangements and agreements that are site-specific.

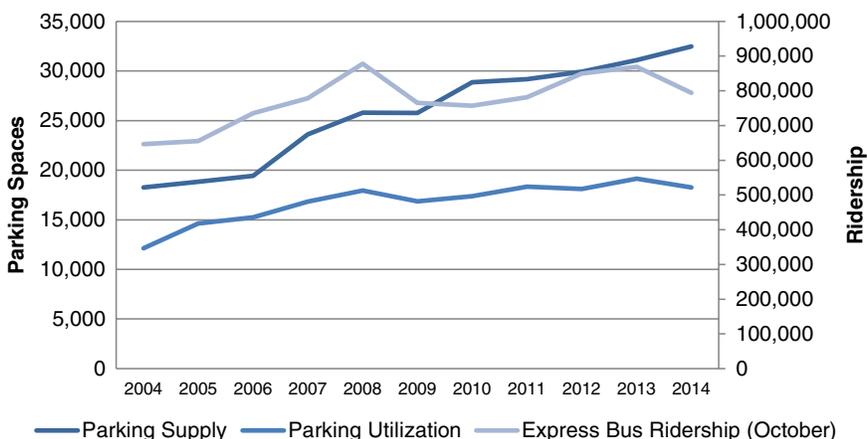


FIGURE 17 Metro Transit park-and-ride parking supply, demand, and express bus ridership 2004–2014. Source: 2014 Annual Regional Park-and-Ride System Survey, Metro Transit.

Sharing Transit Parking During Off-Peak Periods

Because the peak demand for park-and-ride parking is typically on weekdays during traditional business hours, many transit agencies permit other drivers to use the parking facilities outside of peak hours. Most respondents that own or manage parking (25 of 33 agencies, 76%) have some type of agreement or policy for the nontransit users.

Off-peak uses include special events such as farmers markets, food truck events, and carnivals and fairs. Other occasional or temporary uses include film production and construction project staging. Some agencies allow for other transit agencies, local businesses, and municipalities to lease or use parking (including both during the weekday and at off-peak hours).

King County Metro Transit works with several partners to offer its parking for both peak and off-peak uses. At transit facilities with less than 90% utilization on weekdays the agency offers a special permit to businesses that allow for the use of the excess parking supply. After hours, Metro has an agreement at its Issaquah Highlands Park & Ride lot for use as overflow parking for a nearby cinema. The agency's lots are used by the Bellevue School System for school pick-up needs at the Overlake Village Park & Ride, with a special use permit. For weekend special events, such as University of Washington Husky, Seahawks, and Sounders sports games, Metro allows for park-and-ride spaces to be used for game day parking.

Transit-Oriented Development

TOD creates walkable, mixed-use neighborhoods near high-quality public transit services (typically within ½ mile). In recent years, many transit agencies have worked to encourage TOD near their stops and stations to promote ridership, generate revenue, or accomplish other goals. Because this type of development is often contemplated for surface parking lots adjacent to the stations, transit agencies' policies and efforts around TOD are closely related to their parking policies.

Joint Development

Many transit agencies have pursued “Joint Development”—arrangements in which agency-owned land near a stop or station is developed in partnership with a private developer or other public agency. Most commonly, this land is in use as surface parking prior to development. Most agencies surveyed (23 of 32 or 72%) have engaged in (or have the authority to engage in) joint development on agency land. The complex nature of development on transit agency land has resulted in a variety of types of development projects in relation to parking. Some projects provide or replace existing parking.

Agency Profile: MARTA TOD and Parking

MARTA is the largest transit provider in the southeastern United States, providing heavy rail and bus service to Fulton, DeKalb, and Clayton counties in the Atlanta metropolitan region. Its 38 rail transit stations represent a variety of community contexts, from stations in the high-intensity metropolitan core (such as the Peachtree Center station in downtown Atlanta) to those in lower-intensity, park-and-ride-oriented settings (such as the Hamilton E. Holmes and Indian Creek stations at either end of the east–west Blue Line). These also include purpose-built park-and-ride stations such as North Springs and the station connecting directly to the domestic terminal at Hartsfield–Jackson Atlanta International Airport.

The majority of MARTA's rail stations feature parking, even in highly urban environments. Historically, MARTA has not charged customers for daily parking, although it does charge \$5–\$8 per day for parking more than 24 hours. The agency is beginning to explore changes to its parking policy that may include charging nontransit users.

With such a variety of stations, MARTA has taken a case-by-case approach to managing its parking resources and advancing TOD throughout the system (Figure 18). To date, the most tangible efforts in TOD have been at the Lindbergh Station, where the agency constructed a new headquarters and led a joint development project that added office, multi-family residential, and retail development around the station. This relatively early effort introduced new opportunities for the agency, but also led to new challenges; the one-for-one parking replacement policy that MARTA used at the time led to the replacement of a large number of spaces, many of which are underutilized today. This amount of parking was planned and constructed for the full buildout of the TOD district, although weaker development market conditions than those at the time of the station area planning and a change in the development team kept many of the proposed development phases from occurring leaving MARTA with an excess of parking at the station and assuming responsibility for its financing.



FIGURE 18 MARTA's surface parking at Inman Park Station. (Source: Nelson\Nygaard.)

Revising the Approach

Having learned lessons from its experience with the Lindbergh Station, MARTA has recently shifted attention and resources back to its TOD program and is currently in the process of forming joint development agreements at multiple stations. It has taken a revised approach to parking retention and other site development dynamics; the agency calculates the average utilization of station parking over a 5- to 7-year period and uses this number as the basis for parking replacement targets. The agency is taking a more proactive role with surrounding neighborhoods, working to build consensus and understand neighborhood expectations on the scale of development and appropriate parking levels to avoid neighborhood spillover. The agency has also taken a more innovative approach to financing parking, using federal transportation funding administered through the Atlanta Regional Commission (the Atlanta area's MPO) and its own local match to secure funds for garage construction, but allowing developers to finance and build the facility with a guarantee that MARTA will reserve a portion for rider use. MARTA then uses these funds to purchase spaces for its patrons in a constructed parking facility.

The joint development agreements that MARTA is currently creating and advancing engage FTA for review and approval of parking plans. FTA has allowed MARTA to establish agreements on sharing the parking that it secures, with an overall goal of reducing parking. One approach that the agency has begun taking for this is instituting requirements that a portion of MARTA's replacement spaces would be available for MARTA users for certain times of the day, such as from 6 a.m. to 10 a.m. This allows the basic commuter market using these MARTA-reserved parking spaces to continue to be served; however, it also allows for any fluctuation in these commuter demand levels to flex parking to other users without needing to revise parking rights agreements.

Parking Replacement

When transit agencies pursue joint development on land for use as surface parking, they often seek to replace some or all of that parking, most commonly in a new on-site parking structure. Twenty-six of 37 respondents (71%) have considered or implemented structured parking at stations in coordination with TOD or joint development. Because parking structures are both expensive and require a large amount of space, the issues of how much structured parking to provide, and how to pay for it, become a major factor in determining the feasibility of joint development.

Twenty-three of 36 respondents (64%) do not have a written or formal policy governing what should happen when development replaces surface parking. Regardless, most responding agencies typically aim for a one-to-one replacement or build more parking where existing or expected demand is high. Some agencies refer to FTA's Joint Development Guidelines during decision making.

TABLE 12
AGENCIES WITH PARKING REPLACEMENT POLICIES

| One-to-One Replacement | Demand-Based |
|--|-----------------------|
| KCATA | BART (tradeoffs tool) |
| LIRR | CTA (tradeoffs tool) |
| NJTRANSIT (and account for growth potential) | LA |
| Pace | MARTA |
| RTD (with exceptions) | TriMet |
| WMATA | UTA |

A minority of agencies have a standard policy that specifies what should happen when development replaces surface parking (Table 12). Six of 36 respondents (17%) have a policy that requires one-to-one replacement of all parking removed by development (some specify that they regularly accommodate exceptions to this rule.) Six of 36 respondents (17%) plan for parking replacement based on current or expected future parking demand. For example, MARTA bases its number of parking spaces needed on historical parking demand counts (using 7 years of data). Utah Transit Authority estimates the parking needed using a minimum 20-year horizon, which projects the number of spaces needed to meet future peak hour demand, plus 5%.

Anecdotally, several agencies have recently worked on joint development projects to minimize the amount of parking provided. For example, Capital Metro (Austin) is currently negotiating joint development for agency-owned land at Plaza Saltillo Station, which is adjacent to the Downtown Station. No off-street parking is expected to be provided and on-street parking is readily available. Another example is a joint development agreement between the Delaware Transit Corporation, ING Bank at Riverfront, and the city of Wilmington, Delaware, to build a new structured parking facility at a major station.

Agency Profile: BART Replacement Parking Policy

BART operates heavy rail serving the San Francisco Bay Area. The system carries more than 420,000 passengers each day. The District owns and manages more than 46,000 parking spaces at 33 BART stations, which includes 15 parking structures and 30 surface parking lots.

