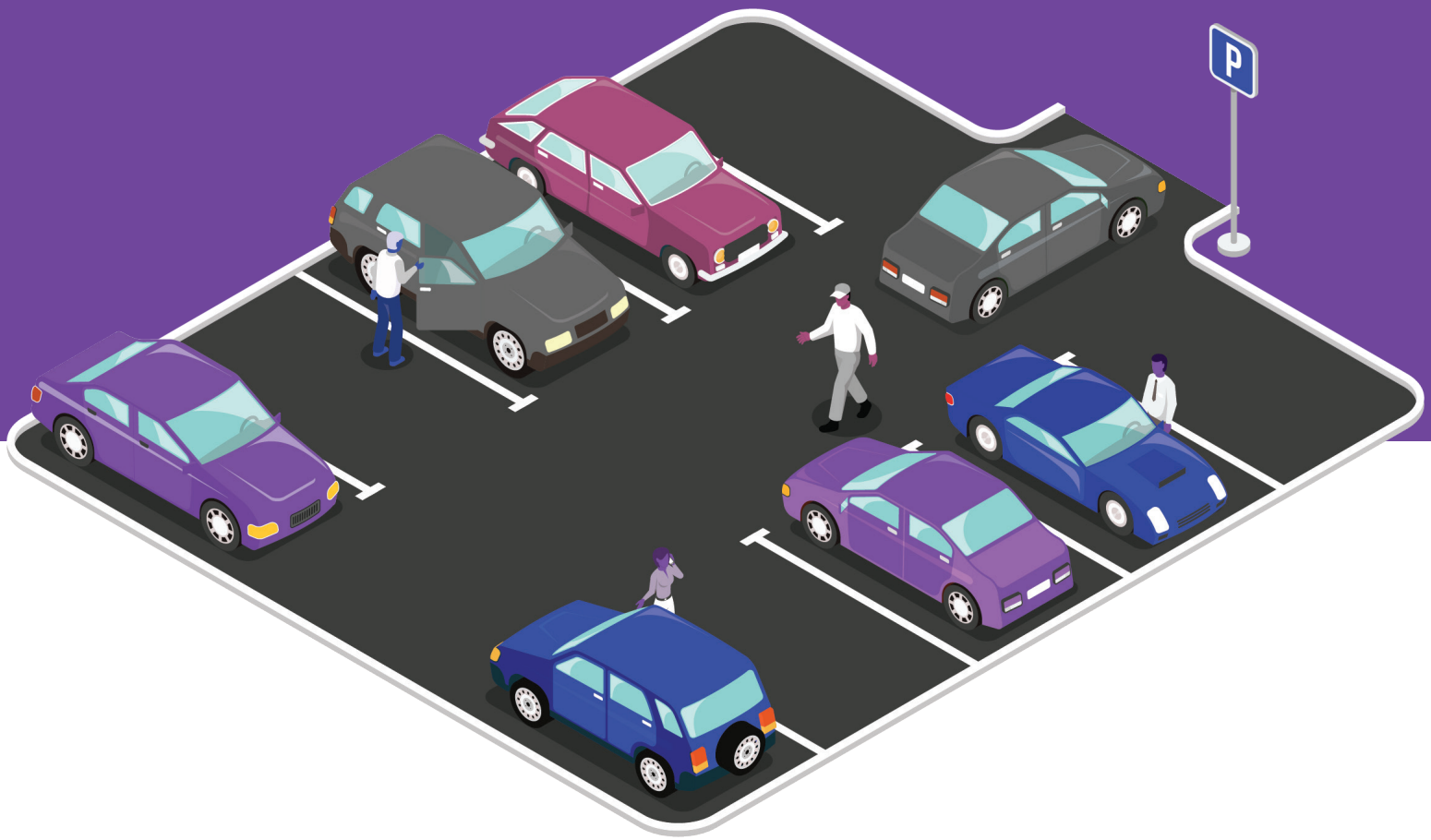
Metro Boston

# Perfect Fit Parking Initiative

Phase II Report




**Metropolitan Area Planning Council**

July 2019

# Acknowledgments

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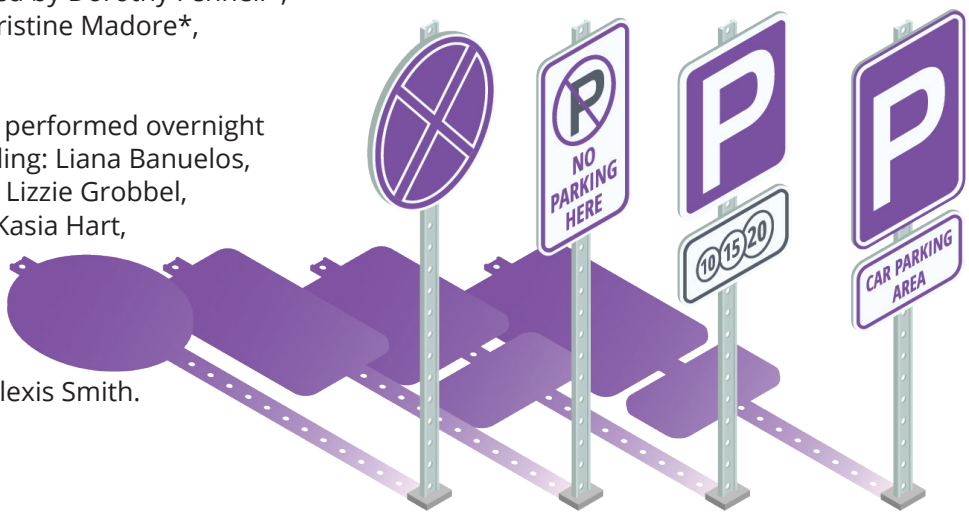

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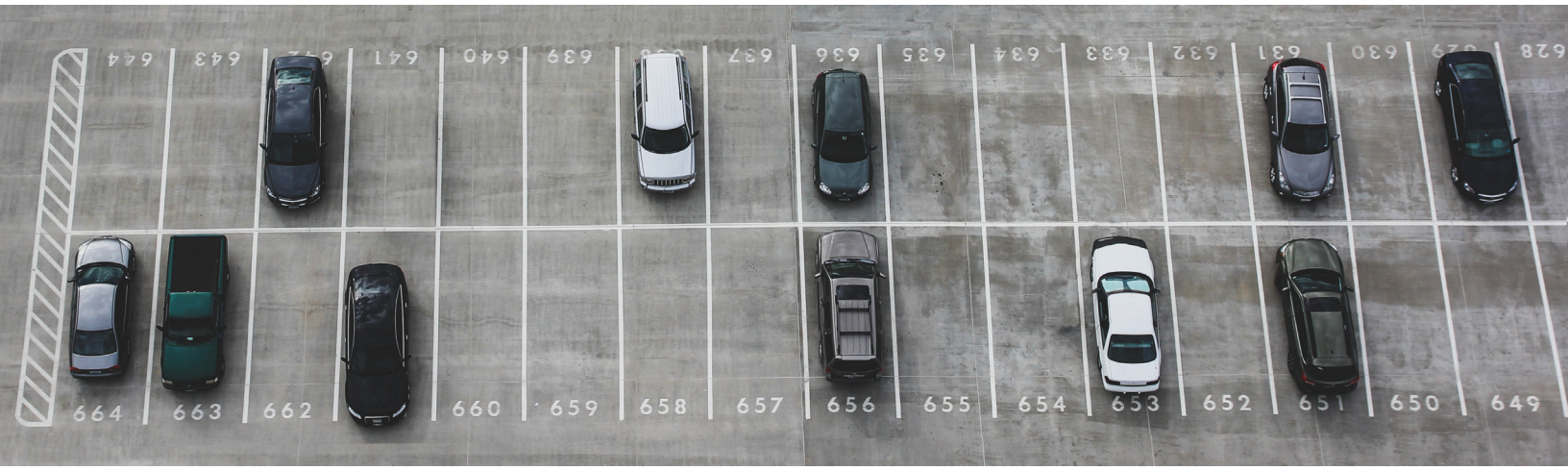
# About MAPC

The Metropolitan Area Planning Council (MAPC) is the regional planning agency that serves the people who live and work in the 101 cities and towns of Metropolitan Boston. Our mission is to promote smart growth and regional collaboration. Our regional plan, MetroFuture: Making a Greater Boston Region, guides our work as we engage the public in responsible stewardship of our region's future. The development of MetroCommon 2050, MAPC's next regional plan, is underway.

We work toward sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, a diverse housing stock, public safety, economic development, clean energy, healthy communities, an informed public, and equity and opportunity for all.




# Executive Summary

Parking, and especially the amount of parking that should be required with new housing, is a hotly-debated issue in Metro Boston. Some neighbors worry about competition for on-street spaces. Others want to discourage people with more cars from moving into the neighborhood. Developers are understandably focused on marketability and the bottom line. However, there's little guidance on how much parking is actually needed for a given development – and how much is too much.

Excess parking has real consequences. Property that could be landscaped as common or even public green space is instead paved over as parking. Since car owners prefer to live in buildings with easy parking, providing abundant parking encourages more vehicles on the site, increasing the number of trips and traffic on nearby roads. In neighborhoods that are accessible to an MBTA station, this means fewer people use the available transit, while congestion, pollution, and greenhouse gas emissions rise. Finally, of special concern in the face of Greater Boston's housing supply and affordability crisis, more parking means fewer (and more expensive) housing units.[1]

Moreover, transportation infrastructure, design, and travel behaviors are rapidly evolving. Urban residents are turning more often to new options, such as ride-hailing, bike-sharing, and car-sharing. Vehicles able to park themselves, on the market now, can make use of smaller parking garages with more compact stalls and aisles. These changes will affect parking needs in the very near future. In the further future, autonomous vehicle technology may create an even more radical transformation. This is especially likely if fleets of always-available shared vehicles predominate the autonomous mobility world. In that case, parking demand will likely decrease as vehicles will be in use more of the time.

Despite these ongoing and imminent changes in mobility and car ownership, municipal parking regulations are generally the same as they've been for decades. Requirements are often uniform across an entire municipality, and are rarely informed by real-world data about parking demand in existing developments. Almost none of these regulations account for how the need for parking may vary with development type, location, cost, or transit service. And since minimizing competition for existing on-street spaces – which can be a valid concern – is often the principle purpose of parking regulations, municipalities are naturally inclined to over-prescribe parking as a precaution against spillover.

A more "perfect fit" of parking supply and demand can lower development costs, enable more

1 Appendix A describes how excess parking poses barriers to the development of dense, walkable communities.

affordable housing, free up land for open space, and promote sustainable transportation, while also protecting neighborhoods from spillover parking. Communities that adopt a more data-driven approach to decision-making are better able to respond to changing demographics, unique building characteristics, new transportation technologies, and evolving commuting practices.

Over the past three years, MAPC has set out to measure the actual supply of and demand for residential parking in the Inner Core subregion, which includes Boston and 20 surrounding cities and towns. We interviewed property managers and conducted overnight counts of parking spaces and parked cars at nearly 200 multifamily residential developments in 14 municipalities: Arlington, Boston, Cambridge, Chelsea, Everett, Malden, Medford, Melrose, Newton, Quincy, Revere, Somerville, Waltham, and Watertown. The survey included apartments and condos, large and small projects, and projects close to and far from transit. Counts took place during peak utilization hours: in the middle of the night on weeknights, and not during the summer or near major holidays. Over two phases of research, we obtained data from 189 sites across the study area.[2] The sites included 19,600 housing units, most of which have been built since 2000, and all of which provide off-street parking.

The amount of parking provided varied widely, ranging from 0.25 to 2.0 spaces per unit. The average was exactly 1.0 parking space per unit. Yet it appeared that residents didn't need that much parking, because the garages and lots we visited were rarely full, and many had ample empty parking. In the vast majority of developments we studied, the average parking use was less than one space per household, and across the entire sample, only 70 percent of the available spaces were full when surveyed. In affordable housing developments (sites where 50 percent or more of the apartments are deed restricted) demand was even lower: only 0.55 cars were parked per household.

Overall, 30 percent of the available parking we surveyed was not being used. At a quarter of the sites, less than half the parking was occupied. The pattern of oversupply was observed in all 14 cities and towns. MAPC counted nearly 6,000 empty parking spaces—over 41 acres of pavement—representing an estimated $94.5 million in construction costs (or about $5,000 per housing unit in the survey).[3]

Of course, supply and demand differed at every site. To help explain the variation, we measured 25 neighborhood and building characteristics and investigated their correlation with parking demand (defined as parked cars per occupied housing unit). After exploring all of those variables and their interactions, we identified three factors as strongly predictive of parking demand: transit connectivity (jobs within a 30-minute transit commute); percentage of deed-restricted affordable units; and the amount of parking supplied. In fact, supply (spaces per unit) was the single biggest predictor of demand, suggesting that the availability of parking is attracting car-owning households and influencing their behavior. The more parking is provided, the more likely it is that a household will use it.

These findings make it clear: not only is the over-building of parking in residential developments wasting tremendous amounts of money and useful space; but the provision of abundant parking may also be counterproductive to local transportation goals for traffic and sustainability. Transit-proximate developments that provide easy parking are less transit-oriented than they might seem: they're attracting car-owning households less inclined to use the available transit and more likely to use their cars, affecting local traffic with every trip.

2 Phase 1 of this effort, which took place from 2015-2017, comprised 80 sites in five communities north of Boston: Arlington, Chelsea, Everett, Malden, and Melrose. Results are described in a separate report.

3 Blended rate determined by average construction costs for surface and garage spaces and based on proportion of surface (42 percent) and garage (58 percent) spaces observed during overnight parking counts. We estimated an average construction cost of $23,500 per garage space based on WGI's Parking Structure Cost Outlook for 2018, which assumes all above-grade construction. For surface space construction costs, several sources (including Todd Litman's "Parking Requirement Impacts on Housing Affordability" and Joe Cortright's "The price of parking") cite costs at $5,000-$10,000/space; we assumed a below average rate at $6,000/surface space.

Cities and towns shape the region's transportation future through their land use regulations, and they would do well to implement parking requirements aligned with actual parking demand, emerging trends, and transportation policy objectives. A data-driven approach to modifying parking requirements and instituting smart parking policies can prevent excess parking construction, reduce development costs, and make additional land available for more productive uses, such as more housing units. As this research shows, the right parking policies also have a role to play in enabling more housing production near transit and promoting the use of low-carbon transportation modes.

