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Department of
CITY & METROPOLITAN PLANNING
THE UNIVERSITY OF UTAH

Empty Spaces

Real parking needs at five TODs

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Executive summary

The land near transit stations is a valuable commodity. Hundreds or thousands of people travel to and through these places each day, and decisions about what to do with this land have implications for local economies, transit ridership, residents' access to opportunity, and overall quality of life for everyone in a community.

Many communities choose to dedicate at least some of that land for parking. The question is, how much? Too little parking could discourage people from coming to the station, but too much parking is unnecessarily expensive and gets in the way of other uses like homes, shops, or offices. How much parking should transportation engineers build?

To answer that question, many engineers and planners consult the Institute of Transportation Engineers' (ITE) *Trip Generation and Parking Generation* guides. These publications represent data collected from mostly isolated suburban land uses—not walkable, urban places served by transit. There are few alternative guidelines for engineers building this other type of development, however, so despite these shortcomings many planners continue to use ITE's publications.

The goal of this study was to determine how much less parking is required at transit-oriented developments (TODs) and how many fewer vehicle trips are generated than standard industry estimates. It is clear that TODs require less parking than development without transit, or transit without development. This study sought to gather information about how much parking is used at TOD to help developers and engineers make more-informed decisions in the future.

To do that, Professor Reid Ewing and his research team at the University of Utah College of Architecture + Planning selected five TODs across the country, each with a slightly different approach to development and parking: Englewood, CO in the Denver region; Wilshire/Vermont station in Los Angeles, CA; Fruitvale Transit Village in Oakland, CA; the Redmond, WA station in the Seattle region; and Rhode Island Row in Washington, DC. The research team together with two transportation consulting firms, Fehr & Peers Associates and Nelson\Nygaard Consulting Associates, counted all persons entering and exiting the TOD buildings, and conducted brief intercept surveys of a sample of them. Researchers also conducted parking inventory and occupancy counts.

Consistent with other research, this study found that the five TODs generated fewer vehicle trips than ITE publications estimate, and used less parking than many regulations require for similar land uses. And in one case, actual vehicle trips were just one third of what ITE guidelines estimate.

The TODs included in this study also built less parking than recommended by ITE. Yet even this reduced amount of parking was not used to capacity: the ratio of demand to actual supply was between 58 and 84 percent. Fewer vehicle trips is one likely reason why parking occupancy rates were lower than expected. Another possible reason is that ITE's data do not fully account for other travel modes that are available and actively encouraged at TODs. In each of the five TODs studied, at least 33 percent of trips were taken by modes other than driving. Additional reasons for low parking rates is that parking is shared between commercial and residential uses at two TODs, is shared between transit and park-and-ride uses at one TOD, is unbundled with apartment rents at two TODs, and is priced at market rates for commercial users at three TODs.

These findings underscore the obvious need for developers, regulators, and practitioners to rethink how they use parking guidelines intended for suburban development not served by transit. Current engineering standards are not designed to accommodate this type of development but in time we hope studies like this can help change that. Better aligning industry standards with current needs can reduce the cost of development near transit, and make it easier to build more homes, shops, and offices in these high-demand locations. More detailed results are available in the full academic version of this study and two peer-reviewed articles, all referenced in the Acknowledgments on page 10.

Introduction

The land near transit stations is a valuable commodity. Hundreds or thousands of people travel to and through these places each day, and decisions about what to do with this land have implications for local economies, transit ridership, residents' access to opportunity, and overall quality of life for everyone in a community.

Some communities chose to use the land near transit stations for parking lots, usually with the intent of making it as easy as possible for people to drive to the station and then ride transit. This approach certainly makes parking convenient, but it misses an opportunity to maximize this valuable land.

Transit-oriented development (TOD) is an approach that makes the most of the land near transit stations. TOD means building homes, offices, public services, shops, and restaurants within a short and easy walk of transit. This type of development is in high demand among both homebuyers and businesses, as Smart Growth America's *Core Values* and *Foot Traffic Ahead* research have detailed,¹ and forward-thinking transit agencies across the country are capitalizing on that demand by building or encouraging TOD at their stations.