Since the adoption of its TOD policy in 2001, BART has sought out opportunities to develop the property around its stations, including in some cases the land held as surface parking. As the agency has evolved from strictly a transit (and parking) provider to also a land developer, it has sought a better understanding of the implications of its parking policies and how those policies impact its ability to maximize the value of its transit stations.

Historically, BART has had a one-for-one parking replacement requirement for any development that affected its existing parking facilities. In recent years, as more development has occurred at BART, it became clear that this policy was negatively impacting the agency's ability to jointly develop its valuable land assets. Although agency staff provided for some flexibility with replacement parking on an ad hoc basis, there was limited consistency about how parking replacement should be evaluated internally and applied externally. The end result was developers consistently asking for waivers from parking requirements and increased uncertainty regarding project approval.

In 2005, a new BART replacement parking model was developed with the goal of providing internal and external stakeholders with an open and practical planning tool. The model seeks to account for not just impacts on parking and BART ridership, but also how projects can support joint development efforts, address BART's overall fiscal health and long-term capacity challenges, and ensure consistency with BART's multimodal access policy.

The model incorporates four steps. First, specific data inputs are collected for the station area where the joint development is proposed such as existing ridership, parking occupancy data, access data by mode, and population and employment within 0.5 mile. In addition, a synthesis of the policy context and access issues at the station is completed. This qualitative information is used to assess whether local partners are willing to make decisions that will support the replacement parking scenario being considered by BART. Second, specific future development scenarios are created including project size, type of land uses, parking assets and policies related to shared parking, parking pricing, and other planned access improvements. In the third step, each scenario is evaluated according to established criteria for that station, such as ridership impacts, parking demand impacts, associated costs and revenues, and mode shifts. The final step is to use the analysis to develop a joint development and access and replacement parking scenario that could be included in ongoing planning processes.

By using this policy, BART has been able to complete joint development projects on its property that will supply less than full parking replacement, but meet the agency's goals for increased ridership and revenue. For example, a large development project is proceeding for MacArthur Station in Oakland (Figure 19). The model showed that even with a loss of 50% of the parking, ridership would increase substantially because of BART's ability to capture a portion of the trips from the new residential and retail activity, as well as improve transit access to the station. It also revealed that this reduced parking scenario outperformed other scenarios from an expenditure and revenue perspective.

The final development plan changed substantially from the model inputs; however, the model was a crucial piece in



FIGURE 19 TOD at MacArthur BART station. (Source: Nelson\Nygaard.)

securing approval of a final development plan that required approximately 75% replacement parking. When complete, MacArthur Transit Village will supply 624 units of housing adjacent to the station, including 90 units of permanently affordable housing. A new parking structure, built by the developer, will supply 478 parking spaces for BART riders.

Value Capture

The presence of high-quality transit increases the value of surrounding land. Some localities and transit agencies have sought to generate revenue, either for transit or for other local needs, by attempting to realize or capture some portion of this additional land value generated by transit proximity (Figure 20).

Joint development, discussed previously, can be a form of value capture if the deal is revenue-positive for the operator. Eighteen of 21 responding agencies (86%) have used joint development. In addition, seven agencies have used air rights development—creating new developments in the empty space above transportation facilities. Four agencies have used a developer impact fee to generate revenue and three have used negotiated exactions. One agency has used transportation utility fees as a value capture strategy.

Station Area Policies

Transit agencies collaborate with several other entities to manage parking at and around station areas. This includes, but is not limited to, agency participation in the development of local land use policies, development standards, and station area access. When asked specifically with whom agencies work, most reported that they coordinate and communicate most often with municipalities; private operators, businesses, and institutions; and state agencies (Figure 21).

Several agencies reported that local governments have implemented policies that encourage TOD or transit-supportive development densities. Working with CTA, Chicago created a TOD policy that allows for lower parking ratios within

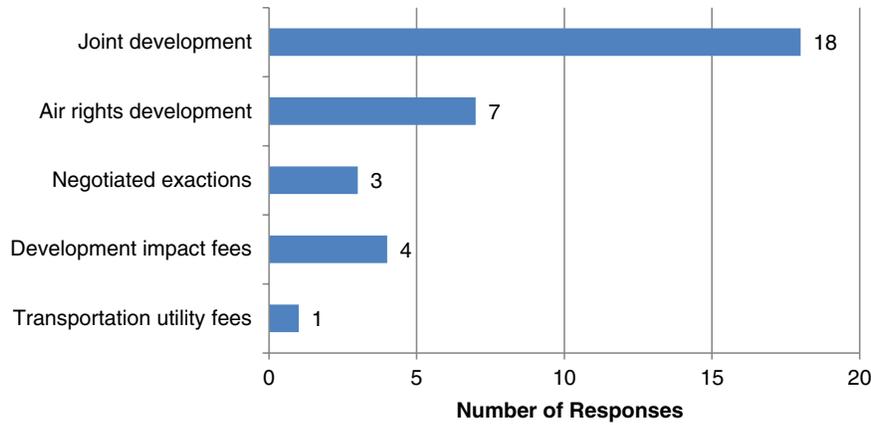


FIGURE 20 Value capture strategies in use.

600 feet of all stations, and within 1,200 feet if the development occurs along a “pedestrian street.” In the St. Louis region, some municipalities have created overlays or special districts to allow for lower parking ratios at transit stations. Santa Clara Valley Transportation Authority serves as a technical resource for the municipalities it serves. Almost all of the 16 local governments in the Authority service area have TOD and/or transit-supportive policies and zoning codes, including San José, which has set reduced parking requirements near transit stations.

Agency Profile: LA Metro Documented Parking Policy

LA Metro is the regional transportation planning agency and public transit operator for Los Angeles County. LA Metro provides a range of transit services, including local fixed-route bus, bus rapid transit, commuter rail, heavy rail, streetcar, and demand-responsive ADA transit. Metro operates park-and-ride facilities with 22,000 parking spaces at 48 bus and rail stations. The parking supply is expected to increase to 25,000 parking spaces with the completion of its Expo II, Gold Line Foot-

hill Extension in 2016 and could increase to 30,000 spaces if Metro acquires the Caltrans-owned parking lots scattered throughout the county.

In July 2003, LA Metro formally adopted policies for managing its park-and-ride assets. It documents how the agency will manage its existing parking resources, develop new facilities, and work with localities to improve and periodically assess the need to provide nonauto access to transit. For existing facilities, the policy states that LA Metro will monitor occupancy, and for facilities with more than 75% occupancy it will pursue management strategies such as parking districts that allow for shared parking between sites or users, and charging at parking lots where occupancies exceed 90%. The policy places several conditions on the implementation of parking charges including that the actions not cause significant decreases in transit system ridership, not cause adverse spillover parking into surrounding areas, that rates are competitive with surrounding facilities, and that revenue can cover expected costs. Variable pricing by time of day is permitted, and payment is to be integrated with the fare payment system. The policy also documents the agency’s strategy for improving the efficiency

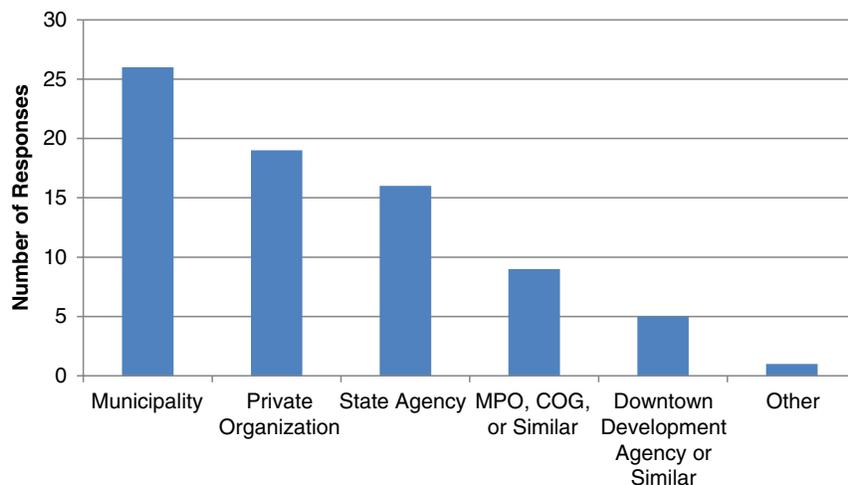


FIGURE 21 Common collaborators on parking for transit.

of parking (carpool/vanpool preference, time limits, and innovative technologies), and increases the supply of parking cost-effectively (re-striping, tandem parking, and mechanical parking).

For the highest-demand facilities, the policy documents a set of strategies for increasing the supply of available parking including buying or leasing nearby existing parking facilities, building parking lots or structures, and working with jurisdictions or private entities to provide parking or shared parking. The policy also encourages working with localities to make more on-street parking available to transit riders. Finally, the policy provides for the consideration of other public policy changes to promote station access, including working with cities to better integrate land use and transportation and improve local parking controls.

The first paid parking facilities under the policy were implemented in 2004. Paid parking permits were introduced at two Gold Line Metrorail stations (Sierra Madre Villa and Lake Avenue) at a cost of \$29 and \$28 per month, respectively. Today, reserved paid parking is available at 15 LA Metro stations, with both monthly and daily reserved parking available (Figure 22). Patrons register and pay online. According to LA Metro, such charges have not resulted in reduced ridership or neighborhood spillover. More than 90% of parking spaces in the system remain free.