Some of the communities in the study area have already taken steps to tackle excess parking, allowing for more flexible parking requirements in some of their most walkable and transit-oriented districts. The findings from our research, however, reveal that more work needs to be done.

For cities and towns looking to alleviate the burdens of excess parking and to expand sustainable transportation options to residents, MAPC recommends the following:

**Require fewer spaces—or none at all**

Much of the oversupply we observed stemmed from excessive parking requirements in the local zoning code. In Metro Boston, many developments are approved through a special permit process. During this process, developers often advocate for reducing parking beyond the minimums required through zoning, but confront resistance from neighbors. Every city and town can consider reducing their existing requirements, and, more importantly, can tailor those requirements to different types of development in different locations. Shared parking (daytime/nighttime) is one proven strategy for reducing parking construction while meeting community needs. In some cases, and as San Francisco has just done, parking minimums can be entirely eliminated, and parking maximums established to prevent over-supply.

**Design transit-oriented developments for transit-oriented households**

Abundant parking at developments meant to be transit-oriented is counter-productive. It attracts car owners; makes housing less affordable for car-free or car-limited households; and encourages residents to use cars for trips that could be made by transit, walking, or biking. New housing in areas with good transit connections should provide less than one space per unit, so as to attract households with fewer vehicles. Bike storage, car sharing, transit subsidies, shuttles, and human-oriented design are also all key elements of transit-oriented development.

**Don't make people pay for what they don't need**

In many developments, housing and parking is a package deal. Car-free households have to pay for parking they don't use or are tempted to buy a car to take advantage of the free parking. Property owners should unbundle the rental costs for housing and parking so that residents can choose whether or not to rent a parking space. State and local regulators should encourage or require property owners to do so. Furthermore, regulations and development approvals should be structured so that parking spaces not needed by building residents can be leased to neighbors, local employees, or commuters.

**Less parking, more affordable housing**

Developments with more subsidized units require less parking than market-rate developments, and produce correspondingly fewer auto trips. Communities seeking to reduce traffic impacts of new

development should require more affordable units and enable lower parking requirements in return. This is particularly true for development sites near transit, where affordable requirements should be higher than elsewhere, and parking requirements lower. State and local regulators should provide credit for lower levels of car ownership and trip generation at sites that include a substantial amount of affordable housing, and affordable housing funders and developers should avoid spending scarce public resources on parking that is likely to go unused by residents who can't afford to own a car.

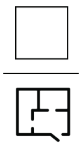
**Get ready for a parking marketplace**

The increasing pressure on street parking, combined with excess parking in residential (and possibly commercial) developments and the rise of the sharing economy, sets the stage for an app-enabled marketplace in which residents and property owners can rent spaces on demand, for minutes or months (think Airbnb for cars). Public agencies have the opportunity to set parameters and tax policy now, before this market has established itself and becomes resistant to regulation. Cities and towns can be leaders in this field until the Commonwealth acts.

Along with other strategies described in the report, these approaches can be used by municipalities, developers, advocates, and other stakeholders looking to implement a smart parking solution and to reduce the barrier excess parking places on the development of transit-oriented, walkable, and diverse communities.

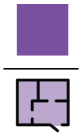
## Definitions of terms used in the report:

**Parking Supply per Unit**



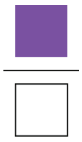
the total number of parking spaces divided by the total number of housing units

**Parking Demand per Unit**



the number of occupied parking spaces divided by the number of occupied housing units

**Parking Utilization**



the number of occupied parking spaces divided by the total number of parking spaces

total housing units

unoccupied housing units

occupied housing units

total parking spaces

unoccupied parking spaces

occupied parking spaces

# Methodology

There is little comprehensive, hard data on residential parking supply and demand, and there are few studies about the factors that influence residential parking demand.[4] An exception is work done by the Center for Neighborhood Technology (CNT), which has spearheaded efforts to collect data on parking utilization at residential developments in several urban areas, including King County, Washington, and Washington, D.C.[5,6] This work was part of an effort to move away from one-size-fits-all parking requirements. It used parking utilization data to characterize parking demand in a particular community or region, with the aim of making parking requirements more comparable to the actual amount of parking residents use.

MAPC's Perfect Fit Parking Initiative builds off this prior work to create a database and model of parking supply and demand in the Inner Core subregion of Metro Boston. We collected data on multifamily buildings/complexes with nine or more units and off-street residential parking provided on-site. In the most recent phase of data collection, MAPC opted to limit analysis to sites constructed in 2000 or later, in an effort to gather data around the most up-to-date trends in parking supply and demand. We also tested to ensure that the selected sites were representative of recent development and showed a similar distribution of density, size, transit access, etc. In both phases, MAPC worked with both municipalities and property management companies to identify eligible sites and receive permission to study them. MAPC then surveyed property managers and conducted overnight parking counts to obtain specific statistics for each development. Finally, MAPC created a statistical model to explain parking demand. Each step of the methodology is summarized below and more thoroughly detailed in the Perfect Fit Parking Initiative Technical Memo.


4 Rachel Weinberger, "Death by a Thousand Curb-Cuts: Evidence on the Effect of Minimum Parking Requirements on the Choice to Drive," Transport Policy, Urban Transport Initiatives, 20 (March 2012): 93–102, doi:10.1016/j.tranpol.2011.08.002.

5 "Right Size Parking: Final Report" (King County Metro, August 2015), http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-final-report-8-2015.pdf.

6 Jonathan Rogers et al., "Estimating Parking Utilization in Multi-Family Residential Buildings in Washington, D.C.," Transportation Research Board, November 13, 2015, http://www.cnt.org/sites/default/files/publications/DR1_TRB_DC%20Multifamily%20Parking%20Utilization.pdf.

# Study Area

The surveyed sites (see Figure 1) are located within the Inner Core subregion. The Inner Core covers the densest part of Greater Boston within Route 128, and is home to about 1.7 million residents, approximately 56 percent of whom are renters.[7,8]

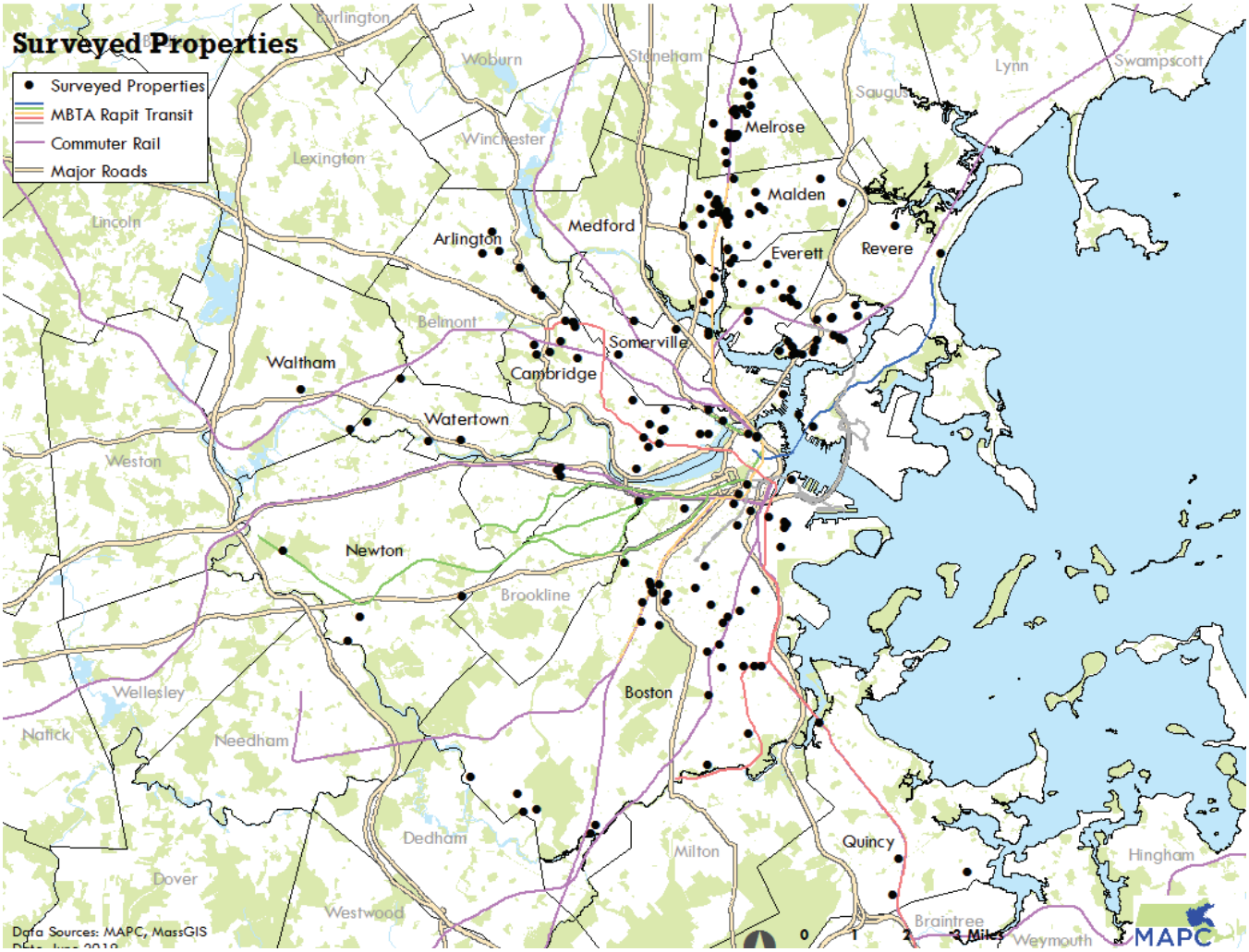



*Figure 1: Surveyed Sites Map*

7 U.S. Decennial Census 2010.

8 Housing Tenure by Units in Structure (American Community Survey, 2013-2017).

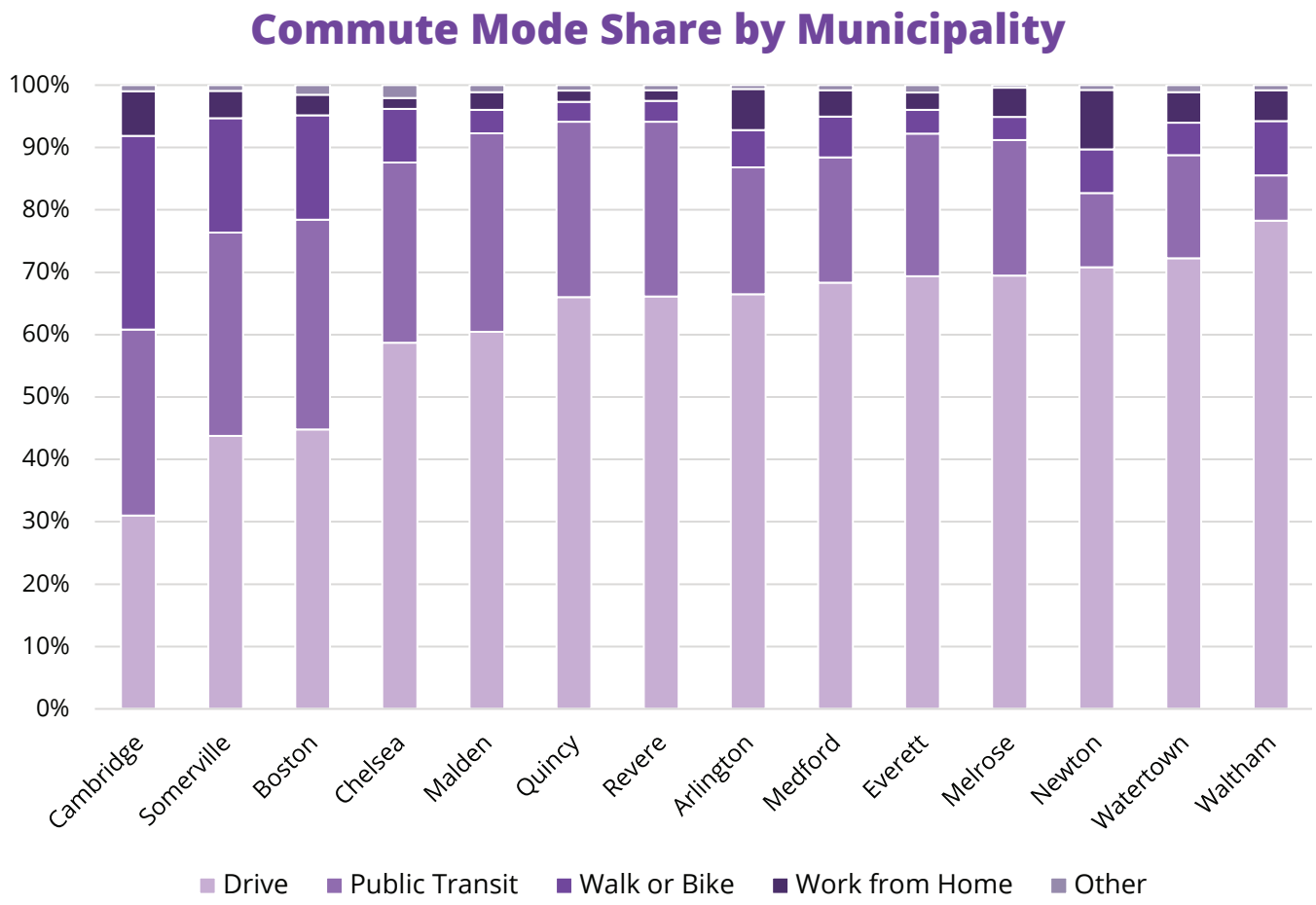



*Figure 2: Commute Mode Share by Municipality, American Community Survey 2013-2017*

Transit service varies widely throughout the region, ranging from multiple subways to the occasional bus. About 27 percent of workers commute by public transit, much higher than the statewide average of 10 percent.[9] As Figure 2 demonstrates, the more suburban communities tend to have a higher percentage of workers who drive, whereas residents in communities better-served by transit have a greater tendency to commute by transit. Vehicle ownership varies greatly between dense, transit-rich municipalities like Boston and Cambridge (0.9 vehicles/household, on average), and less dense and less transit accessible communities like Saugus and Milton (1.9 vehicles/household, on average).[10]

Inner Core municipalities each have unique community character, demographics, and needs. One condition they share is tremendous pressure on the housing market. Most have seen some modest level of multifamily housing, and some neighborhoods have seen a building boom. It is likely that the demand for housing will continue to grow, and parking will remain controversial. Decisions made about parking will affect conditions and costs for years to come.

