Statewide Transit-Oriented Development (TOD) Study

Factors for Success in California

Special Report

Parking and TOD: Challenges and Opportunities

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I. INTRODUCTION

This special report is intended to provide information to local jurisdictions, transit agencies, developers, financial institutions, and others as they develop and implement parking standards and programs for transit-oriented developments (TODs) in California. It provides an overview of available information regarding the extent to which parking for various types of land uses may be reduced in the vicinity of major transit stations[1]. It is one of a series of reports produced for the California Department of Transportation, Division of Mass Transportation's Statewide Transit-Oriented Development Study. This report is not intended to be an exhaustive source of information on TOD parking issues; rather, it is meant as a starting point upon which additional information can and should be added. For some topics (e.g., shared parking, parking planning), guidebooks currently exist which can be referenced for more detailed information (see Sources section).

TOD offers significant opportunities to reduce the number of parking spaces below conventional parking requirements for retail, office and residential land uses. TOD provides these opportunities by increasing transit accessibility and combining a mixture of land uses. At the same time, increased densities in TODs, coupled with the goal of improving accessibility for pedestrians to transit stations, often means building structured parking garages. Parking spaces in structures can cost from $10,000 to $30,000 each, compared to about $5,000 per space for surface parking (depending on underlying land values, type of parking structure [e.g., above or below ground], landscaping, and architectural quality). These increased costs can negatively affect the financial feasibility of projects, even if they are otherwise profitable.

Hence, if the design and location of TODs enables a reduction in the number of parking spaces needed, the cost savings can be significant.[2] Reduced parking requirements can lower TOD construction costs, which in turn can make housing more affordable and/or allow more development to be built on sites near transit. For example, in one case study of six San Francisco neighborhoods, the standard requirement for off-street parking was found to increase costs for single family homes and condominiums by more than ten percent[3].

This study also found that, based on home selling prices and the distribution of incomes for San Francisco residents, an additional 26,000 households could potentially afford to purchase condominiums if off-street parking was not legally required.

In addition, reduced parking requirements can:

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[1] In this special report, "transit" refers to bus, commuter rail, and light rail transit.
[2] Kodama, et al. The last 15 percent of parking spaces constructed usually produce less income per space and cost more than average to build.
[3] Jia and Wachs. Donald Shoup, cited in this study, argues that parking requirements probably increase housing costs more than the direct costs of the parking, as higher priced units in particular may not be as marketable unless they also include more luxury features and amenities.

- Reduce residential parking rates
- Reduce office/commercial rents
- Lessen urban water runoff
- Reinforce/encourage transit use
- Increase taxable square footage
- Improve local traffic circulation
- Improve urban design, and
- Generate congestion management credits for businesses (where applicable)

The research summarized in this special report indicates that TOD can potentially reduce parking per household by approximately 20%, compared to non transit-oriented land uses. A wide range of parking reductions (from 12% to 60%) has also been found for commercial parking in TODs. To date, however, there are no clear conclusions regarding how much parking may reasonably be reduced for any particular TOD. Therefore parking needs must be calculated on a site-by-site basis.

Overview of Report Organization

This special report is organized in five main sections. The first section presents general findings regarding the extent to which parking can be reduced in TODs, which derive from interviews/surveys of transit agencies and developers in California and around the country, and a review of the literature. Sources that were reviewed include academic studies, trade journal articles, consultant reports, agency studies, and planning documents available in hard copy or on the Internet.

These findings show that parking can successfully be reduced in TODs. However, there is no single formula that can or should always be used, and parking needs can vary widely in various locations -- even within the same jurisdiction. In establishing parking codes, studies have found that jurisdictions often simply use other localities' parking codes or strategies, which often lead to parking problems. Experience has shown that strict adherence to local parking codes or national Institute of Transportation Engineers (ITE) parking data often creates oversupplies of parking in many places.

Thus, the general findings offered here should be tempered with additional research that accounts for various factors that affect parking demand, such as: the specific tenant mix in a particular project (e.g., office worker densities, shoppers per retail employee); the quality of the local transit service; applicable trip reduction requirements and/or incentives; residential demographics; site conditions (e.g., pedestrian circulation constraints, parking spillover potential); as well as other local factors that can affect transit and auto use rates.

The next two sections of the report present summaries of site-specific and regional strategies that various jurisdictions and developers are using to reduce parking or to use parking more efficiently in TODs.