LA Metro also has a joint development policy that was last revised in October 2009. The goals of the policy are to encourage comprehensive planning and development around station sites and along transit corridors, and reduce automobile use and congestion through encouragement of transit-linked development. At specific sites, the policy aims to promote and enhance transit ridership, enhance and protect the transportation corridor, enhance the land use and economic development



FIGURE 22 LA Metro park-and-ride parking facility. (Source: LA Metro.)

goals of surrounding communities, and generate value to LA Metro. The joint development policy provides specific implementation procedures for soliciting project proposals, evaluating proposals, and dealing with unsolicited proposals. The policy includes no specific requirements for parking replacement. According to LA Metro staff, parking spaces are added or replaced depending on demand.

LA Metro currently has a project underway to update the agency's parking policies and develop a comprehensive Supportive Transit Parking Program Master Plan. In its first phase, the project will develop management alternatives for the board to consider. In its second phase, a Metro Parking Strategic Implementation Plan (a 5- to 10-year program) will be presented to the Board for adoption that will include projects for implementation. Finally, some of the areas the master plan will cover include a facilities assessment, ridership versus demand model, supply and demand analysis, and an evaluation of Metro's parking enforcement, management, organizational structure, and maintenance schedule.

CONCLUSIONS

Parking is widely recognized as an important factor influencing transit access and ridership. As transit agencies work to attract customers, parking policies, in particular parking pricing, play a critical role in transit agency decision making. An increasing number of transit agencies are currently revising their parking policies to encourage transit use and to efficiently use resources consumed for parking.

This synthesis documents transit agency parking policies and parking management at transit stations using three primary resources: (1) a scan of current research on transit-supportive parking policies, (2) an original survey distributed to a sample of transit agencies, and (3) several brief agency profiles based on interviews and existing available data. The survey was distributed to 46 transit agencies of which 37 (80%) responded. Participating transit agencies represent a broad spectrum in terms of service type, jurisdiction, ridership, mode, types of parking, and parking policy.

Although there is substantial published literature on parking policy, there is limited existing research documenting the impact of parking policies on transit ridership. Within the existing research, there are inconsistent findings regarding which parking policies support and promote the use of transit. The survey results also indicated that there are differing approaches to parking management designed to attract transit riders. Opposing approaches to achieve the same objective furthers the notion that parking management is highly contextual, as well as suggests that further research is warranted.

Several factors can complicate a transit agency's parking policies and decision making, including station context, land value and development opportunity, network service characteristics, community plans, state and local laws, and funding. In response to these challenges, transit agencies have adopted a variety of policies to manage station parking. The primary parking management tools identified through the literature review, survey, and agency profiles include:

- Parking pricing:
 - Free parking,
 - Flat pricing,
 - Demand-based pricing, and
 - Event pricing.
 - Partnerships:
 - Leasing parking through a private partner,
 - Leasing parking through a municipal partner or another public entity,
 - Sharing transit agency-owned parking with other uses, and
 - Partnering with localities to manage parking in a station area.
 - Nontraditional parking policy:
 - Bicycle parking,
 - Carpool and vanpool parking,
 - Green and hybrid and electric charging stations, and
 - Carshare pods or bikeshare stations.
 - Transit-oriented development and joint development:
 - One-to-one parking replacement,
 - Site-specific or flexible parking replacement, and
 - Station typology.
 - Parking capacity expansion:
 - Expand parking (and use parking more efficiently) for existing service, and
 - Expand parking for new service.
- Notable findings from this synthesis included the following.
- **Inconsistent findings about the ridership impact of providing parking versus station area development.** Published research has arrived at various conclusions on transit ridership when comparing providing parking at stations with providing housing or jobs. One study found that to maintain ridership levels the density of housing or jobs needed is higher than most municipalities would be able or willing to build. Another study found that to generate the same ridership as a surface parking lot housing development must be built to 110–150 units per acre. Other studies have concluded that building housing at transit stations, not parking, is the most effective way to maximize transit ridership. Another paper demonstrated that parking and transit-oriented development are dependent on local real estate conditions, implying that the trade-offs between parking supply and the built environment are highly contextual.
 - **Parking pricing is used as a tool to boost ridership.** Findings regarding parking pricing at transit stations revealed contradictory approaches to encouraging transit ridership, as charging for parking may reduce demand. Some agencies offer free parking to encourage tran-

sit customers, while others price parking to shift some parkers to the use of alternative access modes, leaving the limited parking available for those who are less price-sensitive or lack alternatives. Although the literature and survey results do not agree on standard pricing approaches or fees, *TCRP Report 153* from 2012 notes that for transit to be a competitive option parking fees in combination with a round trip transit fare should be less than all day parking costs in the central business district.

- **Only one of five riders uses a park-and-ride, and as a result many agencies have an excess parking supply.** Although the degree to which there is an excess parking supply varies between transit modes and between agencies, transit riders use fewer parking spaces than corresponding ridership levels would suggest. Survey results indicated that the average park-and-ride mode split is only 22%, implying that 78% of riders are arriving at the station by taking transit, walking, biking, or something else. Results also revealed that across all survey respondents 35% of the parking supply is unused at the busiest time on a typical weekday, although capacity varies widely from station to station.
- **Three-quarters of survey respondents that have excess parking capacity also plan to build more parking.** Despite excess parking capacity in many agency systems, most survey respondents have plans or policies to build more parking. The most commonly cited reasons for increasing parking supply include expansion of the transit system itself, response to the demand that exceeds supply at a specific station, and funding availability.
- **Providing parking is not a top strategy for agencies to attract riders.** Survey results indicated that providing parking at stations is not as important to agencies as factors such as passenger amenities, operational efficiency, station area planning, and improved station access. Indeed, providing parking was ranked 10th out of 13 ridership promotion strategies by responding agencies. Nevertheless, research shows that agencies spend substantial resources constructing, maintaining, and operating their parking supplies.
- **Many agencies provide nontraditional parking (e.g., bicycle parking).** Although there is little documented evidence about the impact on providing nontraditional

parking on transit ridership, almost all respondents provide some type of nontraditional parking. The most common alternative parking type is bicycle parking, with 94% of survey respondents providing some type of bicycle racks. As documented in *TCRP Synthesis 62*, more research is needed to quantify the impact of providing bicycle parking on transit ridership.

- **Agencies engage in joint development agreements.** Most survey respondents have either employed (or have the authority to employ) joint development agreements. Some projects have replaced parking and others have not; however, transit agencies are becoming experienced with these types of transactions.
- **Transit parking is provided by transit agencies, municipalities, and the private sector.** As transit agencies are primarily in the business of providing transit service, agencies regularly coordinate and partner with the public and private sector to provide and manage parking facilities for transit riders. Likewise, three-quarters of agency respondents indicated that nontransit riders use agency parking, typically outside of peak hours. This suggests that these partnerships allow for flexibility and demand-responsiveness in the parking system.

Overall, the lack of research that quantifies the impact of parking policies on transit ridership suggests several opportunities for follow-up work. Several key areas are largely absent from the existing documentation on this topic including:

- When to provide parking and when not to, which is especially pertinent given the relatively high cost of land within transit agency service areas, the high cost of providing parking, and increasing demands for transit agencies to control costs and help meet air quality targets.
- Comprehensive and detailed analyses of the quantitative relationship between providing parking and levels of transit ridership.
- Station typologies and their catchment areas with regard to the role of parking and parking replacement including data on individual station areas, their placement on the transit route or line, catchment areas and land use context, and how these variables would be used to manage parking supply and regulations.

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APPENDIX A

Survey Questionnaire

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

Survey Instructions

This study, sponsored by the Transportation Research Board, will collect information about parking policies and programs that support transit access and ridership. You are invited to participate because your agency owns, manages, or operates parking at transit stations or has parking policies that encourage transit ridership. Your organization was identified by the project advisory panel as an important and interesting agency to include in this survey.

This effort is intended to capture diverse representation of transit agencies in terms of geography, type of transit service, size of agency, and other criteria. We expect this study will be of direct value to you and your organization; the quality of the report is enhanced with every response received.

If a question does not apply to you, please indicate "N/A". If you cannot answer a question, you may leave it blank. When estimating a percentage, please precede it with a tilde (~), for example ~10%.

Please complete the survey by Friday, February 13th, 8pm EST.

Thank you for taking the time to participate. If you have any questions or need clarification, please don't hesitate to contact me: Lisa Jacobson, email: ljacobson@nelsonnygaard.com, direct phone line: 617-521-9406.