## PROPERTY SELECTION

Consistent with prior research in other regions, MAPC focused our analysis on predominately residential buildings and development complexes with nine or more units. The analysis focused on developments constructed since 2000, with a few exceptions of older buildings where data was collected in earlier phases. Buildings with a significant nonresidential component were excluded from consideration, though incidental

9 Transportation to Work from Residence (American Community Survey, 2013-2017).

10 Massachusetts Vehicle Census, 2014 (MAPC, Massachusetts Registry of Motor Vehicles).

retail or office was noted and allowed. In most cases, spaces reserved for commercial tenants were identified with signage or pavement markings, and they were noted in the overnight counts as on-site parking spaces available for other users. To ensure the properties surveyed were reasonably demonstrative of current development patterns in the region, MAPC compared the sample to the characteristics of over 400 known post-2000 developments throughout the Inner Core, as documented by MassBuilds, MAPC's collaborative inventory of past, present and future real estate development projects. Residential developments in MassBuilds classified according to nine different criteria and surveyed sites were compared to ensure a similar distribution of values for each criterion.[11] If the distribution of values for the surveyed sites was dissimilar, additional efforts were made to recruit sites that would help fill gaps in the survey set.

MAPC worked with city and town staff to obtain the relevant contact information for these properties. If that was not available, staff contacts provided MAPC with assessor data. To supplement the information provided by the cities and towns, MAPC contacted large property management companies and developers directly to collect multiple surveys from single points of contact. Community development corporations with residential portfolios in the Inner Core were also asked to participate.

## SURVEYS

After the properties were selected, the property manager or owner of each development was asked to complete an in-depth two-page survey regarding parking at their development. Questions detailed the type and number of housing units at each development, as well as the type and number of parking spaces available to residents. The survey asked further questions about parking, including whether there is a waitlist for parking, how residents can obtain additional parking beyond what is provided, if needed, and if there are non-residents who utilize parking on-site. A copy of the survey is available in Appendix B.

## OVERNIGHT COUNTS

Following the completion of the surveys, MAPC staff assessed peak residential parking utilization by conducting weeknight overnight (11:00 p.m. – 4:00 a.m.) parking observations to confirm the number of parking spaces and to count the number of parked vehicles at each site. Counts took place at these hours because they are the peak times for residential parking utilization. Most properties (118) surveyed only offered surface lot parking. While 26 developments offered both garage and surface lot parking, 45 only offered garage parking. Access to secured garages proved to be a barrier to gathering sufficient data in both phases of analysis, but the managers of a few properties from which MAPC staff were barred provided overnight parking count information. Sites where parking utilization could not be determined based on overnight counts or property manager information were excluded from the analysis. In addition to the overnight count data, MAPC was able to obtain information about the number of parking spaces rented at 13 sites where parking is unbundled (residents pay separately from rent), and this information was able to supplement the overnight count data collected. Indeed, this information was treated as a suitable substitute for overnight count data. Ultimately, MAPC has enough survey and overnight count data for 189 sites in total.

## DATA ANALYSIS

MAPC used the survey results and overnight count data to produce descriptive statistics about parking utilization, and to create a model of parking demand per unit. Parking supply per unit was calculated for each property by dividing the total number of parking spaces by the total number of housing units (whether or not the units were occupied at the time of survey). We also calculated the parking utilization rate, the percentage of parking spaces occupied by vehicles during the overnight field survey. The statistical modeling was designed to predict parking demand per unit, the number of occupied parking spaces during the overnight field survey divided by the number of occupied housing units (excluding vacant units).

11 These criteria include: number of residential units, median rent, median income, average block size, number of jobs accessible by transit within 30 minutes, WalkScore®, land use intensity, land use mix, and average vehicle ownership.

We investigated a total of 25 building and neighborhood variables for their potential influence on the parking demand per unit. These variables are described in Table 1.

| Building Features | Parking Features | Built Environment | Socioeconomic Context |
|---|---|---|---|
| • Percentage of units that are affordable<br>• Year of construction<br>• Average bedroom count<br>• Average rent or purchase price<br>• Number of units in building<br>• Housing tenure | • Presence of bicycle parking<br>• Parking cost<br>• Ratio of parking cost to monthly rent cost per bedroom<br>• Ratio of parking cost to monthly rent cost per unit<br>• Percent of provided parking spaces that are garaged<br>• Ratio of garage to surface parking spaces<br>• Parking supply | • Number of jobs accessible by 30-minute transit trip<br>• Neighborhood population density<br>• Neighborhood employment density<br>• Neighborhood population and employment density (cumulative)<br>• Presence of MBTA commuter rail station within half-mile<br>• Presence of MBTA rapid transit station within half-mile<br>• WalkScore® | • Median annual income (Census tract)<br>• Average household size for rental households (Census tract)<br>• Average household size for ownership households<br>• Share of households in U.S. Census tract that are renter-occupied<br>• Share of households in U.S. Census tract with zero vehicle |

*Table 1: Evaluated Building and Neighborhood Characteristics*

After testing several models and finding that all yielded very similar results, MAPC found three variables to be strongly associated with the number of parking spaces demanded per unit: parking supply per unit, the number of jobs accessible within 30 minutes via transit, and the percent of the building's units that are affordable. These findings are described in greater detail in the following section.

# Findings

## Development Characteristics

MAPC collected survey data and overnight parking counts at 189 multifamily residential developments in 14 municipalities throughout the Inner Core subregion. The average development contained 104 units, of which 99 were occupied at the time of the survey, a vacancy rate of approximately 4.7 percent. Most of the surveyed housing were apartments: 86 percent of the sites were rental developments, representing 94 percent of all the units in the survey. The 13 percent of sites that were condominiums comprised just 5.5 percent of total units; two sites had a mix of condominium and rental units. Approximately 52 percent of all occupied units at the surveyed sites were studios or one-bedroom units, and 42 percent were two-bedroom units. Only 6 percent were three-bedrooms and the average unit size was 1.6 bedrooms per unit. For the apartments for which rental costs were available, the average rent was approximately $1,900 per month and the median rent was approximately $1,750.

The dates of construction spanned a wide range, from the 1890s to 2017. While Phase 1 data collection (which took place in 2016) did not include an age filter for selecting developments, the second phase of data collection focused on housing built since 2000. As a result, the median year built (where known) was 2007, and approximately 62 percent of the sites were built since 2000, making the survey a good representation of recent development.

At two-thirds of the surveyed developments, there was no extra charge for residents to access available parking, though spaces were at some locations available on a first-come, first-served basis. At 32 percent of the sites we surveyed, residents paid separately for a parking space. For those residents, the monthly cost of a parking space range ranged from thirty dollars to as much as four hundred dollars, the latter in some downtown luxury developments. Across all developments where parking was "unbundled," the median monthly cost of a space was a hundred dollars. Designated bike parking was provided at only 41 sites, about 22 percent of the total. Even fewer of the developments – 12 sites – provided residents with any transportation services, such as shuttles or transportation demand management services.

The sample included a wide range of housing developments, from luxury condominiums to fully affordable buildings owned and managed by community-based organizations. MAPC collected information about how many units were restricted to low- and/or moderate-income households (though we did not collect detail on the allowable income levels for the subsidized units). Approximately 37 percent of the developments had zero affordable units on site, an equal share were a mix of market rate and subsidized units, and just over one quarter of the sites were one-hundred percent subsidized units. Overall, one quarter (25 percent) of all units in the surveyed properties were subsidized units, and the average across all developments was 29 percent subsidized units.

About two-thirds of the developments surveyed were within a half mile distance of an MBTA rapid transit or commuter rail station. Eighty-three sites (about 44 percent of the total) were near a rapid transit stop (subway, trolley, Silver Line); and an additional 40 sites were near a commuter rail station only. Sixty-six sites, about one third of the total, are further than a half mile from an MBTA station. In addition to transit proximity, MAPC characterized the utility and connectivity of transit for each site. Specifically, we calculated the number of jobs accessible by transit within 30 minutes. This statistic, based on a dataset developed by the University of Minnesota Accessibility Observatory, accounts for walking, waiting, travel, and transfer travel time for trips to and from every census block in the region, based on published schedules. (While the 30-minute threshold is shorter than most transit commutes, the statistic is still very useful as a relative measure of transit access to employment). Using this measure, transit accessibility varies widely across the sites, ranging from fewer than 10,000 jobs accessible within a 30 minute transit commute to

more than 600,000 jobs within 30 minutes for developments closest to Downtown Boston. The median for all developments is approximately 62,000 jobs.

Key statistics about all the surveyed sites, summarized by municipality, are presented below in Table 2.

| City or Town | Surveyed Developments (count) | Units per Development (average) | Monthly Rental Cost (average) | Bedrooms per Unit (average) | Monthly Parking Cost (average) | Percent Affordable (average) | Sites with Bike Parking (count) | Jobs Accessible via Transit (average) |
|---|---|---|---|---|---|---|---|---|
| Arlington | 6 | 82 | $1,928 | 1.7 | $62 | 24% | 2 | 36,305 |
| Boston | 55 | 135 | $1,992 | 1.7 | $82 | 47% | 7 | 243,066 |
| Cambridge | 22 | 109 | $2,263 | 1.7 | $83 | 40% | 10 | 248,651 |
| Chelsea | 20 | 61 | $1,421 | 1.7 | $15 | 22% | 4 | 82,297 |
| Everett | 12 | 79 | $1,459 | 1.4 | $25 | 8% | 0 | 37,844 |
| Malden | 30 | 70 | $1,651 | 1.4 | $25 | 11% | 9 | 48,463 |
| Medford | 3 | 237 | $2,557 | 1.6 | $60 | 2% | 0 | 36,321 |
| Melrose | 20 | 48 | $1,514 | 1.6 | $8 | 19% | 3 | 23,274 |
| Newton | 4 | 200 | $2,882 | 1.9 | $31 | 19% | 1 | 19,904 |
| Quincy | 4 | 130 | $1,830 | 1.7 | $43 | 24% | 0 | 30,179 |
| Revere | 2 | 213 | $2,193 | 1.4 | $63 | 0% | 0 | 105,185 |
| Somerville | 5 | 155 | $2,254 | 1.9 | $50 | 41% | 1 | 134,906 |
| Waltham | 2 | 135 | $1,786 | 1.2 | $25 | 55% | 1 | 32,361 |
| Watertown | 4 | 151 | $2,108 | 1.6 | $40 | 33% | 3 | 42,606 |
| **Total** | **189** | **104** | **$1,897** | **1.6** | **$49** | **29%** | **41** | **129,659** |

*Table 2: Surveyed Development Characteristics, Perfect Fit Parking Study*

## Parking Supply

The most basic metric of parking at a given development is supply, calculated as the total number of parking spaces available divided by the total number of residential units (including those currently vacant). A total of 19,439 spaces were counted, serving 19,613 units, or one space for every unit. At each of the 189 sites, we calculated the supply, which ranged from 0.13 to more than 2.2. Both the average and median across all 189 sites were 1.0, but the range was quite spread out. Figure 3 is a histogram showing how many of the sites supplied parking within a given range. About one third of the sites provide fewer than 0.8 spaces per unit. Some provided exactly one space per unit, and a large share, almost one in five, provide just over 1.0 spaces per unit. Another 30 percent of the sites provide more than 1.2 spaces per unit.

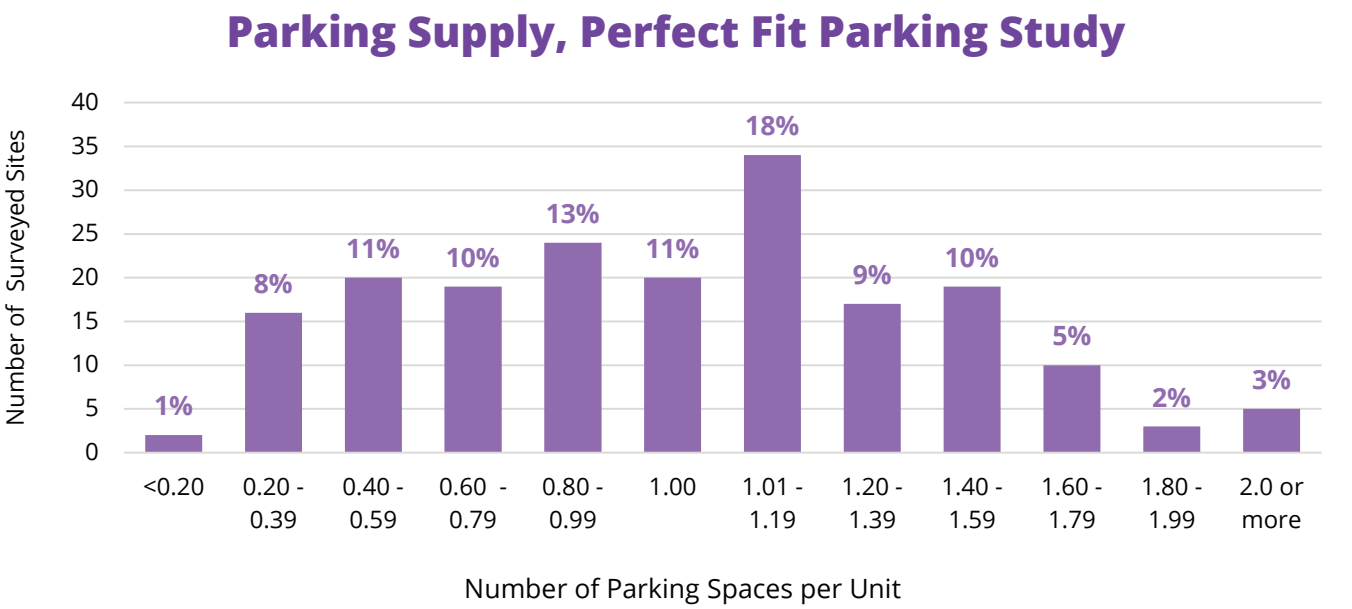



*Figure 3: Parking Supply, Perfect Fit Parking Study (n=189)*

## Parking Demand

Demand is defined as the number of overnight parked cars per occupied housing unit. In other words, how many spaces the residents of a given development are actually using on an average night. The demand we observed varied widely, from almost zero to more than 1.5 parked cars per household. The average was 0.73, and the distribution is shown in Figure 4. Remarkably, 73 percent of sites had a parking demand of less than 1 space/unit, with 27 percent of sites experiencing an average demand of less than 0.5 spaces/unit. It should be noted that for the sites with remarkably low demand (0.25/spaces per unit or less), nearly 50 percent were located near a rapid transit station. Additionally, about 63 percent were sites that were almost entirely affordable. Several of those sites are also age restricted. Of all the sites we surveyed, fewer than one in ten had demand greater than 1.2.