Many communities still choose to dedicate at least some of the land at TOD for parking. The question is, how much? Too little parking could discourage people from coming to the station, but too much parking is unnecessarily expensive and gets in the way of other uses like homes, shops, or offices. How much parking should transportation engineers build?

Local codes and zoning guidelines often govern the amount of parking required at TODs. In other places with some flexibility for parking requirements, many engineers and planners consult the Institute of Transportation Engineers' (ITE) *Trip Generation* and *Parking Generation* guides. These publications represent data collected from mostly isolated suburban land uses—not walkable, urban places served by transit. There are few alternative guidelines for engineers building this other type of development, however, so despite these shortcomings many planners continue to use ITE's publications for assessing proposed TOD projects.

The goal of this study was to determine how much less parking is required at TODs and how many fewer vehicle trips are generated than standard industry estimates. With so many people riding transit, walking, or biking to get to these stations, it is clear that TODs require less parking than development without transit, or transit without development. This study sought to gather information about how much parking is used at TODs, and to help developers and engineers make more-informed decisions when building parking at TODs in the future.

¹ Smart Growth America. (2015, June.) *Core Values: Why American Companies are Moving Downtown*. Available at <https://smartgrowthamerica.org/resources/core-values-why-american-companies-are-moving-downtown/>. And Leinberger, C. and Rodriguez, M. (2016, June). *Foot Traffic Ahead: 2016*. Available at <https://smartgrowthamerica.org/resources/foot-traffic-ahead-2016/>.

An in-depth look at five TODs

TOD is widely defined as compact, mixed-use development with high-quality walking environments near transit facilities. It could be an organic neighborhood built over a long period of time near transit by many small developers, a large master-developed project built by one developer around a new station, or a clustering of several different development projects near transit facilities according to a master development plan.

In order to keep survey results comparable to one another, Professor Reid Ewing and his research team at the University of Utah College of Architecture + Planning limited this analysis to locations developed by a single entity under a master development plan. The researchers used a total of seven criteria to select TOD projects to include in this survey. The first three criteria are consistent with the definition above. TODs must be:

1. Relatively dense, with multi-story development;
2. Mixed use, with residential, retail, entertainment, and sometime office uses in the same development; and
3. Pedestrian-friendly, with streets built for pedestrians as well as autos and transit.

The researchers included four additional criteria to maximize the utility of the sample and data. To be included in this survey, TODs must also be:

4. Directly abutting a transit station;
5. Built after the transit line was constructed or proposed (and hence with a parking supply that reflects the availability of high quality transit);
6. Fully developed or nearly so; and
7. With self-contained parking.

With these criteria in mind, the research team selected five TODs across the country, each with a slightly different approach to development and parking.

Englewood, CO's TOD was among the first projects in the U.S. to replace an enclosed regional shopping mall with an open air, mixed-use development, and created “hybrid-TOD” that divides the development into zones of TOD and of big box retail. The TOD portion is 38 acres on the western portion of the site, abutting the rail line. The remainder of the site is occupied by big-box retailers, including a Wal-Mart. At 41 units per net acre and 15 units per gross acre, Englewood TOD is the least dense of the TODs studied.

The **Wilshire/Vermont** TOD is located in Los Angeles, CA's Koreatown neighborhood on one of the city's premier transit corners, served by a two subway lines and a number of bus lines. Above the station are 449 apartments and 36,500 square feet of retail space, with parking underground in a two-floor garage. Twenty percent of the residential units are set aside for low-income residents. At 140 units per acre, this TOD is the densest of those studied. There is no official transit parking located on-site.

Oakland, CA's **Fruitvale Transit Village** centers around a pedestrian plaza adjacent to the BART station. Retail businesses line the plaza along with street trees, benches, planters, and fountains. On the southeast side sits the last remnants of the site's original park-and-ride lot, a large empty

space in an otherwise dense urban area. It serves as a land bank for the Phase II of the development.