Respondent Information

* 1. Respondent Information

Name of Respondent:

Agency Name:

About Your Agency

2. What is the primary city, town, or region served by your transit agency?

3. How would you describe the agency's service jurisdiction from the following (choose the largest that applies, as it is assumed to be inclusive of all smaller descriptions):

- More than one state
- Multiple counties or parts of counties
- One county or county-equivalent jurisdiction
- One city/municipal jurisdiction
- Sub-municipal service area (such as a campus, a corridor, or another district entirely within a political jurisdiction)
- Other (please specify)

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

4. How would you classify the agency's primary service-area setting? Choose all that apply.

- Rural
- Semi-rural
- Suburban/small urban
- Urban
- Special targeted area (such as a university campus vicinity, a business or employment district, or a corridor)

5. What transit services do you manage or operate? Choose all that apply.

- Local fixed-route bus (includes trolleybus and trackless trolley)
- Express or commuter bus
- Bus rapid transit
- Commuter rail
- Heavy rail
- Light rail
- Streetcar
- Demand-responsive
- Ferry/water taxi
- Other transit types (please specify)

6. How would you describe the immediate areas around your stations, e.g. not typical curbside stops? Choose all that apply.

- Park and ride/parking facilities available for transit rider use
- Downtown or other employment center with some dedicated rider parking (either privately or publicly owned/operated)
- Downtown or other employment center with no dedicated rider parking
- TOD or other mixed-use districts with some dedicated rider parking
- TOD or other mixed-use districts with no dedicated rider parking
- Other (please explain)

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

7. What is the nature of the agency's organization? Choose any that apply, or add more detail.

- Autonomous authority (not part of an elected government, but with similar powers such as taxation, bonding, or eminent domain)
- Department or division of a local government
- Department or division of a state government
- Administered within a metropolitan planning organization (MPO)
- Other (please explain)

Parking Inventory

8. What percentage of your daily riders drive and park to use your transit system? Report by transit service, if possible. If not available, use "Other".

| | |
|---|--|
| Local fixed-route bus (includes trolleybus and trackless trolley) | <input style="width: 100px; height: 20px;" type="text"/> |
| Express or commuter bus | <input style="width: 100px; height: 20px;" type="text"/> |
| Bus rapid transit | <input style="width: 100px; height: 20px;" type="text"/> |
| Commuter rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Heavy rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Light rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Streetcar | <input style="width: 100px; height: 20px;" type="text"/> |
| Demand-responsive | <input style="width: 100px; height: 20px;" type="text"/> |
| Ferry/water taxi | <input style="width: 100px; height: 20px;" type="text"/> |
| Other | <input style="width: 100px; height: 20px;" type="text"/> |

9. How many parking spaces does your agency own and/or manage?

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10. How many parking spaces do you own and/or manage by transit mode? Count only spaces that could be used by riders or customers of the agency, not those principally reserved for agency staff or service uses. If spaces are used for more than one mode, please explain in the 'Other' section:

| | |
|---|--|
| Local fixed-route bus (includes trolleybus and trackless trolley) | <input style="width: 100px; height: 20px;" type="text"/> |
| Express or commuter bus | <input style="width: 100px; height: 20px;" type="text"/> |
| Bus rapid transit | <input style="width: 100px; height: 20px;" type="text"/> |
| Commuter rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Heavy rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Light rail | <input style="width: 100px; height: 20px;" type="text"/> |
| Streetcar | <input style="width: 100px; height: 20px;" type="text"/> |
| Demand-responsive | <input style="width: 100px; height: 20px;" type="text"/> |
| Ferry/water taxi | <input style="width: 100px; height: 20px;" type="text"/> |
| Other | <input style="width: 100px; height: 20px;" type="text"/> |

11. What types of parking does your agency own and/or manage, besides standard vehicular parking:

- Bicycle parking
- Carpool or vanpool spaces
- Green/hybrid vehicle spaces
- Electric charging stations
- Compact vehicle spaces
- Large vehicle spaces (e.g. truck, SUV)
- Other (please specify)

▲
▼

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12. Do your passengers/riders use parking facilities owned and/or managed by other entities? Choose all that apply.

- Municipal
- Private operator of a single use lot or structure
- Private operator of a lot or structure associated with another use (e.g. church, residences, etc.)
- Another transit agency
- Quasi-public agency
- Other (please explain)

13. Does your agency charge for parking?

- Yes
- No

Parking Pricing Policies

14. Why does your agency charge for parking? Choose all that apply.

- Manage demand
- Generate revenue
- Cover costs
- Balance demand between stations
- Attract riders
- Other (please specify)

15. How are parking rates determined? Please explain, include link to policy document, or email us the policy document.

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

16. What is the annual revenue the agency collected from parking in the most recent known year?

| | |
|---|----------------------|
| Year reported | <input type="text"/> |
| Parking permits/daily/hourly payments: \$ | <input type="text"/> |
| Special Event parking: \$ | <input type="text"/> |
| Parking fees and citations: \$ | <input type="text"/> |
| Other (specify): \$ | <input type="text"/> |

Parking Pricing: Weekdays

17. What are your most common parking rates? Choose the nearest value.

| | Rates |
|-------------|----------------------|
| Hourly rate | <input type="text"/> |
| Daily rate | <input type="text"/> |
| Monthly | <input type="text"/> |
| Annual | <input type="text"/> |
| N/A | <input type="text"/> |

18. What is your range of parking rates? Choose the closest numbers.

| | Low | High |
|---------|----------------------|----------------------|
| Hourly | <input type="text"/> | <input type="text"/> |
| Daily | <input type="text"/> | <input type="text"/> |
| Monthly | <input type="text"/> | <input type="text"/> |
| Annual | <input type="text"/> | <input type="text"/> |

19. How do your rates compare with typical rates for private or municipal parking facilities near transit stops/stations?

- Agency rates higher
- Agency rates about the same
- Agency rates lower
- Varies widely
- Other (please specify)

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

20. If you provide parking for special events, do you have event rates?

- Yes
 No/ N/A

Typical event rates:

21. Do you charge for parking on weekends (Saturday - Sunday)?

- Yes
 No

Parking Pricing: Weekends

22. What are your most common parking rates? Choose the nearest value.

| | Rates |
|-------------|----------------------|
| Hourly rate | <input type="text"/> |
| Daily rate | <input type="text"/> |
| Monthly | <input type="text"/> |
| Annual | <input type="text"/> |
| N/A | <input type="text"/> |

23. What is your range of parking rates? Choose the closest numbers.

| | Low | High |
|---------|----------------------|----------------------|
| Hourly | <input type="text"/> | <input type="text"/> |
| Daily | <input type="text"/> | <input type="text"/> |
| Monthly | <input type="text"/> | <input type="text"/> |
| Annual | <input type="text"/> | <input type="text"/> |

No Parking Pricing

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

24. Why don't you charge for parking? Choose all that apply.

- Attract more riders
- Minimize spillover parking
- Not enough demand
- Cost to maintain technology
- Cost to enforce
- Public or rider resistance/pushback
- Nearby parking is free
- Included in transit pass
- State or municipal laws
- Other (please specify)

25. Do you provide parking for special events?

- Yes
- No/ N/A

If yes, do you charge for parking? What are your typical event rates?

Parking Management

26. What division of your agency is responsible for parking management?

27. How does your agency approach parking management?

- System-wide approach applied uniformly to all parking resources (for example same hours, same rates, etc.)
- By using a station typology (for example, a different model for stations with structures than for those with surface lots)
- Specific station-by-station
- Other (please explain)

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

28. Does your agency have a long-term plan or defined vision for parking at transit stations? This could be a simple policy on replacement or future addition, or might be more elaborate. Please describe as appropriate.

29. Does your agency have any specific policies regarding the allocation of bicycle, carpool, green vehicle, or other non-traditional spaces?

Yes

No

If yes, please describe policies, include a weblink, or email us the policy document.

30. Does your agency have arrangements in which other entities are allowed to use parking your agency owns or operates, especially outside of traditional commute hours?

Yes

No

Please explain.

31. Does your agency have arrangements with owners or operators of private parking facilities (especially garages or parking serving private properties) to allow spaces to be used for transit riders?

Yes

No

If yes, please explain.

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

32. What percentage of your facilities are full at peak?

- 90%-100% of facilities are full at peak
- 70%-90% of facilities are full at peak
- 50%-70% of facilities are full at peak
- 25%-50% of facilities are full at peak
- 0-25% of facilities are full at peak
- N/A

33. What is typical peak parking utilization for all parking in your agency's system?

34. What resources does your agency use to enforce parking? Select any of the following that apply:

- Agency staff or police
- Municipal police
- Private management vendor under contract with the agency
- Other public agency (such as a city or county government department)

Parking Planning

35. Does your agency currently plan on constructing, acquiring, or leasing additional parking facilities for transit riders' use? Please explain.

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36. Does your agency have a parking replacement policy when changes are made on the station site? This generally involves redevelopment of the station site or area, but might also be applied to other changes that consume parking spaces like added bus bays or utility structures.

Yes

No

If yes, please describe: is it a target ratio of spaces removed to spaces replaced, a required ratio, an analytic tool, or something else (like a proffer system with partner agencies and developers)?