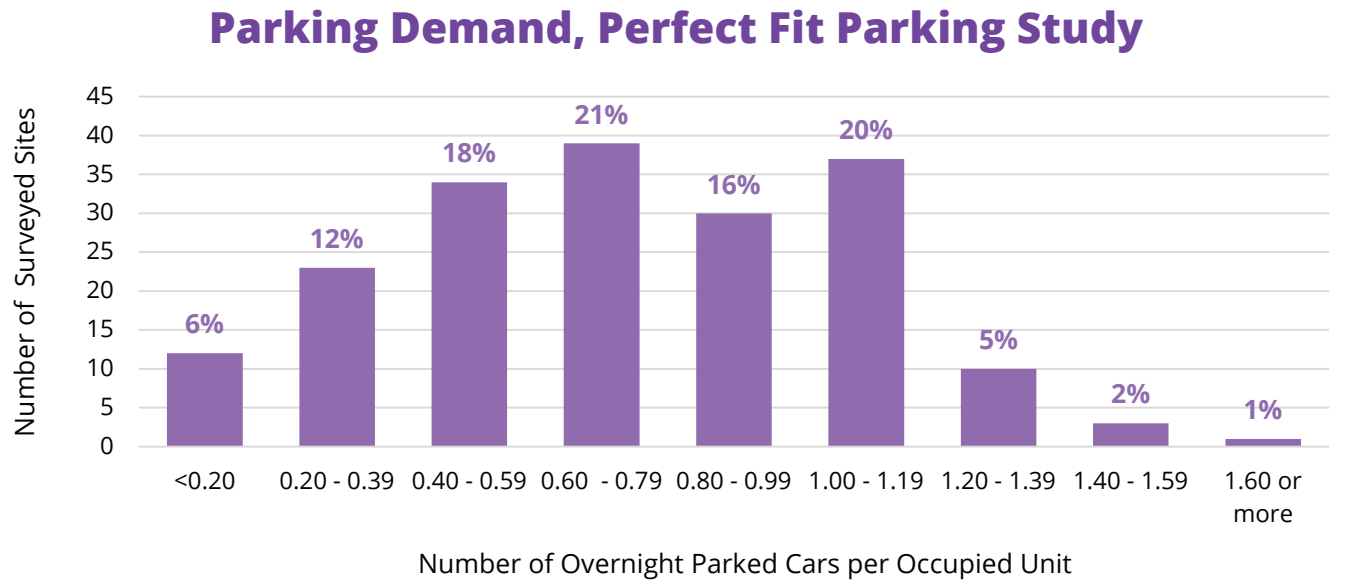



*Figure 4: Parking Demand, Perfect Fit Parking Study (n=189)*

In addition to examining the results for the entire survey sample, MAPC also calculated statistics for each city and town. Figure 5 shows the average supply and demand by municipality. This graph shows that average supply exceeds average demand in every municipality we studied, generally by a factor of 30 – 50 percent. Parking is being oversupplied in urban communities where demand is lowest, as well as in suburban communities where demand is higher.

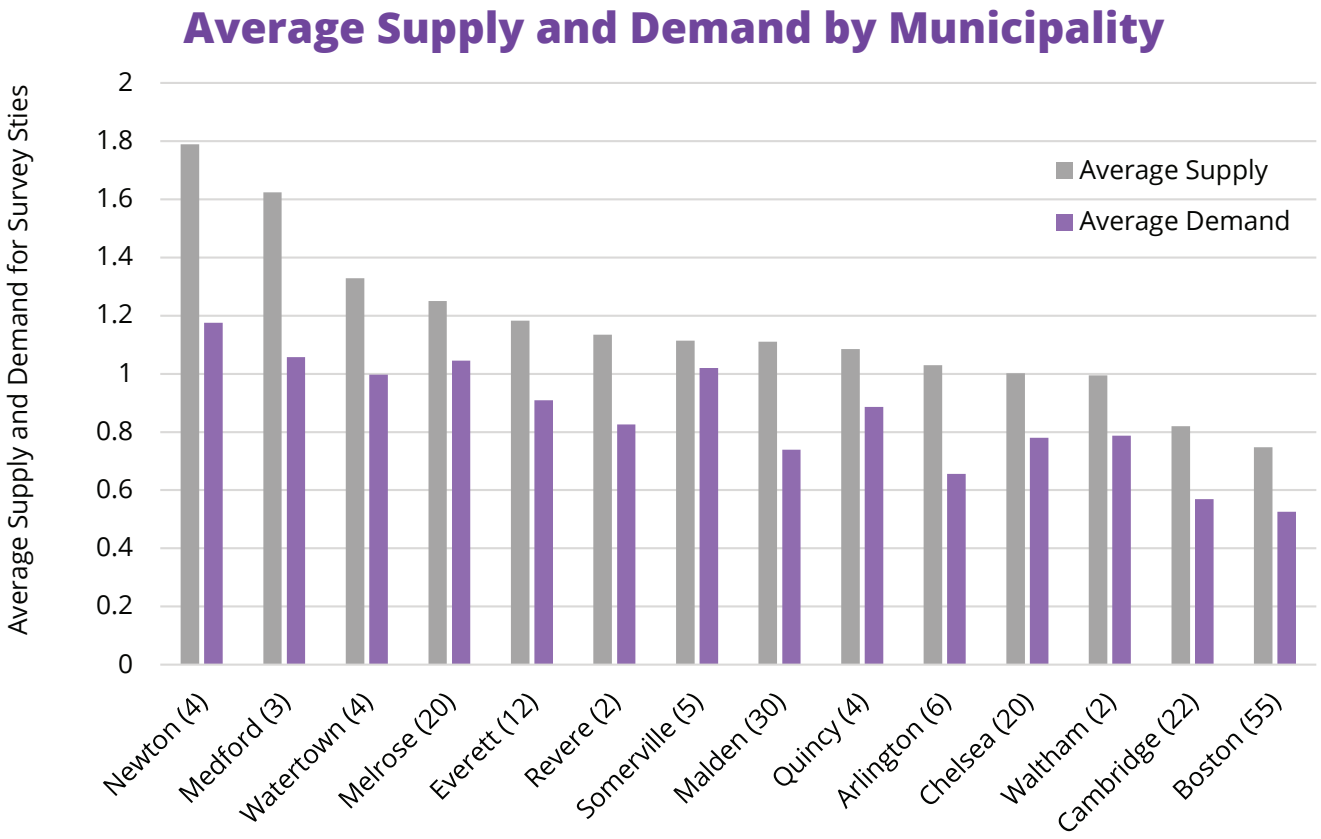



*Figure 5: Average Supply and Demand by Municipality, Perfect Fit Parking Study (n=189)*

*Numbers in parentheses indicate the number of sites surveyed in each municipality.*

When examining the results, two development and neighborhood characteristics stood out as having a strong relationship with parking demand: transit proximity, and affordable housing. Figure 6 shows the average parking demand for developments based on their affordability and transit proximity. For sites that are within a half-mile of a rapid transit stop, parking demand is less than 0.70 spaces per unit for predominately market-rate developments, and only 0.48 spaces per unit for developments that are 50 percent or more deed restricted units. This pattern holds even outside of rapid transit station areas. In those locations, which may also be served by bus, commuter rail, or no transit at all, average demand for mostly market rate developments is 0.89 spaces per unit, and for majority-affordable developments only 0.60 spaces per unit. These descriptive statistics show the strong relationship between transit service, affordability, and parking demand, which is examined more rigorously in our statistical model described in a later section of the report.

## Parking Demand by Rapid Transit Proximity and Affordability

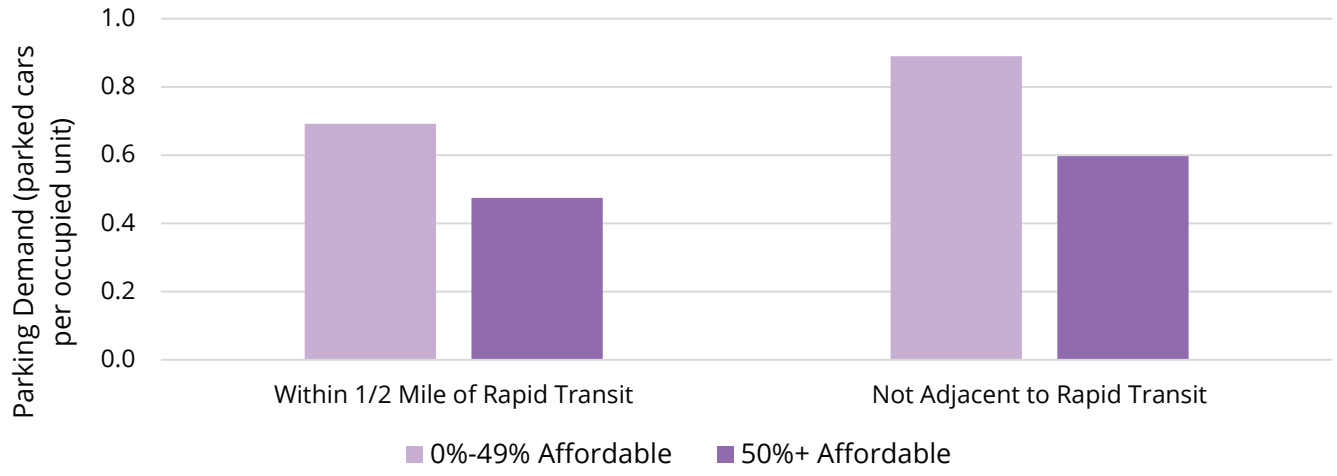



*Figure 6: Parking Demand by Rapid Transit Proximity and Affordability, Perfect Fit Parking Study (n=189)*

## Parking Utilization

*Utilization* is a measure of how much the parking is being used. It is calculated as occupied parking spaces divided by total parking spaces, and it is expressed as a percentage. Overall, we counted 13,529 occupied parking spaces out of 19,439 total. (Correspondingly, the 5,910 vacant parking spaces we counted comprise 30 percent of the total parking.) **Therefore, MAPC observed an overall utilization rate of 70 percent, meaning over one-quarter of parking spaces were sitting empty.**

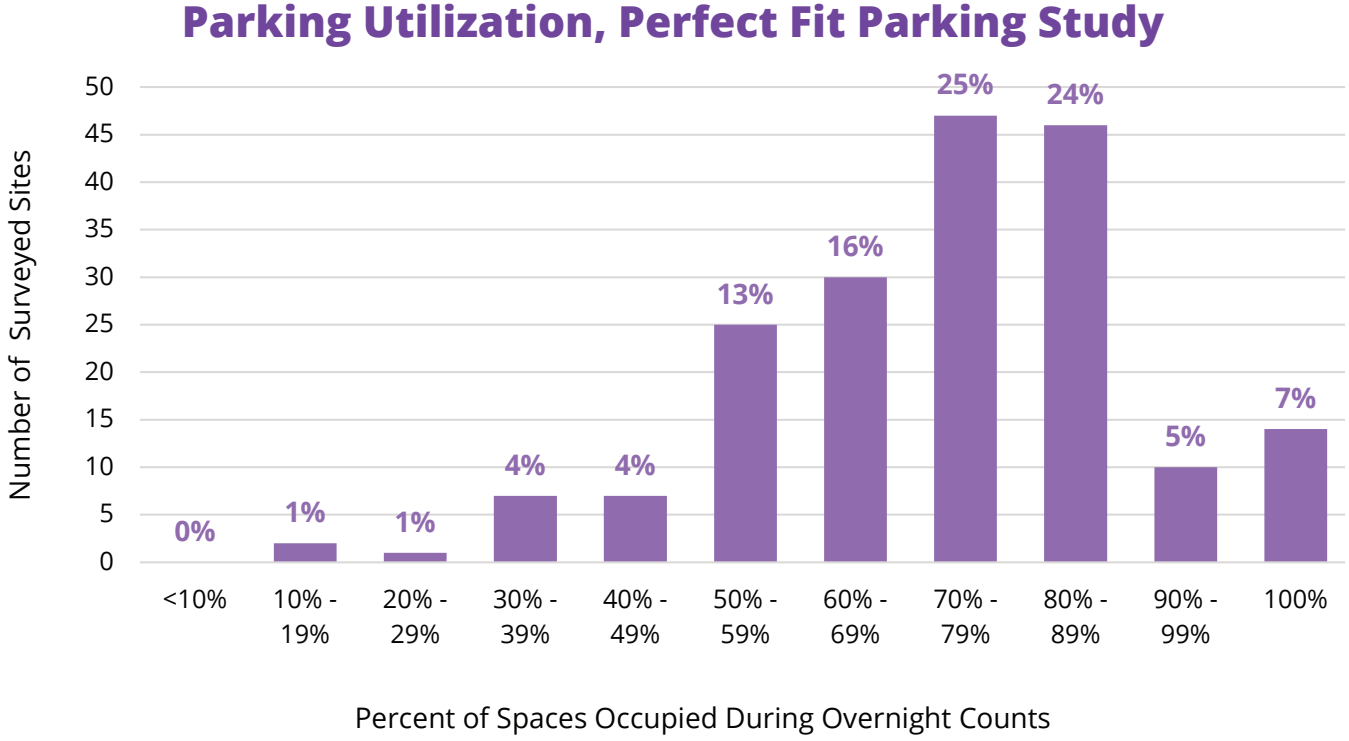



*Figure 7: Parking Utilization, Perfect Fit Parking Study (n=189)*

The distribution is shown in Figure 7. Despite the difference in demographics, parking requirements, and rates of parking supply and demand per unit across all observed communities and sites, parking lots were almost never full. We surveyed 189 sites and found only 14 sites (7 percent) where all the parking spaces were occupied at the time of survey. Only 13 percent of the properties surveyed had a parking utilization rate above 90 percent (this includes the ones that were completely occupied). At about half of the sites, between 70 percent and 90 percent of the parking spaces were being used. Meanwhile, 17 sites (9 percent) had a utilization rate of less than 50 percent.

We also examined the data to see if there is a relationship between supply and utilization. One might assume that sites with a limited amount of parking are likely to have a high utilization rate (i.e., most of the spaces are being used) while those with abundant supply will have a lower utilization rate (because there are more spaces than are needed.)