However, since it is not feasible to universally apply the specific parking reduction factors and strategies described in this special report to all situations, the fourth section of the special report suggests a generalized process for developing a local parking program. The primary purpose of this section is to point out general issues that need to be addressed.

Finally, the report provides several appendices that supplement other information presented and provide some illustrative examples. Appendix A summarizes a general methodology for implementing shared parking strategies. Appendix B describes parking policies and programs in a number of "case study" TODs that were analyzed within California and in other parts of the U.S. for this report. In addition, Appendix B summarizes information about actual experience that has resulted from implementing these policies. It is difficult to form any conclusions about "ideal" TOD parking standards or programs based on the specific information presented in Appendix B alone, however, because each of the case study TODs are unique with respect to their context and experience. For instance, some of these TODs are still under construction, some do not reduce parking, while others do reduce parking, but for different reasons.

At the same time, much of the information presented in the Appendix volume is consistent with other research and professional judgment regarding parking and TODs. Appendix C lists maximum parking standards that local governments in the Portland, Oregon, metropolitan area have established to reduce the number of non-residential parking spaces allowed per capita. Finally, Appendix D presents "parking planning worksheets" that can be used in estimating parking requirements in TODs.

Importantly, this special report does not address two important issues that pertain to commuter parking and TODs, namely:

- It does not identify TODs that should include park-and-ride facilities, as this is a transit system planning question that is best answered by local transit agency staff. This issue should be resolved as early as possible in the design of transit stations and TODs, however, so that all parking planning efforts can be integrated.
- It also does not provide suggestions on how to configure parking to maximize accessibility and safety for pedestrians. This is primarily an urban design issue.

II. SUMMARY OF FINDINGS

This section describes broad findings regarding the extent to which parking can be reduced for various land uses in TODs. Importantly, these findings should be considered a general starting point upon which to base detailed site-specific studies.

Residential Parking

Dr. Robert Cervero at U.C. Berkeley has conducted extensive research on residents of California TODs and their travel behavior[4]. To identify potential consumers of new TODs in California, Cervero (1996) studied over 6,500 housing units in 26 large housing projects built within one-quarter mile of urban rail stations between 1985 and 1994. Most of these projects were multi-family buildings with densities of 20 to 60 units per acre[5]. Among Cervero's primary findings are:

- Most TOD residents are young professionals, singles, retirees, childless households, and immigrants from foreign countries.
- These groups tend to require less housing space than traditional "nuclear families", and are more likely to live in attached housing units for financial and convenience reasons, regardless of where the units are located.
- Most TOD residents tend to work downtown and in other locations that are well served by transit.

In more detailed analysis of 12 housing projects near BART stations, Cervero found that TODs had an average of 1.66 people and 1.26 vehicles per household, compared to 2.4 people and 1.64 vehicles for all households located in the same census tracts. Whereas only 48% of all households in the census tracts had fewer than two vehicles, 70% of TOD households had fewer than two vehicles. Thus it appears that TODs offer the potential to reduce parking per household (by 23%) largely by virtue of attracting different types of households. While Cervero does not statistically test the direction of causality (i.e., do TODs cause people to own fewer cars, or are people with fewer cars attracted to TODs?), he cites other studies of rail access[6] to conclude that residents are actively choosing to live in TOD locations that offer transit accessibility to job sites[7].

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[4] In comparison, the California TODs profiled in Appendix A of this report are generally emerging TODs that are currently in development.

[5] 12 to 15 dwelling units per acre is generally considered the minimum threshold needed to support suburban rail service. Puskarev and Zupan (1977), cited by Cervero (1996).

[6] See Voith, Richard. Transportation, Sorting and House Values. American Real Estate and Urban Economics Association Journal. Vol. 19. No. 2. 1991

[7] This activity is often called "residential sorting", whereby households change housing locations that complement their lifestyle preferences (e.g., desire to own fewer cars).

Cervero's findings are supported by another systematic study of residential vehicle ownership in TODs in Vancouver, British Columbia[8]. In this study, Bunt and Associates Engineering surveyed 4,000 households in 60 buildings around six 'Skytrain' transit stations to learn if parking requirements could be reduced in future developments. Primary findings from this study include:

- Households located near stations use transit much more often than more distant households (i.e., residential sorting is occurring).