37. How has your agency funded the construction of parking facilities that the agency owns and operates?

38. With which partner agencies does your agency collaborate on parking management? Choose all that apply.

Municipality or multiple municipalities

Private operators, business, or institution

Downtown development authority, community redevelopment agency, or similar

Metropolitan planning organization (MPO), council of governments (COG), regional planning association (RPA), or similar regional agency

State agency (especially a transportation agency)

Other (please explain)

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

39. How important are these strategies to your agency when looking to increase ridership?

| | Very Important | Moderately Important | Slightly Important | Low Importance | Not Important | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Strategic partnerships with other agencies (such as universities, business improvement districts, etc.) | <input type="radio"/> |
| Bicycle parking | <input type="radio"/> |
| Station area planning and development, especially transit-oriented development | <input type="radio"/> |
| Providing parking at stations or major stops | <input type="radio"/> |
| Priority parking (e.g. carpool, compact, green, etc.) | <input type="radio"/> |
| Improved operational efficiency | <input type="radio"/> |
| Marketing/Advertising | <input type="radio"/> |
| New transit capital infrastructure | <input type="radio"/> |
| Increased security at stations and stops and on vehicles | <input type="radio"/> |
| New rolling stock | <input type="radio"/> |
| Improved station access (e.g. surrounding area improvements) | <input type="radio"/> |
| Passenger amenities (either on or off transit vehicles) | <input type="radio"/> |
| Real-time arrival information | <input type="radio"/> |

Other (please specify)

Development/Land Use

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

40. Does your agency have a dedicated real estate office?

- Yes
 No

41. Has this office engaged in, or does it have authority to engage in any, joint development partnerships on agency-owned land?

- Yes
 No

42. Has your agency considered or implemented structured parking at stations to create more space for TOD or a joint development?

- Yes
 No

If yes, please explain or give an example.

43. Has your agency used any of these value capture strategies:

- Transportation utility fees
 Development impact fees
 Negotiated exactions
 Joint development
 Air rights
 Other

44. If your agency has used value capture, how has it done so? Do the value capture policies affect the parking requirements near transit stations?

TCRP J-07/SH-15 Transit Supportive Parking Policies and Programs

45. To what extent has your agency been involved in developing municipal parking policies at station areas (e.g. encouraging higher or lower requirements)?

- We are regularly involved in these discussions/decision-making
- We are involved with some municipalities
- We are rarely involved with this type of decision-making
- We have never worked with municipalities on this topic
- Other (please explain)

46. Do the local governments in your service area have land use policies or regulations that encourage TOD or transit-supportive development densities? If yes, do these policies and regulations generally set reduced parking requirements at or near transit stations?

Bonus Page

47. Is there anything else that your agency does that is relevant or that you want to share?

Thank You!

Thank you for taking the time to participate. If you have any questions or need clarification, please don't hesitate to contact me: Lisa Jacobson, email: ljacobson@nelsonnygaard.com, direct phone line: 617-521-9406.

APPENDIX B

List of Survey Respondents

| | |
|---|--|
| Bay Area Rapid Transit (BART) | Metropolitan Transportation Agency Long Island Rail Road (LIRR) |
| Broome County Transit (BCT) | Metropolitan Transportation Agency Metro North Railroad (MTA MNR) |
| Capital Metropolitan Transportation Authority (Capital Metro) | Nashville Metropolitan Transit Authority (MTA)/Regional Transportation Authority of Middle Tennessee (RTA) |
| Capital Transit, City & Borough of Juneau, Alaska | New Jersey Transit (NJ Transit) |
| Central Ohio Transit Authority (COTA) | Ozark Regional Transit (ORT) |
| Central Puget Sound Regional Transit Authority (Sound Transit) | Pace Suburban Bus Agency (Chicago Suburbs) |
| Chicago Transit Authority (CTA) | Port Authority of Allegheny County |
| Delaware Transit Corporation | Regional Transportation Commission of Southern Nevada (RTC) |
| Fairbanks North Star Borough (FNSB) Transportation | Regional Transportation District (RTD) |
| Greater Cleveland Regional Transit Authority (RTA) | Research Triangle Regional Public Transit Authority (Triangle Transit) |
| Hillsborough Area Regional Transit (HART) | Santa Clara Valley Transportation Authority (VTA) |
| Jacksonville Transportation Authority (JTA) | Southeastern Pennsylvania Transportation Authority (SEPTA) |
| Kansas City Area Transportation Authority (KCATA) | Transit Authority of Northern Kentucky (TANK) |
| King County Metro Transit | Tri-County Metropolitan District of Oregon (TriMet) |
| Lane Transit District | Utah Transit Authority (UTA) |
| Los Angeles County Metropolitan Transportation Authority (LA Metro) | VIA Metropolitan Transit (San Antonio) |
| Maryland Transit Administration (MTA) | Washington Metropolitan Area Transit Authority (WMATA) |
| Metro Transit (Minneapolis) | |
| Metro Transit (Saint Louis) | |
| Metropolitan Atlanta Rapid Transit Authority (MARTA) | |

APPENDIX C

Survey Results

Includes completed surveys only.

Respondent Information

| Question 1. Respondent Information | | |
|------------------------------------|--------------------------|----------------|
| Answer Options | Response Percent | Response Count |
| Name of Respondent: | 100.0% | 37 |
| Agency Name: | 100.0% | 37 |
| | <i>answered question</i> | 37 |
| | <i>skipped question</i> | 0 |

About Your Agency

| Question 2. What is the primary city, town, or region served by your transit agency? | |
|--|------------------------------------|
| Answer Options | Response Count |
| | 37 |
| | <i>answered question</i> 37 |
| | <i>skipped question</i> 0 |

| Question 3. How would you describe the agency's service jurisdiction from the following (choose the largest that applies, as it is assumed to be inclusive of all smaller descriptions): | | |
|--|--------------------------|----------------|
| Answer Options | Response Percent | Response Count |
| More than one state | 13.5% | 5 |
| Multiple counties or parts of counties | 51.4% | 19 |
| One county or county-equivalent jurisdiction | 32.4% | 12 |
| One city/municipal jurisdiction | 2.7% | 1 |
| Sub-municipal service area (such as a campus, a corridor, or another district entirely within a political jurisdiction) | 0.0% | 0 |
| Other (please specify) | 0.0% | 0 |
| | <i>answered question</i> | 37 |
| | <i>skipped question</i> | 0 |

| Question 4. How would you classify the agency's primary service-area setting? Choose all that apply. | | |
|--|--------------------------|----------------|
| Answer Options | Response Percent | Response Count |
| Rural | 10.8% | 4 |
| Semi-rural | 24.3% | 9 |
| Suburban/small urban | 62.2% | 23 |
| Urban | 83.8% | 31 |
| Special targeted area (such as a university campus vicinity, a business or employment district, or a corridor) | 21.6% | 8 |
| | <i>answered question</i> | 37 |
| | <i>skipped question</i> | 0 |

| Question 5. What transit services do you manage or operate? Choose all that apply. | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Local fixed-route bus (includes trolleybus and trackless trolley) | 86.5% | 32 |
| Express or commuter bus | 83.8% | 31 |
| Bus rapid transit | 45.9% | 17 |
| Commuter rail | 40.5% | 15 |
| Heavy rail | 21.6% | 8 |
| Light rail | 35.1% | 13 |
| Streetcar | 13.5% | 5 |
| Demand-responsive | 70.3% | 26 |
| Ferry/water taxi | 5.4% | 2 |
| Other transit types (please specify) | 16.2% | 6 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 6. How would you describe the immediate areas around your stations; e.g., not typical curbside stops? Choose all that apply. | | |
|--|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Park and ride/parking facilities available for transit rider use | 86.5% | 32 |
| Downtown or other employment center with some dedicated rider parking (either privately or publicly owned/operated) | 43.2% | 16 |
| Downtown or other employment center with no dedicated rider parking | 73.0% | 27 |
| TOD or other mixed-use districts with some dedicated rider parking | 40.5% | 15 |
| TOD or other mixed-use districts with no dedicated rider parking | 43.2% | 16 |
| Other (please explain) | 8.1% | 3 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 7. What is the nature of the agency's organization? Choose any that apply, or add more detail. | | |
|--|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Autonomous authority (not part of an elected government, but with similar powers such as taxation, bonding, or eminent domain) | 62.2% | 23 |
| Department or division of a local government | 16.2% | 6 |
| Department or division of a state government | 16.2% | 6 |
| Administered within a metropolitan planning organization (MPO) | 8.1% | 3 |
| Other (please explain) | 16.2% | 6 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