The **Redmond, WA** TOD in the Seattle region was the researchers' pilot study. Built on the site of a former park-and-ride lot and bus transfer facility, it is now home to a mixed-use, multi-story apartment and retail development—the first of several residential projects of similar size in downtown. King County Metro replaced the park-and-ride lot with a park-and-ride garage, which now occupies the eastern portion of the site.

And in Washington, DC, **Rhode Island Row** was the first project in the city that sold itself as a TOD, built on the site of a former surface parking lot for the Rhode Island Avenue Metro station. Two big-box retailers and a large amount of surface parking make the development an isolated island in a sea of parking lots. However, beyond the immediately adjacent land uses, Rhode Island Avenue is a main street in the midst of revitalization with restaurants, coffee shops, a small local grocer, and residential and office space above the retail spaces.

These five TODs varied greatly in terms of land use mixes. All are mixed-use, but with varying amounts of residential in particular and one, Englewood, essentially divided the residential into a separate part of the project for its residential parking component. All of the sites studied except Englewood also provide less parking than would be indicated using ITE guidelines, yet still have more than enough parking to meet the peak demand. Englewood essentially doubled residential parking by not allowing the sharing of residential and commercial parking areas, despite the well-understood sharing of these types of land uses due to peak demand for each happening at different times of day.

This is the first study to estimate parking generation for mixed-use TODs. It should be noted that budgetary constraints limited the study areas to smaller TODs. This limitation may underestimate the potential trip and parking reductions associated with TODs because smaller developments have more limited potential for internal capture of trips, meaning the results of this study are likely conservative. The University of Utah team is in the process of expanding their data by studying trip and parking generation at two larger TODs: City Creek Center in Salt Lake City, UT, and Orenco Station outside Portland, OR.

Counting trip generation and parking rates

After selecting the projects to examine, the researchers aimed to develop an accurate measure of total trip generation associated with the commercial and residential uses at each of the TODs. To do this, the researchers counted all persons entering and exiting the TOD buildings, and conducted brief intercept surveys of a sample of them. Those surveyed were asked about their mode of transit, purpose of the trip, and where they parked if driving. Researchers also counted all cars entering and exiting parking garages and (in the case of Englewood) parking lots and conducted parking inventory and occupancy counts. The researchers also counted all cars at transit park-and-ride lots, though results are only presented in the study's final report, not in this report or summary articles.

The travel survey and parking utilization data provide a picture of the mode of travel, origin and destination, parking location—if applicable—and purpose for all trips to and from the building throughout the course of the day.

This information along with data collected by Fehr & Peers Associates and Nelson\Nygaard Consulting Associates allowed the researchers to estimate peak parking usage rates for each TOD, as well as vehicle trip generation rates at each TOD.

While researchers acknowledge that an analysis of five TOD projects is far from comprehensive, the comparison to the ITE publications is noteworthy for practitioners, and the study aims to inspire further analysis.

Key findings

Consistent with other research, the TODs included in this study generated many fewer vehicle trips than ITE publications estimate, and used less parking than many regulations require for similar land uses.

All five TODs generated fewer vehicle trips than ITE guidelines would expect (see Table 1, below). In one case, actual vehicle trips were just one third of what ITE guidelines estimate.

TABLE 1

Estimated vehicle trips versus actual vehicle trips

TOD	ITE vehicle trip estimates	Actual vehicle trips	Actual trips as percentage of ITE estimates
Englewood, CO	13,544	9,460	69.8%
Wilshire/Vermont	5,180	2,228	43.0%
Fruitvale Village	5,899	3,056	51.8%
Redmond, WA	1,767	661	37.4%
Rhode Island Row	5,808	2,017	34.7%

With so many other ways to get to these stations, it is not surprising that fewer people drove to these TODs than ITE's guidelines expect. The developers of these TODs recognized this, and built parking accordingly. All TODs included in this study built less parking than recommended by ITE—between 23 to 61 percent of ITE's guidelines.