However, we found no statistically significant relationship between how many spaces are provided and what percent of those spaces are full on an average night. A comparison of supply and utilization is shown in Figure 8. This graph shows that even at sites that provide fewer than 0.75 spaces per unit, the utilization rate was only 74 percent; whereas the sites with the most abundant parking (>1.5 spaces per unit) had very similar utilization rates (average of 68 percent). This finding suggests that providing abundant parking does not necessarily result in a substantially larger percent of unused spaces, because the availability of easy parking may induce residents to buy or keep their car. Just like a gas expands to fill the space provided, it seems that parking demand expands along with supply, tending to fill about 70 percent of the spaces that are provided. Furthermore, this finding should help assuage concerns of underbuilding parking; even sites that provided less than 0.75 spaces per unit had excess capacity to accommodate additional vehicles on-site should parking demand increase in the future.

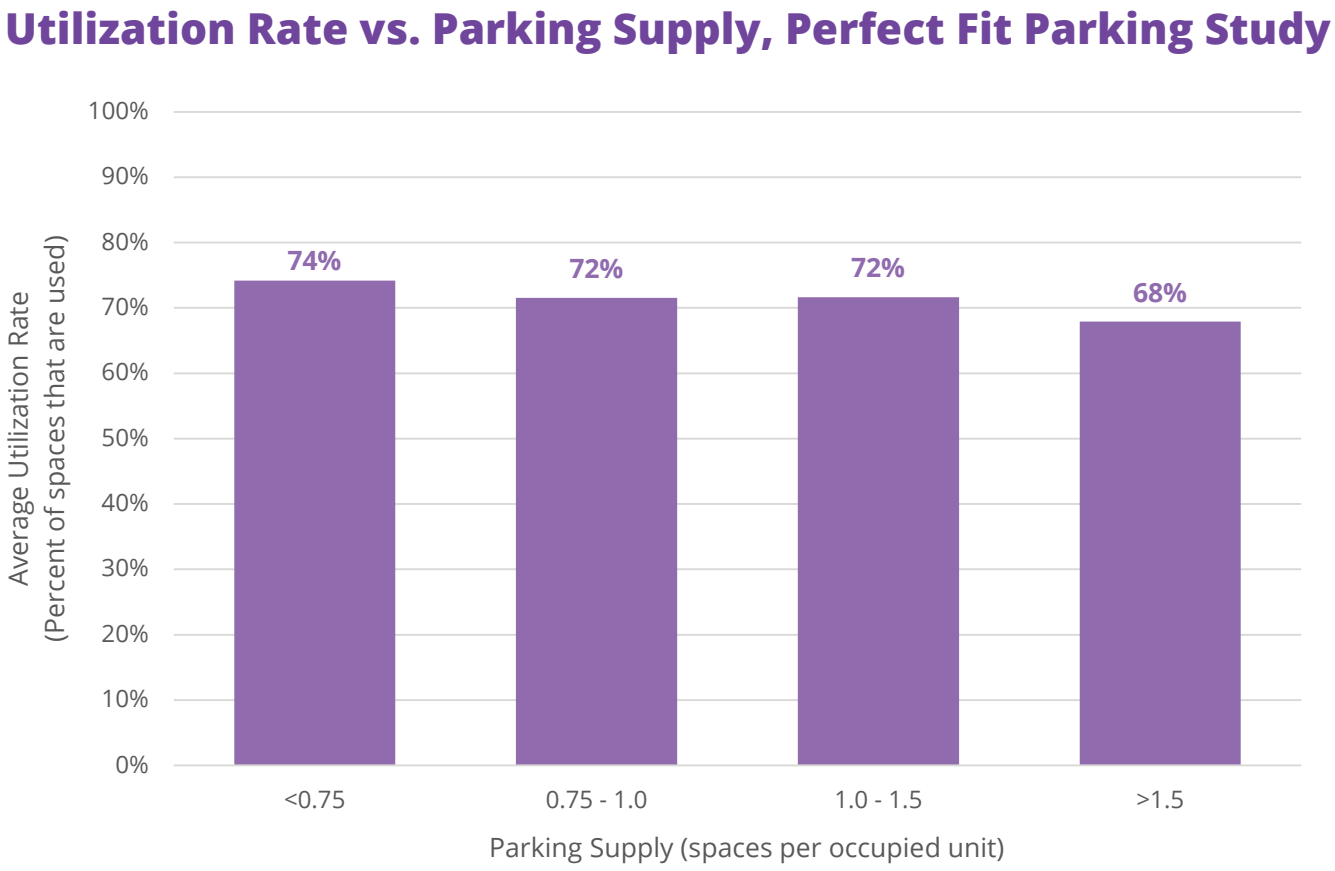



*Figure 8: Utilization Rate vs. Parking Supply, Perfect Fit Parking Study (n=189)*

To demonstrate the relationship between parking demand, parking supply, and parking utilization, Figure 9 depicts a hypothetical development with the average metrics observed during data collection. These descriptive statistics informed our exploration of the factors that drive parking demand in the first place.

## What factors influence parking demand?

To provide a more robust basis for smart parking policies, MAPC created a statistical model to evaluate which building and neighborhood characteristics predict parking demand. As described previously, this method was based on survey results and overnight count data for 189 properties. The model was designed to identify the building and neighborhood characteristics that are predictive of residential parking demand.

To begin the analysis, MAPC tested 25 different variables related to the building (unit count, bedrooms per unit, affordability, year built, cost, and owner/renter); the parking supply (number of spaces available, cost of parking, garage/surface lot, bike parking availability, etc.); the neighborhood built environment (population and employment density, WalkScore®, transit proximity, number of jobs accessible within 30 minutes via transit); and neighborhood demographics (income, household size, auto ownership). Of course, it is not possible to collect data or analyze every possible factor that affects parking demand, especially the characteristics of

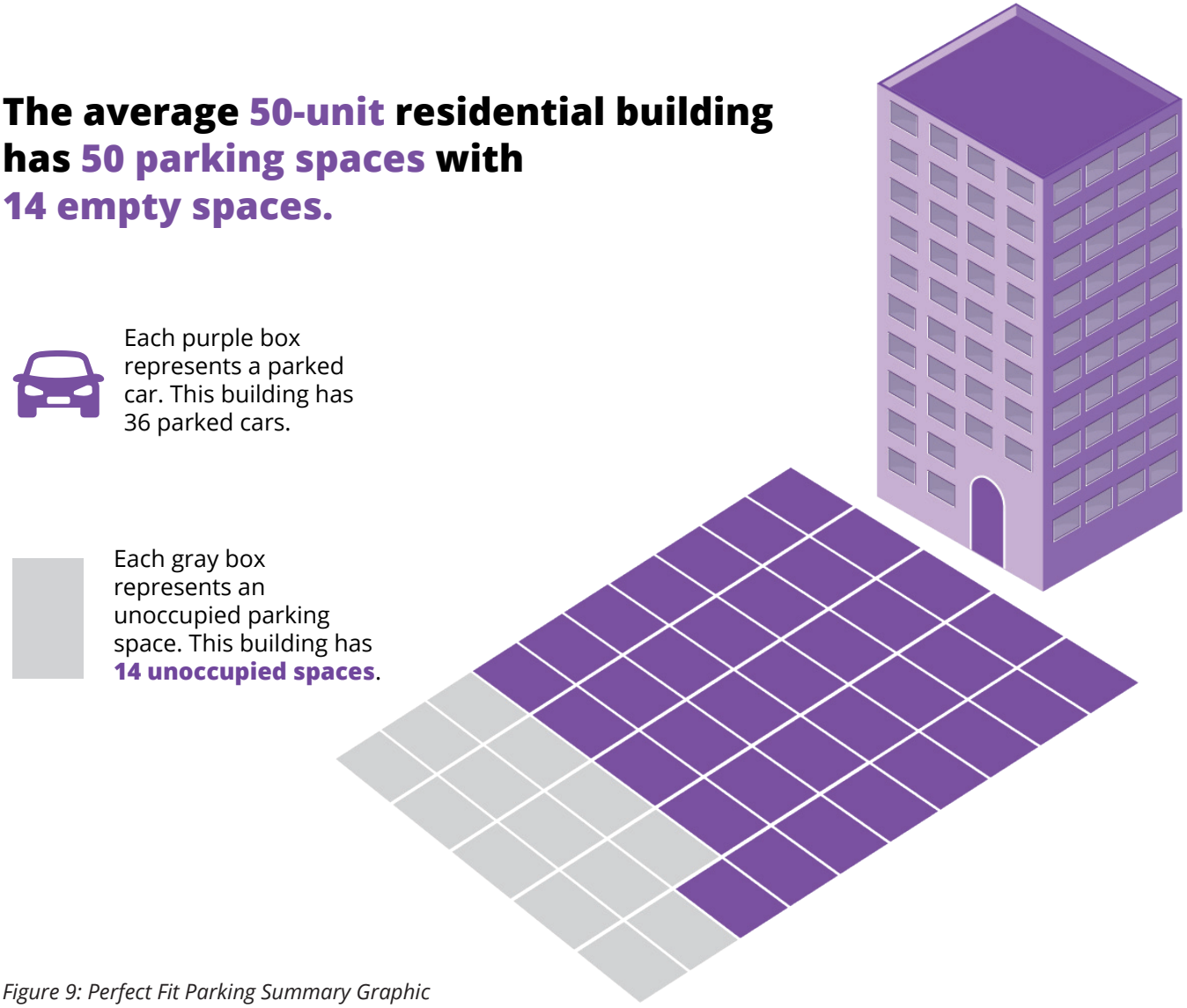



*Figure 9: Perfect Fit Parking Summary Graphic*

the occupants themselves. The purpose of the analysis was to determine the most important neighborhood and building factors that seem to influence parking demand.

As described in detail in the technical appendix, many of the factors we analyzed were correlated with parking demand to some degree or another, including percentage of affordable units, percentage of rental units, parking costs, density, transit access, percentage of zero-vehicle households in the neighborhood, and WalkScore® (all inversely associated with parking demand). Parking supply and neighborhood income were both positively associated with higher parking demand. Notably, none of the following were statistically correlated with parking demand: the total unit count of the development, whether the parking was garage or surface spaces, and whether bike parking was provided.

Of course, many of the variables we tested are also correlated with each other; for example, higher density areas tend to have more renters and higher WalkScore®, so it's impossible to say which factor is more strongly influencing parking demand if they are examined separately. Therefore, MAPC evaluated every combination of multiple variables and selected the combination that yielded the most robust model (that is, explains the highest amount of variation across sites).

Through that process, we determined that **three factors explain most of the variation in parking demand: parking supply, job accessibility by transit, and percent of the site's units that are affordable**. The model developed with those three variables has an $R^2$ of 0.74, meaning it explains 74 percent of the variation in demand across sites. The rest of this section explores each of those variables.

**Parking supply per unit was the dominant factor associated with parking demand per unit.** Figure 10 illustrates the relationship between parking supply and parking demand. The correlation between parking supply and parking demand was positive, indicating the more parking supplied per unit, the more parking demanded per unit. We estimate that each additional space provided per household is associated with an increase of 0.57 parked cars per household.

## Parking Supply and Demand, Perfect Fit Study Sites

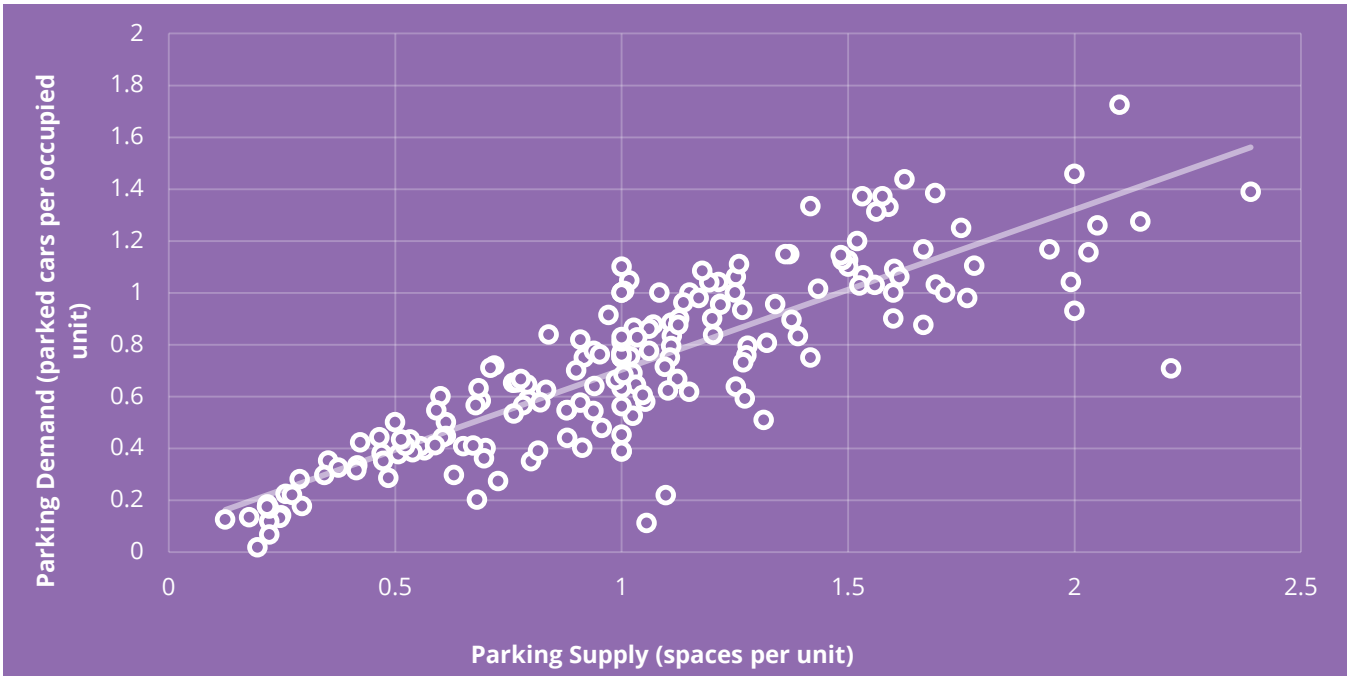



*Figure 10: Parking Supply per Unit vs. Parking Demand per Unit (n=189)*

*Note: Demand per unit can exceed supply if there are vacancies in the building, because the denominators for the two statistics are different: occupied housing units for demand, and all housing units for supply.*