Parking Inventory

| Question 8. What percentage of your daily riders drive and park to use your transit system? Report by transit service, if possible. If not available, use "Other". | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Local fixed-route bus (includes trolleybus and trackless trolley) | 41.2% | 14 |
| Express or commuter bus | 52.9% | 18 |
| Bus rapid transit | 17.6% | 6 |
| Commuter rail | 26.5% | 9 |
| Heavy rail | 17.6% | 6 |
| Light rail | 23.5% | 8 |
| Streetcar | 8.8% | 3 |
| Demand-responsive | 11.8% | 4 |
| Ferry/water taxi | 5.9% | 2 |
| Other | 41.2% | 14 |
| <i>answered question</i> | | 34 |
| <i>skipped question</i> | | 3 |

| Question 9. How many parking spaces does your agency own and/or manage? | |
|--|-----------------------|
| Answer Options | Response Count |
| | 37 |
| <i>answered question</i> | |
| <i>skipped question</i> | |
| | 37 |
| | 0 |
| 12 | |
| 140 | |
| 2,366 | |
| 1,000 | |
| 8,000 | |
| 16,887 | |
| 600 | |
| 10,705 | |
| ~18,640 | |
| 25,350 | |
| 30,000 | |
| ~2,400 | |
| 11,413 | |
| 20,000 | |
| 5,600 | |
| ~28,732 | |
| 47,000 | |
| ~ 3,000 | |

| |
|--------------|
| 6,300 |
| 19,867 |
| ~25,000 |
| 3,500 spaces |
| 14,032 |
| 24,500 |
| 47,000 |
| 62,000 |
| 6,687 |
| Unknown |
| 0 |
| 2,957 |
| ~1,000 |
| 0 |
| ~1,024 |
| 0 |
| ~5,300 |
| 1,723 |
| 1,957 |

Question 10. How many parking spaces do you own and/or manage by transit mode? Count only spaces that could be used by riders or customers of the agency, not those principally reserved for agency staff or service uses. If spaces are used for more than one mode, please explain in the 'Other' section:

| Answer Options | Response Percent | Response Count |
|---|------------------|----------------|
| Local fixed-route bus (includes trolleybus and trackless trolley) | 45.7% | 16 |
| Express or commuter bus | 48.6% | 17 |
| Bus rapid transit | 25.7% | 9 |
| Commuter rail | 42.9% | 15 |
| Heavy rail | 22.9% | 8 |
| Light rail | 45.7% | 16 |
| Streetcar | 14.3% | 5 |
| Demand-responsive | 17.1% | 6 |
| Ferry/water taxi | 14.3% | 5 |
| Other | 42.9% | 15 |
| <i>answered question</i> | | 35 |
| <i>skipped question</i> | | 2 |

| Question 11. What types of parking does your agency own and/or manage, besides standard vehicular parking: | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Bicycle parking | 88.6% | 31 |
| Carpool or vanpool spaces | 31.4% | 11 |
| Green/hybrid vehicle spaces | 14.3% | 5 |
| Electric charging stations | 31.4% | 11 |
| Compact vehicle spaces | 22.9% | 8 |
| Large vehicle spaces (e.g. truck, SUV) | 14.3% | 5 |
| Other (please specify) | 14.3% | 5 |
| <i>answered question</i> | | 35 |
| <i>skipped question</i> | | 2 |

| Question 12. Do your passengers/riders use parking facilities owned and/or managed by other entities? Choose all that apply. | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Municipal | 84.8% | 28 |
| Private operator of a single use lot or structure | 57.6% | 19 |
| Private operator of a lot or structure associated with another use (e.g. church, residences, etc.) | 57.6% | 19 |
| Another transit agency | 36.4% | 12 |
| Quasi-public agency | 12.1% | 4 |
| Other (please explain) | 30.3% | 10 |
| <i>answered question</i> | | 33 |
| <i>skipped question</i> | | 4 |

| Question 13. Does your agency charge for parking? | | |
|--|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 40.5% | 15 |
| No | 59.5% | 22 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

Parking Pricing Policies

| Question 14. Why does your agency charge for parking? Choose all that apply. | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Manage demand | 53.3% | 8 |
| Generate revenue | 73.3% | 11 |
| Cover costs | 53.3% | 8 |
| Balance demand between stations | 6.7% | 1 |
| Attract riders | 13.3% | 2 |
| Other (please specify) | 20.0% | 3 |
| <i>answered question</i> | | 15 |
| <i>skipped question</i> | | 22 |

| Question 15. How are parking rates determined? Please explain, include link to policy document, or email us the policy document. | |
|---|-----------------------|
| Answer Options | Response Count |
| | 14 |
| <i>answered question</i> | 14 |
| <i>skipped question</i> | 23 |

| Question 16. What is the annual revenue the agency collected from parking in the most recent known year? | | |
|---|--------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Year reported | 86.7% | 13 |
| Parking permits/daily/hourly payments: \$ | 66.7% | 10 |
| Special Event parking: \$ | 26.7% | 4 |
| Parking fees and citations: \$ | 26.7% | 4 |
| Other (specify): \$ | 20.0% | 3 |
| | <i>answered question</i> | 15 |
| | <i>skipped question</i> | 22 |

Parking Pricing: Weekdays

| Question 17. What are your most common parking rates? Choose the nearest value. | | | | |
|--|------------------------|--------------------------|-------------------------|-----|
| Hourly Rate (\$) | Daily Rate (\$) | Monthly Rate (\$) | Annual Rate (\$) | |
| | 1 | 5 | 30 | 15 |
| | 1 | 2 | 100 | 170 |
| | 1 | 5 | 30 | |
| | | 2 | 5 | |
| | | 10 | 22 | |
| | | 4 | 26 | |
| | | 1 | | |
| | | 3 | | |
| | | 5 | | |
| | | 2 | | |
| | | 15 | | |
| | | .5 | | |

Question 18. What is your range of parking rates? Choose the closest numbers.

| Hourly Rate (\$) - Low | Hourly Rate (\$) - High | Daily Rate (\$) - Low | Daily Rate (\$) - High | Monthly Rate (\$) - Low | Monthly Rate (\$) - High | Annual Rate (\$) - Low | Annual Rate (\$) - High |
|------------------------|-------------------------|-----------------------|------------------------|-------------------------|--------------------------|------------------------|-------------------------|
| 1 | 1 | 5 | 8 | 42 | 42 | 15 | 15 |
| 1 | 2 | 2 | 2 | Less than \$0.50 | | 110 | 170 |
| 1 | | 2 | 5 | 100 | 100 | | |
| | | Less than \$0.50 | 11 | 42 | 30 | | |
| | | 10 | 10 | 22 | 170 | | |
| | | 1.5 | 12 | 26 | 22 | | |
| | | 1 | 3 | | 26 | | |
| | | 3.5 | 7.5 | | | | |
| | | 2 | 5 | | | | |
| | | 15 | 2 | | | | |
| | | Less than \$0.50 | 25 | | | | |
| | | | 1.5 | | | | |

Question 19. How do your rates compare with typical rates for private or municipal parking facilities near transit stops/stations?

| Answer Options | Response Percent | Response Count |
|-----------------------------|------------------|----------------|
| Agency rates higher | 6.7% | 1 |
| Agency rates about the same | 20.0% | 3 |
| Agency rates lower | 46.7% | 7 |
| Varies widely | 6.7% | 1 |
| Other (please specify) | 20.0% | 3 |
| <i>answered question</i> | | 15 |
| <i>skipped question</i> | | 22 |

Question 20. If you provide parking for special events, do you have event rates?

| Answer Options | Response Percent | Response Count |
|--------------------------|------------------|----------------|
| Yes | 38.5% | 5 |
| No/ N/A | 61.5% | 8 |
| Typical event rates: | | 3 |
| <i>answered question</i> | | 13 |
| <i>skipped question</i> | | 24 |

Question 21. Do you charge for parking on weekends (Saturday - Sunday)?

| Answer Options | Response Percent | Response Count |
|--------------------------|------------------|----------------|
| Yes | 46.7% | 7 |
| No | 53.3% | 8 |
| <i>answered question</i> | | 15 |
| <i>skipped question</i> | | 22 |

Parking Pricing: Weekends

Question 22. What are your most common parking rates? Choose the nearest value.

| Hourly Rate (\$) | Daily Rate (\$) | Monthly Rate (\$) | Annual Rate (\$) | |
|------------------|-----------------|-------------------|------------------|-----|
| | 2 | 5 | 30 | 170 |
| | 1 | 2 | 100 | |
| | | 5 | 22 | |
| | | 10 | | |
| | | 2 | | |

Question 23. What is your range of parking rates? Choose the closest numbers.

| Hourly Rate (\$) - Low | Hourly Rate (\$) - High | Daily Rate (\$) - Low | Daily Rate (\$) - High | Monthly Rate (\$) - Low | Monthly Rate (\$) - High | Annual Rate (\$) - Low | Annual Rate (\$) - High |
|------------------------|-------------------------|-----------------------|------------------------|-------------------------|--------------------------|------------------------|-------------------------|
| Less than \$.50 | 1 | 5 | 8 | Less than \$.50 | 110 | 170 | 250 |
| 1 | Less than \$.50 | 2 | 2 | 100 | 100 | | |
| Less than \$.50 | | 2 | 5 | 22 | 22 | | |
| | Less than \$.50 | | 11 | | | | |
| | | 10 | 10 | | | | |
| | | 2 | 2 | | | | |

No Parking Pricing

Question 24. Why don't you charge for parking? Choose all that apply.