Yet even this reduced amount of parking was not used to capacity: peak occupancy fell below actual capacity supplied. The ratio of demand to actual supply was between 58 and 84 percent. The actual parking supply was less than recommended supply according to ITE, and the actual peak occupancy was much less than the ITE supply guidelines, in a range between only 19 to 46 percent (see Table 2, on page 5).

TABLE 2

Peak parking occupancy as percentage of supply and ITE guidelines²

TOD	Peak parking occupancy as percentage of supply	Peak parking occupancy as percentage of ITE guidelines
Englewood, CO ³	58.3%	45.8%
Fruitvale Village	84.0%	19.0%
Redmond, WA	73.5%	41.6%
Rhode Island Row	63.6%	32.7%
Wilshire/Vermont	66.8%	33.0%

Fewer vehicle trips is one likely reason why parking occupancy rates were lower than ITE's recommendations. Another reason is that parking is shared between commercial and residential uses at two TODs, is shared between transit and park-and-ride uses at one TOD, is unbundled with apartment rents at two TODs, and is priced at market rates for commercial users at three TODs.

One other possible reason is that ITE's data do not fully account for other travel modes that are available and actively encouraged at TODs. In each of the five TODs studied, at least 33 percent of trips were taken by modes other than driving (see Table 3 below). At the Fruitvale Village TOD, 74 percent of trips were taking by modes other than driving.

TABLE 3

Average mode shares for TODs studies

TOD	Observed trip count	Share of all trips					
		Walk	Bike	Bus	Rail	Auto	Other
Englewood, CO	14,073	19.2%	3.8%	3.3%	13.6%	59.7%	0.2%
Wilshire/Vermont	11,043	27.4%	2.2%	21.1%	20.1%	25.9%	3.4%
Fruitvale Village	16,558	28.3%	4.3%	15.2%	26.1%	23.0%	3.1%
Redmond, WA	1,981	18.9%	1.7%	13.0%	N/A	64.9%	1.5%
Rhode Island Row	8,451	16.6%	0.3%	9.3%	27.2%	42.5%	4.0%
Simple averages	N/A	22.1%	2.5%	12.4%	21.8%	43.2%	2.4%

² Measures are aggregate.

³ The Denver region's Englewood station remains the one exception or outlier in these findings. In an effort to generate tax revenue from big box retailers, the City of Englewood made the decision to build a "hybrid-TOD" that divides the development into zones of TOD and of big box retail. The resulting parking supply and vehicular trip generation exceed the other TODs in this study. Even so, the study found the peak demand for parking at the hybrid-TOD still to be much lower than suggested in ITE's guidelines.

Going forward, additional data will need to be collected and formulas refined to account for the varying amounts of residential uses in combination with the commercial uses. However, it is clear that parking utilization and vehicle trip generation rates are both far below identical land uses assembled in a less walkable and more suburban manner.

These findings underscore the obvious need for developers, regulators, and practitioners to rethink how they use parking guidelines intended for suburban development not served by transit.

Lessons from the five TODs

Each of the TODs included in this study used a slightly different model for its parking and development. What can city leaders, developers, and engineers learn from each of them? Here are some ideas that can inform future project decisions.

Redmond, WA: Land use regulations make a difference

Many of the codes and regulations that dictate parking at TOD come not from transit agencies (which might own the land) but from local jurisdictions that have authority over land use planning. The Redmond, WA TOD worked proactively with the City of Redmond and set a new precedent for lower parking requirements in the region.

In 1993, the City of Redmond amended its downtown zoning ordinance and raised the allowable density from 36 to 72 dwelling units per acre and reduced the required parking ratio from an average of two spaces per unit to a total of 1.25. In 2006 the City removed constraints on residential density to encourage a greater mix of unit sizes within the existing bulk and height limits. This meant developers could build as many units as they could provide parking for so long as they complied with building height and setback rules. In 2013, the City of Redmond then went a step further by providing design flexibility to its planning staff, approving residential development at 0.94 spaces per unit.