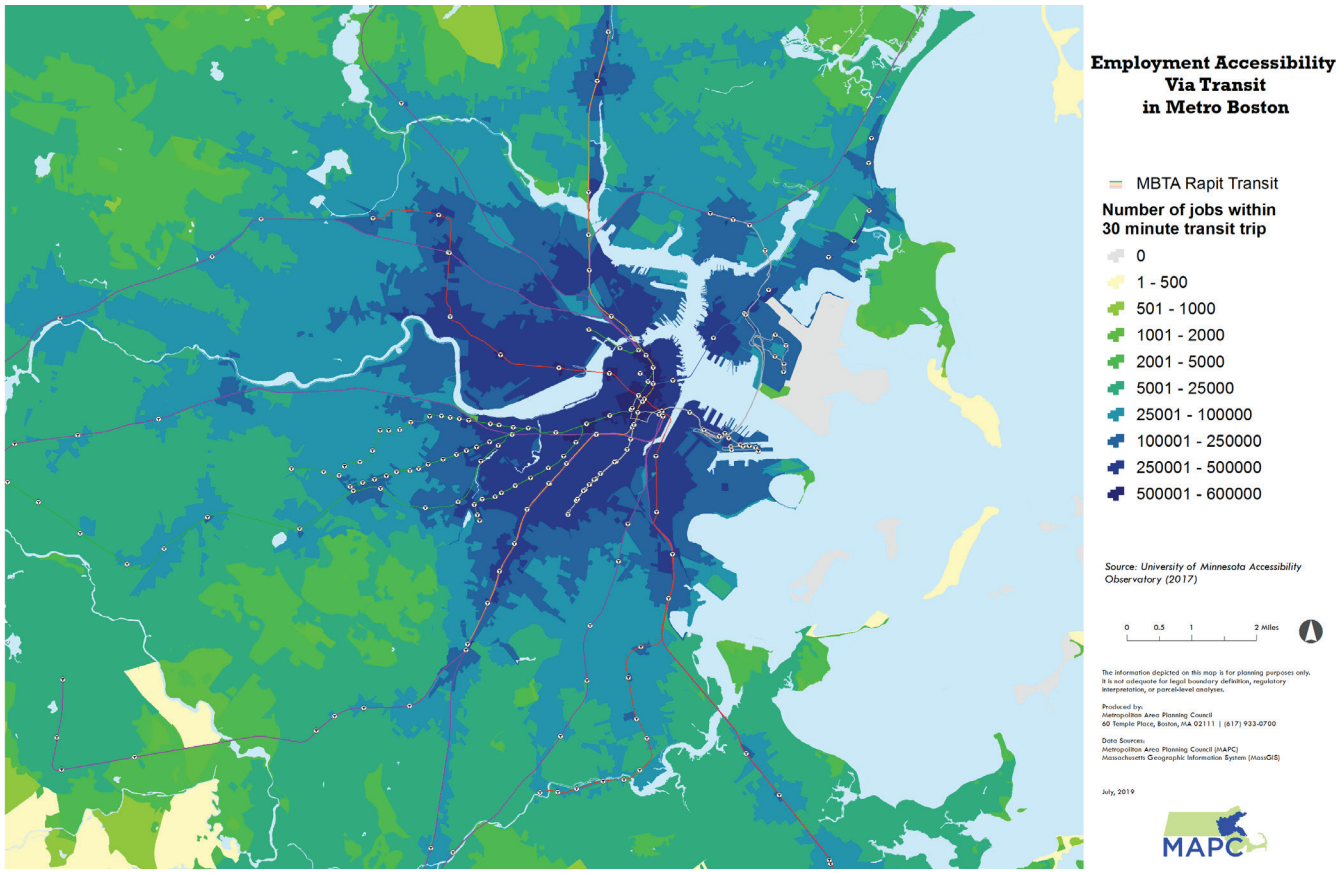



*Figure 11: Employment Accessibility via Transit in Metro Boston*

Parking demand is also influenced by job accessibility, as measured by the number of jobs accessible by transit within 30 minutes. This statistic, based on a dataset developed by the University of Minnesota Accessibility Observatory, accounts for walking, waiting, travel, and transfer travel time for trips to and from every census block in the region, based on published schedules. While the 30-minute threshold is shorter than most transit commutes, the statistic is still very useful as a relative measure of transit access to employment. Figure 11 shows how transit access to employment varies across the region. In Downtown and along the rapid transit lines, people can get to hundreds of thousands of jobs in a 30-minute transit trip, door-to-door. Transit access to employment declines away from the core along the rapid transit lines, and in the areas in between served only by bus. The map also shows where commuter rail stops, or where express bus service provides some higher job accessibility in areas more distant from downtown.

Figure 12 depicts the relationship between transit access to employment and parking demand, and suggests that **as jobs accessibility increases, parking demand per unit decreases**. This relationship was confirmed with our statistical analysis and can be seen here. Most of those sites with demand of greater than 1.0 have poor transit access to employment (fewer than 50,000 jobs within 30 minutes). For those sites where more than 100,000 jobs can be reached within 30 minutes (the three darkest shades on the map), average demand is only 0.54 spaces per occupied unit.

Although less influential on parking demand but still statistically significant is the percentage of affordable units in the building (see Figure 13). We surveyed a range of developments, including 100 percent affordable, mixed income, and all-market-rate units. There was a negative correlation between affordability and parking demand. **As the share of affordable units increases, parking demand decreases.**

This pattern can be seen in the count results from mostly affordable buildings. The survey included 50 developments where 50 percent or more of the

## Job Accessibility and Parking Demand, Perfect Fit Study Sites

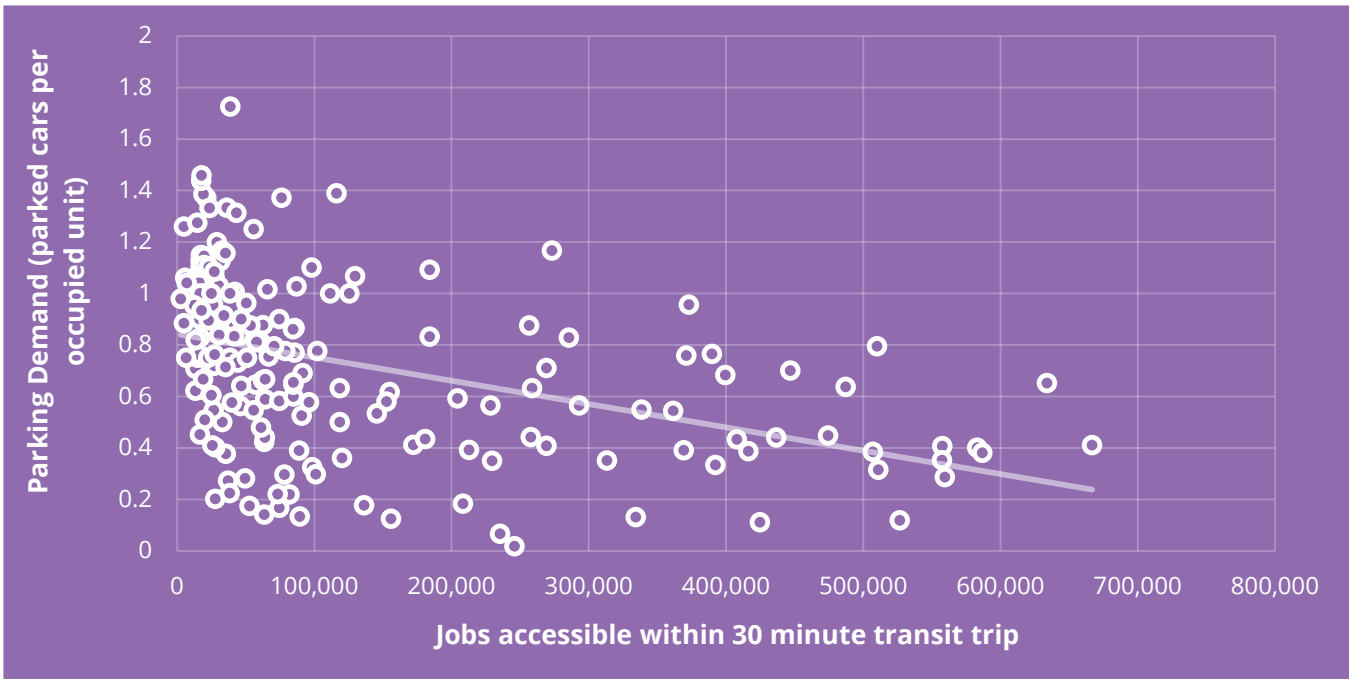



*Figure 12: Jobs Accessible by Transit vs. Parking Demand per Unit (n=189)*

## Affordability and Parking Demand, Perfect Fit Study Sites

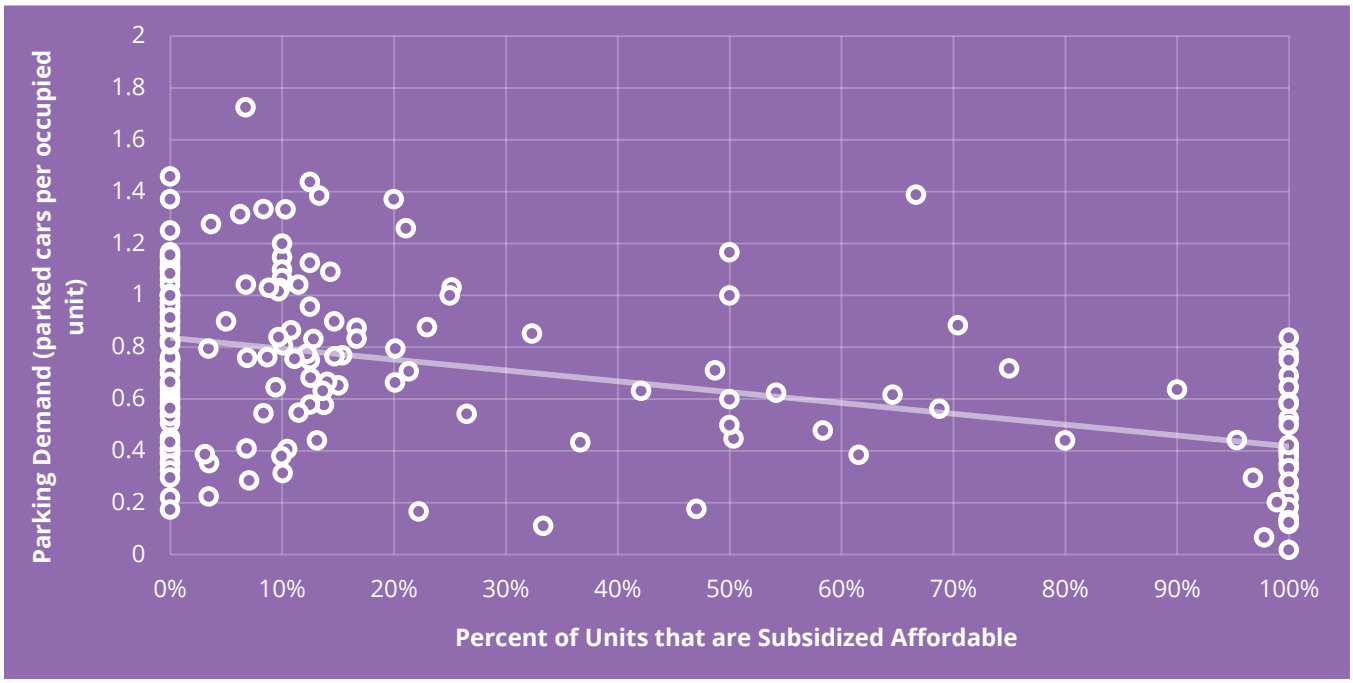



*Figure 13: Percent of Affordable Units vs. Parking Demand per Unit (n=189)*

units were restricted to low- or moderate-income residents. These developments supply an average of 0.75 spaces per unit, but the average parking demand was only 0.55 spaces per household, for an average utilization rate of just 68 percent. Across those 50 developments, we counted 1,100 empty spaces, equivalent to nearly eight acres of land that could have been used for playgrounds, open space, stormwater management, or more housing. For the 33 developments that were 100 percent affordable housing, observed overnight demand averages only 0.49 spaces per household, and is never higher than 0.85 spaces per household.

## Limitations

While the data collection, analysis, and modeling were robust and thorough processes, there are inevitably some limitations to this research. Due to staff and budgetary limitations, the survey could not include every residential development in the region, or even every recently completed development. Reaching property managers and owners proved to be challenging throughout the surveying process. In some communities, municipal staff served as a liaison between MAPC and the property managers and owners, which helped increase response rates. However, some information was still difficult to obtain from property management, particularly with regard to unit mix and rent and purchase price. As noted above, access to secured garages continued to be one of the most significant barriers to obtaining overnight count data. As a result of these limitations (as well as the paucity of recent multifamily developments in some communities) we were able to survey only a handful of properties in some of the study area municipalities. It is therefore important to not overgeneralize for a given city or town.

# Discussion

This report provides the first comprehensive survey of parking supply and demand at residential properties across the region's Inner Core. The findings illustrate the wide variety in the amount of parking provided at various multifamily housing developments, as well as the wide variety of parking demand. Despite this variation, there is a persistent pattern of parking oversupply in all communities and types of developments. At least 18 percent of the surveyed spaces – and as many as 45 percent – were vacant in every municipality. Across the 189 properties surveyed, the average parking utilization rate was 72 percent. Even acknowledging that there is a need for some unused parking to account for guests and unusual demand, it's clear that the developments we surveyed provide more parking spaces than are needed by their residents: only 14 percent of the developments were more than 90 percent utilized. This prevalent and substantial oversupply of parking indicates that all municipalities within the study area would benefit from parking strategies that better align parking supply with demand.

Left unchecked, this disparity between the amount of parking supplied per unit and the amount demanded per unit leads to the construction of excess parking and more congested roads.[12] Rather than use this space for parking, this valuable urban land could instead be put to more productive and beneficial uses. This includes the development of open space, affordable housing, or other uses that would potentially provide a higher tax base. The excess parking also has direct impacts on the cost of housing construction and unit affordability. Using a blended industry-average construction cost of $16,000 per parking space, the 5,910 empty spaces we counted represent $94.5 million of development costs, or an average of nearly $5,000 per housing unit in the survey. If these wasted costs could be averted in future developments, it could enable developers to increase the number of subsidized units or make larger investments in community amenities such as open space, landscaping, or affordable commercial space.