| Answer Options | Response Percent | Response Count |
|-------------------------------------|--------------------------|----------------|
| Attract more riders | 66.7% | 14 |
| Minimize spillover parking | 0.0% | 0 |
| Not enough demand | 38.1% | 8 |
| Cost to maintain technology | 42.9% | 9 |
| Cost to enforce | 52.4% | 11 |
| Public or rider resistance/pushback | 52.4% | 11 |
| Nearby parking is free | 47.6% | 10 |
| Included in transit pass | 0.0% | 0 |
| State or municipal laws | 0.0% | 0 |
| Other (please specify) | 28.6% | 6 |
| | <i>answered question</i> | 21 |
| | <i>skipped question</i> | 16 |

| Question 25. Do you provide parking for special events? | | |
|---|--------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 36.4% | 8 |
| No/ N/A | 63.6% | 14 |
| If yes, do you charge for parking? What are your typical event rates? | | 7 |
| | <i>answered question</i> | 22 |
| | <i>skipped question</i> | 15 |

Parking Management

| Question 26. What division of your agency is responsible for parking management? | |
|---|------------------------------------|
| Answer Options | Response Count |
| | 35 |
| | <i>answered question</i> 35 |
| | <i>skipped question</i> 2 |
| Operations | |
| Point2Point Transportation Options | |
| Finance—Facilities | |
| Capital Planning | |
| Facilities and Transit Police (enforcement) | |
| Planning Department | |
| Facilities Maintenance | |
| Engineering is responsible for maintenance. Real Estate is responsible for business agreements etc. | |
| Planning/Parking Management | |
| Finance-Parking Services | |
| Safety, Security and Facilities | |
| Transit Service Planning and Customer Service | |
| Capital Projects—Operating Projects | |
| Facilities Maintenance | |
| Revenue Division/Business Development Department | |
| N/A | |
| Real Estate | |
| Strategic Planning | |
| Rail and Parking Division located within the Office of Performance Management | |
| King County Metro Transit Division. The Service Development group is largely responsible for policy and may facilitate discussions of parking management in the future. | |
| Customer Service | |

Strategic Investments
 Operations
 Revenue & Ridership under Finance and planning
 Customer access department
 Office of Parking reporting to our Deputy General Manager for Operations
 Operations Division
 Maintenance
 None
 Joint Use Development/Long Range Planning & System Development
 N/A
 Operations
 Property Development & Management (Real Estate)
 Maintenance Department
 Strategic Planning & Project Development

Question 27. How does your agency approach parking management?

| Answer Options | Response Percent | Response Count |
|--|------------------|----------------|
| System-wide approach applied uniformly to all parking resources (for example same hours, same rates, etc.) | 28.6% | 10 |
| By using a station typology (for example, a different model for stations with structures than for those with surface lots) | 8.6% | 3 |
| Specific station-by-station | 37.1% | 13 |
| Other (please explain) | 25.7% | 9 |
| <i>answered question</i> | | 35 |
| <i>skipped question</i> | | 2 |

Question 28. Does your agency have a long-term plan or defined vision for parking at transit stations? This could be a simple policy on replacement or future addition, or might be more elaborate. Please describe as appropriate.

| Answer Options | Response Count |
|--------------------------|----------------|
| | 33 |
| <i>answered question</i> | 33 |
| <i>skipped question</i> | 4 |

Question 29. Does your agency have any specific policies regarding the allocation of bicycle, carpool, green vehicle, or other non-traditional spaces?

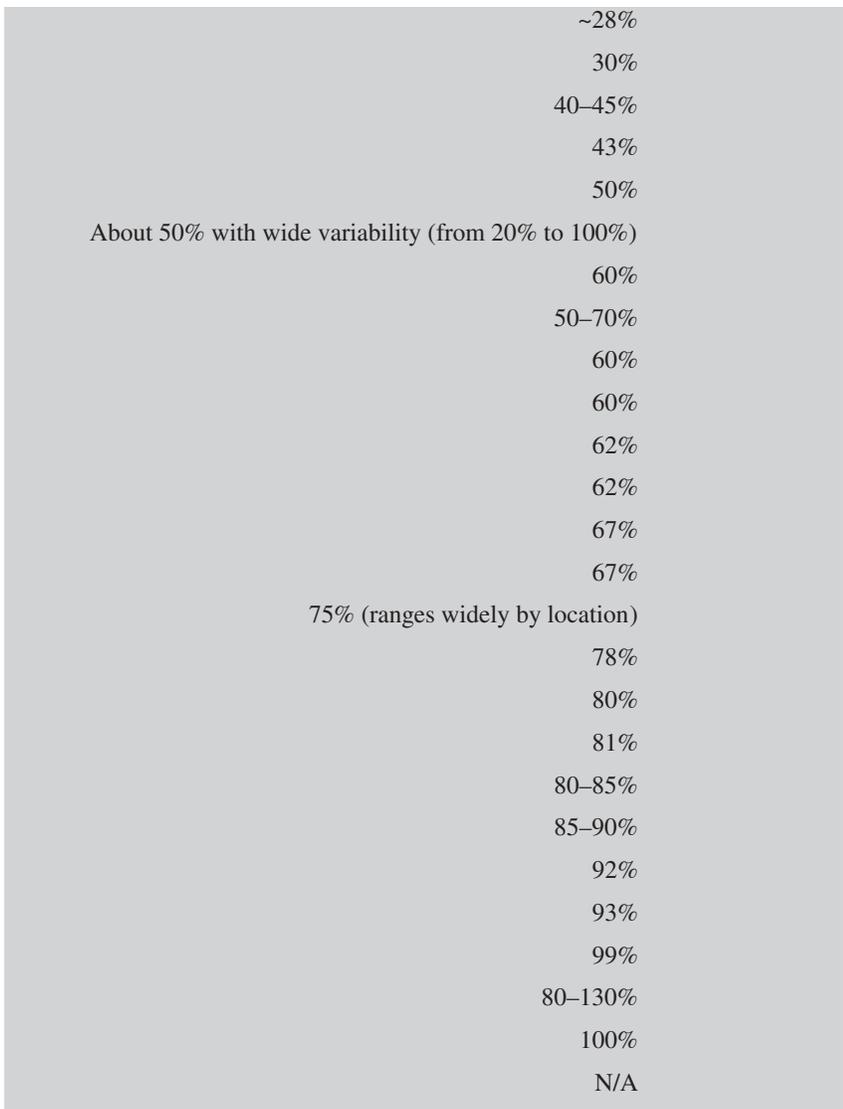
| Answer Options | Response Percent | Response Count |
|--|------------------|----------------|
| Yes | 27.8% | 10 |
| No | 72.2% | 26 |
| If yes, please describe policies, include a web link, or email us the policy document. | | 13 |

| Question 30. Does your agency have arrangements in which other entities are allowed to use parking your agency owns or operates, especially outside of traditional commute hours? | | |
|--|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 67.6% | 25 |
| No | 32.4% | 12 |
| Please explain. | | 22 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 31. Does your agency have arrangements with owners or operators of private parking facilities (especially garages or parking serving private properties) to allow spaces to be used for transit riders? | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 50.0% | 18 |
| No | 50.0% | 18 |
| If yes, please explain. | | 17 |
| <i>answered question</i> | | 36 |
| <i>skipped question</i> | | 1 |

| Question 32. What percentage of your facilities is full at peak? | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| 90%–100% of facilities are full at peak | 5.4% | 2 |
| 70%–90% of facilities are full at peak | 16.2% | 6 |
| 50%–70% of facilities are full at peak | 21.6% | 8 |
| 25%–50% of facilities are full at peak | 8.1% | 3 |
| 0–25% of facilities are full at peak | 40.5% | 15 |
| N/A | 8.1% | 3 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 33. What is typical peak parking utilization for all parking in your agency’s system? | | |
|---|-----------------------|-----------|
| Answer Options | Response Count | |
| | 31 | |
| <i>answered question</i> | | 31 |
| <i>skipped question</i> | | 6 |
| 20% | | |
| 25% | | |



Question 34. What resources does your agency use to enforce parking? Select any of the following that apply:

| Answer Options | Response Percent | Response Count |
|--|------------------|----------------|
| Agency staff or police | 74.2% | 23 |
| Municipal police | 22.6% | 7 |
| Private management vendor under contract with the agency | 32.3% | 10 |
| Other public agency (such as a city or county government department) | 22.6% | 7 |
| <i>answered question</i> | | 31 |
| <i>skipped question</i> | | 6 |

Parking Planning

| Question 35. Does your agency currently plan on constructing, acquiring, or leasing additional parking facilities for transit riders' use? Please explain. | |
|---|-----------------------|
| Answer Options | Response Count |
| | 36 |
| <i>answered question</i> | 36 |
| <i>skipped question</i> | 1 |

| Question 36. Does your agency have a parking replacement policy when changes are made on the station site? This generally involves redevelopment of the station site or area, but might also be applied to other changes that consume parking spaces like added bus bays or utility structures. | | |
|--|--------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 36.1% | 13 |
| No | 63.9% | 23 |
| If yes, please describe: is it a target ratio of spaces removed to spaces replaced, a required ratio, an analytic tool, or something else (like a proffer system with partner agencies and developers)? | | 16 |
| | <i>answered question</i> | 36 |
| | <i>skipped question</i> | 1 |

| Question 37. How has your agency funded the construction of parking facilities that the agency owns and operates? | |
|---|--------------------------|
| Answer Options | Response Count |
| | 32 |
| | <i>answered question</i> |
| | 32 |
| | <i>skipped question</i> |
| | 5 |
| CMAQ funds. | |
| FTA and LTD funds | |
| Currently, primarily local funding. Federal grants were used for construction of several locations in the 1990s. | |
| DOT funds or local impact fee funds. | |
| We have only funded parking lots at our rail stations or park-n-ride lots. These are funded when the stations are rehabilitated using Rail Modernization funds or other FTA sources (State of Good Repair, etc.). | |
| Federal grants, state grants, partnerships, agency capital | |
| FTA grants and local transit funds | |
| A combination of federal grants and local match \$ associated with transit center/light rail projects. | |
| Federal funding when the station is built | |
| With agency funds/federal matching funds | |
| This varies widely. Usually there is some federal money involved via STP-DA or CMAQ funds. Right now we are moving towards more leasing. Bus replacement funds are a bigger focus for us right now. | |

Combination of grant funding (linked to LRT expansion) and general funds.