The residential portion of the Redmond TOD was a near-instant success and filled up quickly. The multifamily units were almost fully leased at the time this study was conducted in mid-2015. There is some evidence that the project has since catalyzed residential development downtown, as there are now several similar sized mixed-use buildings within a few blocks.

Fruitvale Village: Partner with community organizations

Today the Fruitvale Transit Village is a bustling mixed-use development on the Bay Area Rapid Transit (BART) heavy rail system—but that wasn't always the plan for the neighborhood.

In 1991, BART proposed building a new parking structure at Fruitvale to accommodate suburban commuters. Local residents, frustrated with the decline of the neighborhood, voiced strong opposition to the proposal. BART withdrew its proposal as a result of the outcry, and a more collaborative process ensued that brought together a nonprofit community development corporation, local business owners, community leaders, local officials, and BART staff. Community groups were invited to take part in the planning and design of the new transit village, producing different site plans with input from workshop participants, especially community members. The Spanish Speaking Unity Council, a nonprofit community development corporation often referred to simply as The Unity Council, acted as the project developer. BART eschewed the typical

competitive bidding process and granted The Unity Council development rights because of their ability to raise funds and facilitate an inclusive design process, and their stature within the community.

The Unity Council decided early on that local businesses were to come first when it came to renting retail space. In fact, an explicit policy states that only 20 percent of retail space may be rented to chain businesses and restaurants. This restriction made it a challenge to fill retail space at first. However, more than a decade after the village was created, occupancy rates of all categories are much improved: where other case studies in this report show less than full occupancy rates for retail spaces, all the residential and commercial spaces at Fruitvale were fully occupied at the time of this study in 2015.

Washington, DC: Think flexibly

Rhode Island Row is located in DC's Brentwood neighborhood, an area with median household incomes \$16,000 lower than the rest of the city, higher crime rates, and roughly half the population density as the city as a whole.

Prior to redevelopment, the Rhode Island Row site was home to a surface parking lot for a Metrorail station operated by the Washington Metropolitan Area Transit Authority (WMATA). The City initially agreed to reduce Metro parking by 50 percent, but the new plans generated opposition from neighborhood residents, who were concerned that removing the parking lot would lead to commuters taking up limited on-street parking spaces. Ultimately federal regulators pushed back and called for a 1-to-1 replacement in the new development.

The final compromise was an innovative one: shared parking spaces that are available for Metro commuters during the day and residents overnight. That approach and the development as a whole set a new precedent in DC. Thanks to Rhode Island Row, TOD is now considered a standard development typology in the DC area rather than an anomaly. And new development currently being built on several sites adjacent to the Rhode Island Avenue Metrorail station will continue to improve the area. The willingness of private enterprise to invest in land directly adjacent to Rhode Island Row also speaks to its continued success.

Los Angeles, CA: Consider the opportunities in diversity

The Wilshire/Vermont TOD is located in Los Angeles' Koreatown neighborhood, one of the most densely populated and ethnically diverse neighborhoods in the city and the densest of the TODs included in this study. More than two-thirds of Koreatown residents were born outside the U.S., one of the highest proportions in the city. The median income is among the lowest in the city, while the proportion of single residents is higher than average.

Metro's Joint Development Program, which redevelops Metro-owned real estate by leasing it out for commercial uses, recognized from the beginning that the block had a lot going for it from both residential and retail perspectives. The station's location in a dense, diverse neighborhood with a high demand for housing meant that the developer could draw prospective residents and retail customers from multiple populations. In addition, tax-increment financing (TIF) was available in the area. While the project did not use TIF directly, it made the area more attractive in general for development.

Both residential and retail portions of the TOD leased out quickly when it opened. Today, the residential portion of the development is at 97 percent occupancy, and retail spaces have commanded strong rents since the development opened in 2007. A new middle school opened in 2009, and new palm trees, plantings, and a hand-painted 8,200 square foot mural have made the pedestrian plaza a vibrant landmark in the city.