- Households near stations generally owned 10% fewer vehicles than more distant households. Frequent users of Skytrain, however, owned 29% fewer vehicles than households using Skytrain less frequently. The difference in Skytrain use translates directly to lower car ownership rates.

- Other factors were found to affect car ownership much more than transit proximity. These are: household income; number of people in a household; and the size of dwelling units (which was assumed to be correlated with the other two factors). Households in the highest income category owned twice as many cars as households in the lowest income category. Most surveyed TOD residents were in the moderate to low-income categories.

Based on these findings, the City of Vancouver has since allowed parking reductions ranging from 14% to 28% for new projects in other multifamily zones near major transit stations.[9]

The main points to be derived from these studies and other available information on this topic include:

- Parking reductions (perhaps on the order of 20%) are more feasible for multi-family rental units with smaller households (e.g., young couples, singles, empty nesters) and where a significant share of workers is likely to use transit to get to key employment centers;

- Auto ownership rates are highly correlated with household income, as well as household size and number of workers, even where good transit service is available.[10] (Although it is important to point out that higher-income households may also use transit frequently.)

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[8] Importantly, neither study controlled for the preponderance of other land uses (e.g., office, retail) near transit stations, which could potentially affect auto ownership rates. For both studies, "transit orientation" is largely measured by proximity to transit.

[9] The reductions are not universally allowed and must still undergo a hearings process. Anecdotally, City staff report that some condominium projects (i.e., owned housing) in particular have caused parking problems when insufficient parking was initially provided.

[10] Schimek,1996. The relationship of income and auto ownership is well documented in the literature. Cervero (1998), for instance, notes that even in Curitiba, one of the world's most transit oriented cities,

- "Lower income" does not always mean that households do not own vehicles. For example, several TODs located in downtown Portland (OR) with significant amounts of affordable housing units, for instance, report relatively high car ownership rates[11].

Due to these factors, it is possible to state that TOD projects that primarily include higher income groups and/or owner-occupied multi-family dwellings may not be able to reduce parking as much as TODs that incorporate numbers of lower-income households and/or rental units.

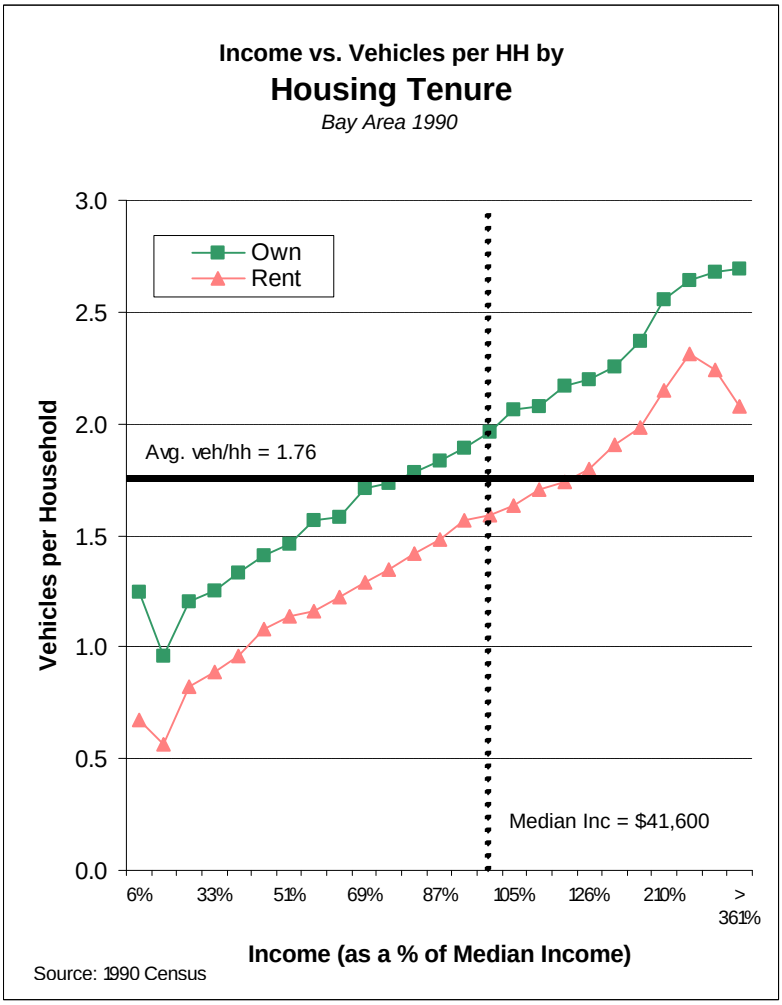
Figure 1, below, illustrates an example of how car ownership rates vary with income and housing tenure in the Bay Area[12]. While the exact numbers may vary from place-to-place, this general relationship is likely to hold true.