The costs of excess parking are particularly concerning for affordable housing developments, where scarce public subsidies are being used to build parking that goes unused by residents. Estimated construction costs for the 1,100 empty parking spaces we counted at majority-affordable developments totaled nearly $17.6 million, a sum that could have subsidized many dozens of affordable housing units. Our conversations with nonprofit housing developers indicate that their rationale for providing abundant parking is to

12 Donald C. Shoup, "The Trouble with Minimum Parking Requirements," Transportation Research Part A: Policy and Practice 33, no. 7–8 (September 1999): 549–74, doi:10.1016/S0965-8564(99)00007-5.

facilitate car ownership, associated job access, and economic mobility for their low-income residents. This perspective is not unfounded: a 2014 study by the Urban Institute found that housing-voucher holders who owned a car were more likely to move to low-poverty neighborhoods and had higher employment rates and earnings than those without a car.[13] However, the study concluded that auto ownership was particularly important because it facilitates residential moves to high opportunity suburban neighborhoods that are inaccessible without a car, not because it provides better outcomes for residents living in lower-income urban neighborhoods. Furthermore, we uncovered no evidence that lack of abundant parking is a principal barrier to auto ownership for low-income residents; the costs of acquisition, insurance, maintenance, and fuel are certainly much larger barriers, especially when overnight on-street parking is permitted in nearly every city and town. Therefore, we question whether investing scarce housing subsidies into excessive parking construction is an efficacious policy for economic opportunity, and we recommend that affordable housing developers and their funders consider whether those resources might be directed away from construction and toward other transportation or training services with demonstrated benefits.

Fortunately, our research also provides insight on how communities can work to establish more context-sensitive parking standards. MAPC found that transit access to employment, as well as the share of affordable units, are strong predictors of parking demand. That is, multifamily buildings in transit-rich areas require less parking than those in outlying areas; and affordable housing developments need substantially less parking than market rate developments. Other factors that were independently associated with lower parking demand were the percentage of rental units in the development, parking costs, neighborhood density, percentage of car-free households in the neighborhood, and WalkScore®. While these factors were not statistically significant in a combined model, they can still be important considerations in policy and development review discussions about parking supply.

As in earlier phases of this work, we find that parking supply is the single biggest predictor of parking demand. The more spaces that are required, the more likely residents are to own a car and use those spaces. It also stands to reason that those residents are more likely to use their vehicles for trips that could otherwise be made by walking, biking, or transit, and are thereby contributing to local traffic and congestion. This finding demonstrates that communities can shape their future through the way they regulate parking. Zoning rules and development-review processes that emphasize parking supply will produce fewer affordable developments, and those it does produce will be occupied by residents who are more likely to own – and use – a car. If communities want to advance sustainability and minimize traffic congestion, they should seek to minimize on-site parking availability, especially in transit-oriented developments, and they should encourage the creation of more affordable housing where residents are less likely to own a vehicle.

Regardless of what happens with future development and parking requirements, it is clear that existing developments already have an excessive amount of parking which is currently going unused. Rather than viewing this only as wasted space, it may be worth viewing these empty parking spots as a resource for local communities. On-street parking is a limited and often contested public resource in many neighborhoods. Furthermore, many cities and towns are reexamining how valuable street right-of-way is being used. As municipalities seek to create bus lanes, bike lanes, expanded sidewalks, parklets, or ride-hailing drop-off locations, the loss of on-street parking is often a major point of contention. Yet as we found, many neighborhoods with multifamily residential developments are likely to have unused spaces that could help to meet neighborhood need. Meanwhile, the growth of the sharing economy has created new markets for short term sharing of all sorts of goods

13 Pendall, Rolf, et al, "Driving to Opportunity: Understanding the Links among Transportation Access, Residential Outcomes, and Economic Opportunity for Housing Voucher Recipients," The Urban Institute, 2014 https://www.urban.org/sites/default/files/publication/22461/413078-Driving-to-Opportunity-Understanding-the-Links-among-Transportation-Access-Residential-Outcomes-and-Economic-Opportunity-for-Housing-Voucher-Recipients.PDF

and services, from apartments to cars to tools. Already, there are apps that facilitate purchasing and sharing of off-street parking spaces. While this market is still emerging, it is likely that as the pressure for on-street parking expands, there will be increased demand for purchasing off-street spaces. To the extent that this can help to relieve demands on street parking and allow for more multimodal use of rights of way, the expansion of that marketplace could have public benefits and could serve as a new source of revenue. It could also bring challenges. Before this marketplace is fully established, public entities should set up regulatory and taxing mechanisms designed to create an equitable, transparent, and sustainable new mode of accessing parking. Municipalities and the Commonwealth should learn the lessons of ride-hailing and short-term rentals, which were not the subject of any regulation discussion until they had a wide array of vested interest opposed to regulation and taxing. With the likely decline in personal auto ownership and potential rise in autonomous vehicles, auto storage (whether short- or long-term) will remain a critical force shaping our region into the foreseeable future, and municipalities must think about how to manage the parking landscape of tomorrow.

# Recommendations

Our findings indicate that parking construction is outpacing parking demand at multifamily developments. Beyond wasting money and space, excess parking attracts car-owning households, resulting in more driving and traffic congestion and less public transit use. Furthermore, more resources allocated toward parking mean fewer, and more expensive, housing units built.

Fortunately, many communities throughout the MAPC region, including several in the study area, have taken steps to better align parking supply and demand by modifying their zoning codes and bylaws and facilitating more low-parking developments. This section includes just a sampling of some strategies implemented by a few Inner Core communities.

While cities and towns are making strides toward reducing parking oversupply, our findings indicate more can be done to limit excess parking and promote more sustainable transportation options for residents. Below is a collection of recommended strategies and considerations for municipalities looking to develop more context-sensitive and data-informed parking regulations.

## Require fewer spaces – or none at all.

Much of the oversupply we observed stemmed from outdated minimum parking requirements in the local zoning code. In Metro Boston, many developments are approved through a special permit process. During this process, developers often advocate for reducing parking beyond the minimums required through zoning but confront resistance from neighbors. Every city and town can consider reducing their existing requirements, and, more important, can tailor those requirements to different types of development in different locations. On-site shared parking (daytime/nighttime) is one proven strategy for reducing parking construction while meeting community needs. Additionally, allowing for parking spaces available off-site to count toward the minimum parking requirements can make more efficient use of existing parking resource. In some cases, and as San Francisco has just done, parking minimums can be eliminated, and parking maximums established to prevent over-supply.

### Boston: Permitting Residential Developments with Little/No Parking On-Site

In Boston, decisions about how much parking to build on-site are often through the Boston Planning and Development Agency's (BPDA) Article 80 process, which assesses a project's impact on transportation, the public realm, the environment, and historic resources. Recently, the BPDA and Zoning Board of Appeal have permitted several residential developments with little to no parking provided on-site, including Lovejoy Wharf in the North End, 47-55 LaGrange Street in Chinatown, and 1970 Dorchester Ave near Ashmont Station in Dorchester. These low/no-parking sites tend to be in transit-rich neighborhoods, and in many cases, off-site parking accommodations are available if necessary. This approach allows the city to take a context-sensitive approach to determining the parking demand and the alternative transportation options at each site.

**ACTION ITEMS:**

- Allow for on-site shared parking at mixed-used sites with different peak demand times
- Allow for off-site parking spaces available to residents to count toward minimum parking requirements
- Eliminate minimum parking requirements altogether, and replace them with parking maximums

## Design transit-oriented developments for transit-oriented households.

Abundant parking at developments meant to be transit-oriented is counter-productive. It attracts car owners; makes housing less affordable for car-free or car-limited households; and encourages residents to use cars for trips that could be made by transit, walking, or biking. New housing in areas with good transit connections should provide less than one space per unit so as to accommodate households with fewer vehicles. Bike storage, car sharing, transit subsidies, shuttles, and human-oriented design are also all key elements of transit-oriented development.

**ACTION ITEMS:**

- Reduce or eliminate minimum parking requirements near transit stations
- Offer on-site accommodations to support sustainable transportation, such as secured bike storage and on-site car-sharing
- Provide residents with transit pass subsidies and discounts on bike share memberships

### Watertown: Unbundling Parking

Watertown's Regional Mixed-Use District (RMUD) includes a portion of Arsenal Street, the town's primary commercial corridor. While the parking requirements for multifamily buildings in this district are the same as the rest of town, the zoning ordinance requires parking to be unbundled from rent. Parking should instead be offered as a fee-based option, and those fees should reflect a reasonable representation of the market value of the parking spaces.[14] This would ensure residents consider the true cost of owning a vehicle, and would allow for car-free residents to avoid paying for an amenity they do not need.

14 Watertown Zoning Ordinance, Section 5.18 Regional Mixed Use District (RMUD), https://www.ci.watertown.ma.us/DocumentCenter/View/3364/ZONING-ORDINANCE--Amended-12112018?bidId=.

## Don't make people pay for what they don't need.

In many developments, housing and parking is a package deal. Car-free households must pay for parking they don't use, or are tempted to buy a car to make use of the space. Property owners should unbundle the rental costs for housing and parking so that residents can choose whether to rent a parking space. State and local regulators should encourage or require such unbundling. Furthermore, regulations and development approvals should be structured so that parking spaces not needed by building residents can be leased to neighbors, local employees, or commuters.

**ACTION ITEMS:**

- Require property owners to charge residents a monthly fee for parking
- Allow for on-site spaces not utilized by residents to be rented by nearby residents, employees, or commuters

## Less parking, more affordable housing.

Developments with more subsidized units require less parking than market-rate developments, and produce correspondingly fewer auto trips. Communities seeking to reduce traffic impacts of new development should require more affordable units and enable lower parking requirements in return. Because residents at affordable housing sites are demonstrated to have lower parking demand (and thus are more dependent on transit), we should not only build less parking at transit-oriented sites, but also including a larger share of affordable units in these projects. Affordable housing funders and developers can also take steps to align parking supply with demand, and they can save valuable public resources in so doing. State and local regulators should recognize this relationship between affordable housing and parking demand. They should permit higher rates of affordable housing at transit-oriented sites, as the auto-trip-generation will be much lower than at market-rate housing.

**ACTION ITEMS:**

- Adopt inclusionary zoning bylaws that require a higher percentage of affordable units around transit-oriented sites
- Consider variation in parking demand between market rate and affordable units during development review process

### Arlington: Pairing Parking Reductions with Transportation Demand Management Measures

The Arlington Redevelopment Authority or the Board or Appeals can allow for a reduction of up to 25 percent of the required parking spaces in the R5, R6, R7, Business, and Industrial zones if transportation demand management (TDM) practices are incorporated. Project proponents must submit a TDM plan outlining what measures will be taken. Suggestions in the zoning bylaw include paying a stipend to workers or residents without cars, providing transit pass subsidies, and offering covered bicycle parking and storage.[15] These strategies can reduce dependence on vehicles, alleviating parking demand as well as traffic congestion.

15 Arlington Zoning Bylaw, Section 6.1.5: Parking Reduction in Business, Industrial, and Multi-Family Residential Zones, https://www.arlingtonma.gov/home/showdocument?id=47195.

## Get ready for a parking marketplace.

The increasing pressure on street parking, combined with excess parking in residential (and possibly commercial) developments and the rise of the sharing economy sets the stage for an app-enabled marketplace in which residents and property owners can rent spaces on demand, for minutes or months (think Airbnb for cars). Public agencies should set parameters and tax policy now, before this market has established itself and becomes resistant to regulation. Cities and towns can be leaders in this field until the Commonwealth acts. The City of Newton, for example, has facilitated a shared parking pilot program to formally allow property owners to rent spaces to other owners or through mobile apps.

**ACTION ITEMS:**

- Promulgate local rules and regulations to manage and limit private parking space rentals

The above recommendations are usually discussed in the context of transportation demand management (TDM). TDM refers to a package of policies and programs designed to reduce drive-alone trips and shift passengers from single-occupancy vehicle (SOV) travel. In the context of this research, TDM can be a collection of policies and programs designed to reduce reliance on driving and instead promote alternative modes of travel, such as walking, biking, and taking public transit. Essentially, TDM can help further reduce demand for parking, and help further make the case for building less parking. For more detail on recommended TDM measures for reducing parking demand, please see the "Transportation Demand Management Strategies" document in Appendix C.

# Conclusion

Our findings clearly indicate that "if you build it, they will come." If communities build excess parking at multifamily developments, residents with multiple vehicles will seek to live at those properties. Sites with less parking will attract residents with fewer vehicles. Most likely, these residents will be transit-dependent, and therefore it is particularly crucial that efforts to align parking supply and demand happen at transit-oriented multifamily developments. Given that housing affordability is also associated with reduced parking demand (and likely, greater transit dependence), a greater share of those transit-oriented units should be affordable.

Better aligning parking at multifamily residential developments, particularly at transit-oriented and affordable sites, may both reduce costs and increase development potential. It will also encourage more households to live in the neighborhood without owning a vehicle, and therefore contribute to more sustainable transportation, a healthier local economy, and better urban design. It will also help to ensure that those least likely to own a vehicle will be able to rely on transit – and avoid the burden of paying for a parking space that has a higher likelihood of going unutilized.

Excess parking was found in all surveyed communities, and standalone actions to reduce parking supply would ease the impacts excess parking places on residents and communities alike. To go a step further, there are a suite of transportation demand management solutions available that can aid in further reducing demand for parking. Ultimately, making data-informed parking policy decisions will allow municipalities to become less congested, more multimodal, and to provide for a higher quality of life.

# Appendix A: The Problem with Excess Parking

Excess parking carries a wide range of economic and environmental burdens. Constructing parking beyond what is demanded can pose several barriers to the development of dense, walkable communities. Some of these barriers are described below:

### Encourages more driving.

First and foremost, studies have shown that excess parking can cause more driving. Researchers have found that an increase from 0.1 to 0.5 parking spaces provided per resident corresponds with a 30 percent increase in commuter automobile mode share.[16] In CNT's analysis of data collected for the Washington D.C. Park Right Calculator, parking supply was found to be the variable that correlates the most with parking utilization, with parking supply accounting for 66 percent of the variation in observed utilization.[17]

Another study compared vehicle commuting mode share between residents of Jackson Heights, Queens, and Park Slope, Brooklyn. Despite neighborhood indicators predicting a higher vehicle mode share in Park Slope, Jackson Heights residents were 28 percent more likely to commute to work by car.[18],[19] One notable difference between the communities was the availability of off-street parking – 37 percent of Jackson Heights residents who owned vehicles had access to off-street parking, compared to 14 percent in Park Slope.[20] Although there are likely a variety of factors that collectively influence transportation decisions, it is clear that the availability of parking is one of the primary considerations.