Englewood, CO: Accommodating cars can come at a cost

The Englewood TOD is unique among the other TODs studied. City staff use the term “hybrid” to describe the development, with part of it walkable from the transit station and part of it dedicated to big-box retail.

Englewood is the most auto-oriented of the TODs included in this study. Almost 60 percent of trips to the area were done by car, and it had the lowest rail mode share despite being located on the RTD rail line. It also had the lowest peak parking occupancy rate—58.3 percent.

Part of this oversupply is a result of negotiations with Wal-Mart, which insisted as a condition of locating there that the residential development be parked at 1.5 spaces per dwelling unit (rather than the 1 space per dwelling unit that the city favored) to prevent residential parking from spilling into the retail lots. Another part of the oversupply can be attributed to the fact that the parking garage at northwestern edge of the project is not shared, but rather is restricted to residential users. Failure to create shared parking across the development is a lost opportunity. This is in contrast to Rhode Island Row and Fruitvale, for example, where commercial patrons can park in the same garage with residential users.

The success of the development itself is similarly bifurcated. The civic center on the southwestern side of the site is a lively place with a library, courts, museum, and city offices, but does not generate much street activity because the parking garage is located behind the buildings. The ground floor retail on the western most portion of the site has remained mostly vacant, perhaps because there is not enough transit traffic to make these spaces viable commercially. The better performance of commercial uses on the eastern side of the TOD may, ironically, be due to greater auto-orientation. TODs may not achieve their full potential if designed for the automobile in a hybrid configuration like Englewood's.

Conclusion

All the projects included in this study had fewer vehicle trips than expected by ITE guidelines. Most used less parking than many regulations require for similar land uses.

Vehicle trip generation rates for the five TODs included here were, on average, less than half of what ITE estimates. Englewood, with its hybrid design including extra parking and auto-oriented land use, still had 30 percent fewer vehicle trips than ITE's guidelines. The denser, more walkable TODs included in this study had 50 to 65 percent fewer vehicle trips than ITE's estimates.

With so many other ways to get to these stations, it is not surprising that fewer people drove there. Even reduced amounts of parking were not used to capacity, and actual peak occupancy was much less than the ITE supply guidelines, in a range between only 19 to 46 percent. On average,

residential peak occupancy reached only 70.2 percent of the available supply. Fewer vehicle trips, innovative parking strategies, and more diverse travel modes are all likely reasons why parking occupancy rates were so low at these TODs.

Analysis of five TOD projects is far from comprehensive, but engineers and municipal leaders can use these findings to make more educated decisions about future TOD projects. Lower vehicle trip generation and parking occupancy rates have implications for how to best use the land near transit stations. Similarly, where impact fees and mitigations are often calculated based on vehicle trip generation, TOD projects must be given the credit they are due for generating far fewer vehicle trips, thereby reducing any related impact fee assessments or off-site mitigations in proportion with these lower rates of actual impact.

Well-designed TOD projects can create convenient homes and offices accessible by a variety of transportation options. Current engineering standards are not designed to accommodate this type of development but in time we hope studies like this can help change that. Better aligning industry standards with current needs can reduce the cost of development near transit, and make it easier to build more homes, shops, and offices in these high-demand locations.

Acknowledgments

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The full academic version of the original research is available through the National Institute for Transportation and Communities, at <http://nitc.trec.pdx.edu/research/project/767>. That research was published in two peer-reviewed journals:

Ewing, R., Tian, G., Lyons, T., & Terzano, K. (2017). "Trip and parking generation at transit-oriented developments." *Landscape and Urban Planning*, 160, 69-78. Available at <http://www.sciencedirect.com/science/article/pii/S0169204616302687>.

Tian, G., Ewing, R., Weinberger, R., Shively, K., Stinger, P., & Hamidi, S. (2016). "Trip and parking generation at transit-oriented developments: a case study of Redmond TOD, Seattle region." *Transportation*, 1-20. Available at <http://link.springer.com/article/10.1007/s11116-016-9702-x>.