Yes

Mix of Federal, State and local funding. Most were built as part of large capital projects when stations/lines were built.

A mix of local, state, and federal funds.

Varies - from straight capital funding to revenue financing.

Primarily, the agency constructs parking through our yearly capital budget that is funded through participating municipalities' 1% sale tax. FTA provided some funding for one park-and-ride.

Yes, parking garages

Past grant funders have included: FTA, FHWA, state DOT. Local match funds may also be involved.

Through our Capital Program

Capital Program

Through the capital program. One structured parking facility will be a public private partnership.

Grant funding.

Funding is by others or part of the joint development deal.

Variety of sources; CMAQ or part of fixed guideway transit projects

N/A

Local funds.

Federal funding has developed the existing commuter rail stations and parking.

Variety of methods. Grants, partnerships, etc.

Through local, state and Federal funds. VTA is also investigating any grant opportunities.

CMAQ funds

Federal & local funds

Question 38. With which partner agencies does your agency collaborate on parking management? Choose all that apply.

| Answer Options | Response Percent | Response Count |
|---|------------------|----------------|
| Municipality or multiple municipalities | 86.7% | 26 |
| Private operators, business, or institution | 63.3% | 19 |
| Downtown development authority, community redevelopment agency, or similar | 16.7% | 5 |
| Metropolitan planning organization (MPO), council of governments (COG), regional planning association (RPA), or similar regional agency | 30.0% | 9 |
| State agency (especially a transportation agency) | 53.3% | 16 |
| Other (please explain) | 3.3% | 1 |
| <i>answered question</i> | | 30 |
| <i>skipped question</i> | | 7 |

Question 39. How important are these strategies to your agency when looking to increase ridership?

| Answer Options | Very Important | Moderately Important | Slightly Important | Low Importance | Not Important | N/A | Rating Average | Response Count |
|---|-----------------------|-----------------------------|---------------------------|-----------------------|----------------------|------------|-----------------------|-----------------------|
| Marketing/Advertising | 14 | 15 | 6 | 1 | 0 | 1 | 4.17 | 37 |
| Strategic partnerships with other agencies (such as universities, business improvement districts, etc.) | 19 | 11 | 4 | 2 | 0 | 1 | 4.31 | 37 |
| Station area planning and development, especially transit-oriented development | 17 | 16 | 2 | 1 | 0 | 1 | 4.36 | 37 |
| Providing parking at stations or major stops | 13 | 13 | 6 | 4 | 0 | 1 | 3.97 | 37 |
| New transit capital infrastructure | 18 | 14 | 3 | 0 | 0 | 1 | 4.43 | 36 |
| New rolling stock | 13 | 12 | 10 | 1 | 0 | 1 | 4.03 | 37 |
| Improved operational efficiency | 21 | 13 | 1 | 1 | 0 | 1 | 4.50 | 37 |
| Passenger amenities (either on or off transit vehicles) | 14 | 21 | 0 | 1 | 0 | 1 | 4.33 | 37 |
| Increased security at stations and stops and on vehicles | 14 | 18 | 2 | 2 | 0 | 1 | 4.22 | 37 |
| Bicycle parking | 5 | 15 | 14 | 2 | 0 | 1 | 3.64 | 37 |
| Improved station access (e.g., surrounding area improvements) | 16 | 17 | 2 | 1 | 0 | 1 | 4.33 | 37 |
| Priority parking (e.g., carpool, compact, green, etc.) | 3 | 9 | 10 | 8 | 5 | 2 | 2.91 | 37 |
| Real-time arrival information | 21 | 11 | 3 | 1 | 0 | 1 | 4.44 | 37 |
| Other (please specify) | | | | | | | | 2 |
| <i>answered question</i> | | | | | | | | 37 |
| <i>skipped question</i> | | | | | | | | 0 |

Parking Planning

| Question 40. Does your agency have a dedicated real estate office? | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 59.5% | 22 |
| No | 40.5% | 15 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 41. Has this office engaged in, or does it have authority to engage in any, joint development partnerships on agency-owned land? | | |
|--|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 71.9% | 23 |
| No | 28.1% | 9 |
| <i>answered question</i> | | 32 |
| <i>skipped question</i> | | 5 |

| Question 42. Has your agency considered or implemented structured parking at stations to create more space for TOD or a joint development? | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Yes | 70.3% | 26 |
| No | 29.7% | 11 |
| If yes, please explain or give an example. | | 17 |
| <i>answered question</i> | | 37 |
| <i>skipped question</i> | | 0 |

| Question 43. Has your agency used any of these value capture strategies: | | |
|---|-------------------------|-----------------------|
| Answer Options | Response Percent | Response Count |
| Transportation utility fees | 3.8% | 1 |
| Development impact fees | 15.4% | 4 |
| Negotiated exactions | 11.5% | 3 |
| Joint development | 65.4% | 17 |
| Air rights | 26.9% | 7 |
| Other | 23.1% | 6 |
| <i>answered question</i> | | 26 |
| <i>skipped question</i> | | 11 |

Question 44. If your agency has used value capture, how has it done so? Do the value capture policies affect the parking requirements near transit stations?

| Answer Options | Response Count |
|--------------------------|----------------|
| | 14 |
| <i>answered question</i> | 14 |
| <i>skipped question</i> | 23 |

Question 45. To what extent has your agency been involved in developing municipal parking policies at station areas (e.g. encouraging higher or lower requirements)?

| Answer Options | Response Percent | Response Count |
|--|--------------------------|----------------|
| We are regularly involved in these discussions/decision-making | 21.2% | 7 |
| We are involved with some municipalities | 39.4% | 13 |
| We are rarely involved with this type of decision-making | 18.2% | 6 |
| We have never worked with municipalities on this topic | 9.1% | 3 |
| Other (please explain) | 12.1% | 4 |
| | <i>answered question</i> | 33 |
| | <i>skipped question</i> | 4 |

Question 46. Do the local governments in your service area have land use policies or regulations that encourage TOD or transit-supportive development densities? If yes, do these policies and regulations generally set reduced parking requirements at or near transit stations?

| Answer Options | Response Count |
|--------------------------|----------------|
| | 30 |
| <i>answered question</i> | 30 |
| <i>skipped question</i> | 7 |

Bonus Page

Question 47. Is there anything else that your agency does that is relevant or that you want to share?

| Answer Options | Response Count |
|--------------------------|----------------|
| | 12 |
| <i>answered question</i> | 12 |
| <i>skipped question</i> | 25 |

Abbreviations and acronyms used without definitions in TRB publications:

| | |
|------------|--|
| A4A | Airlines for America |
| AAAE | American Association of Airport Executives |
| AASHO | American Association of State Highway Officials |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI-NA | Airports Council International-North America |
| ACRP | Airport Cooperative Research Program |
| ADA | Americans with Disabilities Act |
| APTA | American Public Transportation Association |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ATA | American Trucking Associations |
| CTAA | Community Transportation Association of America |
| CTBSSP | Commercial Truck and Bus Safety Synthesis Program |
| DHS | Department of Homeland Security |
| DOE | Department of Energy |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FAST | Fixing America's Surface Transportation Act (2015) |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| HMCRP | Hazardous Materials Cooperative Research Program |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISTEA | Intermodal Surface Transportation Efficiency Act of 1991 |
| ITE | Institute of Transportation Engineers |
| MAP-21 | Moving Ahead for Progress in the 21st Century Act (2012) |
| NASA | National Aeronautics and Space Administration |
| NASAO | National Association of State Aviation Officials |
| NCFRP | National Cooperative Freight Research Program |
| NCHRP | National Cooperative Highway Research Program |
| NHTSA | National Highway Traffic Safety Administration |
| NTSB | National Transportation Safety Board |
| PHMSA | Pipeline and Hazardous Materials Safety Administration |
| RITA | Research and Innovative Technology Administration |
| SAE | Society of Automotive Engineers |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005) |
| TCRP | Transit Cooperative Research Program |
| TDC | Transit Development Corporation |
| TEA-21 | Transportation Equity Act for the 21st Century (1998) |
| TRB | Transportation Research Board |
| TSA | Transportation Security Administration |
| U.S.DOT | United States Department of Transportation |

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