### Contributes to environmental degradation.

Parking's role in putting more cars on the road also has significant environmental implications. The Environmental Protection Agency estimates that 60 percent of the transportation sector's greenhouse gas (GHG) emissions come from light duty vehicles, which include passenger cars, SUVs, and minivans.[21] While there are several determinants of driving patterns, parking expert Donald Shoup argues that minimum parking requirements increase the amount of land area set aside for parking, and subsequently allow for more cars to create more traffic congestion.[22]

If there are more single-occupant vehicles on the road, this not only creates greater traffic congestion and higher GHG emissions, but also means fewer people are using more-sustainable travel options, such as public transit, walking, and biking. This serves as a barrier to the Commonwealth's mode shift goal of tripling the share of trips taken by walking, bicycling, or public transit. Even parking lots themselves can have a negative environmental impact, with large

16 Chris McCahill et al., "Effects of Parking Provision on Automobile Use in Cities: Inferring Causality," Transportation Research Bureau, November 2015, http://www.ssti.us/wp/wp-content/uploads/2016/01/TRB_2016_Parking_causality_TRB_compendium.pdf.

17 Jonathan Rogers et al., "Estimating Parking Utilization in Multi0Family Residential Buildings in Washington, D.C.," Transportation Research Bureau, November 13, 2015, http://www.cnt.org/sites/default/files/publications/DR1_TRB_DC%20Multifamily%20Parking%20Utilization.pdf.

18 Rachel Weinberger et al., "Guaranteed Parking – Guaranteed Driving: Comparing Jackson Heights, Queens and Park Slope, Brooklyn Shows That a Guaranteed Parking Spot at Home Leads to More Driving to Work." (Prepared for Transportation Alternatives, October 2008).

19 Neighborhood indicators include income, car ownership, and vehicle and transit commuting times to the Central Business District.

20 Ibid, 7.

21 U.S. Environmental Protection Agency, Office of Air and Radiation, "Fast Facts on Transportation Greenhouse Gas Emissions," Overviews and Factsheets, accessed November 3, 2016, https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.

22 Donald C. Shoup, "The Trouble with Minimum Parking Requirements," Transportation Research Part A: Policy and Practice 33, no. 7–8 (September 1999): 549–74, doi:10.1016/S0965-8564(99)00007-5.

expanses of pavement dedicated to parking contributing to the heat island effect and impeding sustainable stormwater management practices.

### Serves as a barrier to dense, walkable development.

In addition to the environmental toll of more single-occupant vehicles on the road, there are significant financial burdens associated with the over-construction of parking. Setting aside the cost of land acquisition, paving and striping, and engineering work required for proper drainage, parking construction costs alone can hinder development. Parking structure construction costs in the Boston area are above the national average, with the average parking structure costing approximately $70 per square foot per space, or $23,500 per space, to construct.[23, 24] Construction costs are lower for surface lot parking; generally, surface parking lots comprise about 10 percent of total development costs, and on average cost about $10,000 per space to construct.[25] Developers interviewed for a parking study in Chicago indicated that developments typically do not fully recoup the full cost of constructing and maintaining parking lots, regardless of whether parking is included in rent or purchase price.[26]

Sometimes, the cost of constructing parking as prescribed by parking requirements can prevent development altogether. Michael Manville and Donald Shoup found that in Los Angeles, the parking requirements were so restrictive that buildings would have to be partially demolished in order to comply with the City's regulations.[27] Given the Greater Boston's increasing demand for housing, reducing the burden on developers by creating data-driven parking requirements can encourage housing production by decreasing construction costs and supporting future development in high density regions with good transit accessibility.

### Disproportionately burdens low-income populations.

Excess parking also takes away resources that could otherwise be allocated to other uses that have a more direct benefit to the public good, particularly the construction of affordable housing. According to a 2014 study, two parking spaces per unit can increase the cost of affordable housing construction by approximately 25 percent.[28] This means that in Greater Boston, where the average construction cost for a 1,600 square foot development is around $254,000, a requirement of two parking spaces per unit could drive up costs by nearly $64,000.[29] With funding for affordable housing already scarce, these additional costs may make the construction of affordable housing cost-prohibitive.

Furthermore, passing the cost of constructing parking onto residents through rent or purchase price disproportionately impacts low-income populations. Since low-income individuals tend to spend a larger proportion of their earnings on housing and transportation than those in higher income brackets, bundling the cost of parking with the rent or purchase price has considerable equity implications. Additionally, those living in affordable units tend to drive less frequently and instead rely on alternative modes of transportation, meaning they are even more likely to be paying for parking that they will not utilize.

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23 Cudney, Gary. "Parking Structure Cost Outlook for 2018," 2018. https://wginc.com/wp-content/uploads/2018/07/Parking-Construction-Cost-Article-17x11-8.5x11-Pages.pdf.

24 Assumes that parking spaces and associated aisle space are approximately 300 square feet.

25 Victoria Transport Policy Institute, "5.4: Parking," in Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications, 2nd ed., 2016, http://www.vtpi.org/tca/tca0504.pdf.

26 Center for Neighborhood Technology, "Stalled Out: How Empty Parking Space Diminish Neighborhood Affordability," March 2016, http://www.cnt.org/sites/default/files/publications/CNT_Stalled%20Out_0.pdf.

27 Michael Manville and Donald C. Shoup, "Parking Requirements as a Barrier to Housing Development: Regulation and Reform in Los Angeles," University of California Transportation Center, February 1, 2010, http://escholarship.org/uc/item/1qr84990.

28 Todd Litman, "Parking Requirement Impacts on Housing Affordability" (Victoria Transport Policy Institute, August 24, 2016), http://vtpi.org/park-hou.pdf.

29 "The Greater Boston Housing Report Card 2015: The Housing Cost Conundrum" (The Boston Foundation, November 2015), https://www.tbf.org/~/media/TBFOrg/Files/Reports/GB%20HousingReportCard%20111315.pdf.

# Appendix B:
# Property Owner/Manager Survey

**METROPOLITAN AREA PLANNING COUNCIL:** Residential Building Parking Study

The Metro Boston Perfect Fit Parking Initiative is a project by the Metropolitan Area Planning Council (MAPC). This 2-page survey is about the type and amount of housing and parking provided at your building. The purpose of this survey is to understand current parking demand at multifamily developments to better determine how much parking may be needed in the future. The information you provide will be used along with the data collected from other property managers and owners, and will be made available on our website, not including your name or contact information. Your participation is voluntary and the survey should take about 10 minutes to complete. Please contact Kasia Hart by phone (617-933-0745) or email (khart@mapc.org) for further information. Thank you!

## SECTION 1 SITE CONTACT

| | | | |
|---|---|---|---|
| 1 | Building name | | |
| 2 | Address | Street: | |
| | | City: | Zip: |
| 3 | Building manager | Company: | |
| | | Contact person: | Title: |
| | | Phone: | Email: |
| 4 | ☐ Check the box to receive periodic notifications of the project by email. | | |

## SECTION 2 PARKING

| | | | | | |
|---|---|---|---|---|---|
| 1 | How many parking spaces are provided for residents? | Surface lot | Garage | Bicycle | Scooter/ Motorcycle |
| | | | | | |
| 2 | Is parking included in residents' monthly rental cost/purchase price? No | | | If yes, how many spaces are provided per unit: | |
| 3 | If parking is included as part of rental costs/purchase price, can a resident save money if they do not need a parking space? No | | | | |
| 4 | If parking is not included as part of rental costs/purchase price, what is the monthly cost of a parking space? | | | | Monthly cost |
| 5 | If a resident wants additional parking beyond what is included in their rent or purchase price, how are additional spaces assigned? Please check all boxes that apply.<br>☐ The resident must pay for each additional space requested<br>☐ Parking is not included with rent/purchase price- residents pay for each space requested<br>☐ There is no option for additional parking<br>☐ Other, please specify: | | | | |
| 6 | Any additional comments on parking cost structure? | | | | |
| 7 | Is there a waitlist for residential parking spaces? Yes | | | | |

**METROPOLITAN AREA PLANNING COUNCIL:** Residential Building Parking Study CONTINUED ON NEXT PAGE →

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | In addition to residential parking, does the building reserve space for other users? If yes, indicate what the breakdown is below. (write "0" if type not present) | | | | | No |
| | Parking Type | Visitors | Management | Handicapped | Car sharing | Other |
| | Amount of spaces | | | | | |
| 9 | Does the building lease and/or allow non-residents to use parking? | | | | | No |
| | If yes, how many spaces and to which users are the spaces available to? (write "0" if type not present) | | | | | |
| | Nearby residents who do not reside in the building | | Nearby businesses | | City government | Other, specify |
| 10 | Do you think there are residents with cars who are parking off-site? | | | | | No |
| 11 | Do you provide any transportation services to residents, such as shuttle services? | | | | | Yes |
| 12 | Are there any recurring comments or complaints you hear from residents about parking in/around the building? | | | | | |

## SECTION 2 HOUSING

What kind of housing is available at your development? ☐ Apartments ☐ Condominiums

| | | Studio | 1 Bedroom | 2 Bedroom | 3+ Bedroom | TOTAL |
|---|---|---|---|---|---|---|
| 1 | Number of units by bedroom | | | | | |
| 2 | Current number of vacant units | | | | | |
| 3 | Number of subsidized units by type (Section 8, Rental Voucher or other types of deed restricted units) | | | | | |
| 4 | Average monthly rental cost/purchase price (please check the appropriate boxes below) | | | | | |
| | Less than $1000/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | $1000-$1,499/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | $1,500-$1,999/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | $2,000-$2,499/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | $2,500-$3,000/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | Over $3,000/month | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| | For condos: average purchase price | | | | | ☐ N/A |

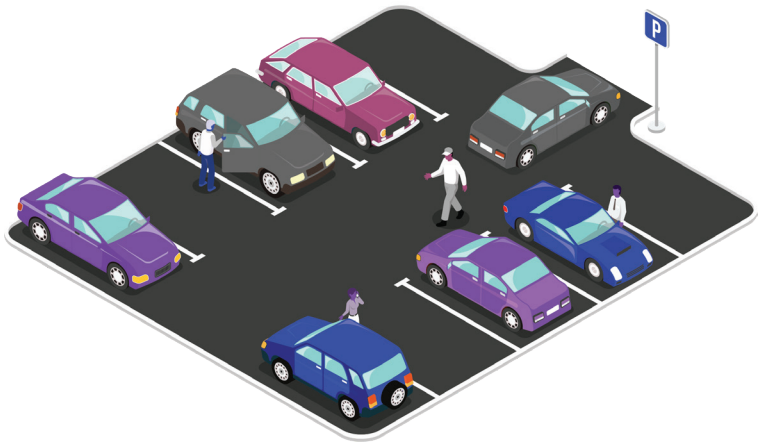
**METROPOLITAN AREA PLANNING COUNCIL:** Residential Building Parking Study

# Appendix C: Transportation Demand Management Strategies

Metro Boston

# Perfect Fit Parking Initiative

## Transportation Demand Management Strategies



## Pricing Incentives

### Charge for parking separately from rent

Unbundling parking from rental costs helps ensure residents are not paying for an amenity that they do not need if they do not own a vehicle.

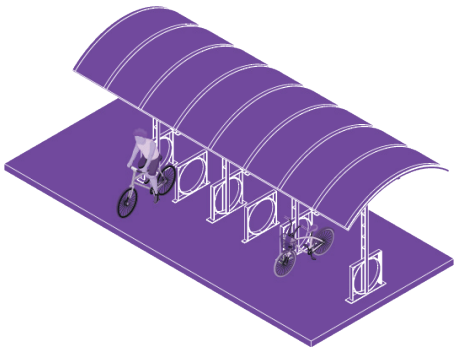
### Charge market rate for parking

The monthly charge for parking should adequately reflect the cost of constructing, operating, and maintaining parking to capture the true cost of car ownership.

### Offer a fee-in-lieu of parking option for developers

Allow developers to pay into a municipal transportation fund and rent nearby public parking spaces for residents instead of constructing all required parking spaces on-site

## On-Site Amenities and Services



### Provide secure bicycle parking

Bicycle rooms, cages, or racks should be sheltered from the elements and allow sufficient space for bicycle maintenance.

### Reserve some parking spaces for car share parking

Allowing for a small number of the parking spaces provided on-site to be used for car-sharing vehicles (like ZipCars) can discourage vehicle ownership and allow more than one or two users to benefit from a single parking space.

### Provide on-site bike share facilities

On-site bike share can promote cycling as an alternative to driving (even just for one-way trips), and enhance connections to transit stations also equipped with bike share facilities.

## Programming and Partnerships

### Join a transportation management association

A transportation management association is a membership-based organization of business owners, institutions, and property managers that provide transportation services and programs designed to reduce traffic congestion and promote local economic development. Several local TMAs will provide shuttle services, connecting residents to nearby businesses, transit stations, and other desirable destinations.

### Provide residents with free or discounted transit passes and bike share memberships

Subsidizing the cost of public transit and biking can help encourage mode shift and reduce demand for parking, particularly if residents are paying market rate for parking.

### Allow for off-site spaces to count toward on-site parking requirement

To make most efficient use of existing parking facilities, allow developers to count public off-site parking spaces (that allow for overnight parking) or private off-site parking spaces the developer has leased or owns toward the number of parking spaces required on site. These spaces should be within a reasonable walking distance to the development (generally 500-1000 feet or a 5 minute walk).

## Policy


### Reduce or eliminate minimum parking requirements

Instead of rigid parking minimums, more flexible parking requirements (such as parking maximums or allowing for a reduction in the minimum parking spaces required on-site) allows developers the flexibility to better align parking supply with variations in demand depending on neighborhood context and building features.

### Adopt a transportation demand management ordinance/bylaw

Require new developments to implement a variety of transportation demand management (TDM) measures in exchange for reducing the number of parking spaces constructed on site. This can decrease traffic congestion, promote mode shift from driving, and serve as an appealing amenity for residents.

### Allow for on-site shared parking

If a site includes a mix of uses that experience different peak demand times for parking (e.g. first floor retail and upper floors residential), allow for employees, residents, and other uses to park in the same spaces at different times of day, which will reduce the total number of spaces needed to be constructed on-site.

**Questions?**

Contact Kasia Hart at khart@mapc.org or 617.933.0745

MAPC
METROPOLITAN AREA PLANNING COUNCIL

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