anecdotal evidence and actual transit boarding counts show that condominium households have the city's highest vehicle ownership rates and generate few transit work trips. Many condominiums are located directly adjacent to high-capacity bus axes, and most households owning these units have upper to middle incomes (the highest valued condominiums are located closest to downtown reflecting their general accessibility advantages). Using 1990 NPTS data, Schimek was able to estimate auto ownership while statistically controlling for household characteristics, land use density, level of transit service, and other variables (few researchers have done this). This relationship was confirmed anecdotally for this study through conversations with condominium property managers and city officials.

[11] See The Yards, where most affordable studio residents have cars. In another case, the Stadium Station Apartments (immediately adjacent to light rail, not profiled), all residents earn less than 60% of the median income, and 75% have cars (though they are also frequent transit users).

[12] Non-Profit Housing Association of Northern California

Figure 1
Source: 1990 U.S. Census



Parking for Commercial Uses

Compared to the topic of residential auto ownership rates, no studies available in the literature have systematically estimated optimal office or retail parking requirements while accounting for level of transit service across several locations. (However, several studies have documented pervasive "oversupplies" of both types of parking). Commercial parking demand is more complex generally and is affected by numerous factors, including: employee demographics, retail sales volumes, employee densities, types of adjacent land uses, etc. Some of these factors will be discussed subsequently.

Some of the TOD-style developments that are profiled in Appendix B of this report indicate that transit availability can be combined with the tools described in the next

section of this report to successfully reduce parking. These reductions are summarized in Table 1:

Table 1
Commercial Parking Reductions at Selected TODs

TOD	Land Use	Parking Reduction
Pacific Court (Long Beach, CA)	Retail	**60%**
Uptown District (San Diego, CA)	Commercial	**12%**
Rio Vista West (San Diego, CA)	Retail/Commercial	**15%**
Pleasant Hill (CA)	Office	**34%**
Pleasant Hill (CA)	Retail	**20%**
Dadeland South (Miami, FLA)	Office	**38%**
City of Arlington (VA)	Office	**48%-57%**
Lindbergh City Center (Atlanta, GA)	Speculative Office	**19%**
Lindbergh City Center (Atlanta, GA)	Retail	**26%**
Portland (OR) Suburbs*	General Office	**17%**
Portland (OR) Suburbs*	Retail/Commercial	**18%**

***Based on maximums specified in Metro's Title 2 Regional Parking Ratios (see Appendix C).**

Planners and developers should take into account two major trends when planning for office parking that are increasing office space utilization and parking requirements in some markets areas: 1) "hoteling"; and 2) rapidly increasing office rents. These influences are described below:

Some industries (e.g., consulting, accounting) are increasingly implementing "hoteling" plans whereby a large pool of workers report to a "home" office each day, from which they may then be assigned to work in the office or the "field" (away from the office) for all or part of the day. In this case, while the home office may be located near transit, many or most clients may not be, requiring workers to have access to a car. Thus many companies continue to require parking sufficient to accommodate peak office occupancy, which sometimes greatly exceeds 100 percent of normal, planned occupancy[13].

In localities or 'markets' with high office rents (e.g., San Francicso, Washington D.C.), property managers are increasingly "squeezing" more companies into buildings, and companies are increasingly squeezing more employees into office space on a permanent basis (i.e., the use of cubicles is increasing)[14]. The result of both trends is declining square footage per employee in many markets. In this case, it may still be possible to reduce parking to account for transit, mixed uses, or other factors. These reductions, however, may need to be applied to new, updated (increased) "normal" parking standards.

[13] See Reston, Virginia in the Profiles for an example.
[14] Rick Davis, ULI

III. SITE-SPECIFIC APPROACHES

This section summarizes several strategies that jurisdictions and developers are using to reduce parking in TODs. These strategies largely involve using parking more efficiently and encouraging coordination among multiple users. It does not, however, address pricing strategies, such as increased parking charges, which can also be very effective in promoting transit use and reducing parking demand. Pricing strategies can be very complex, and often require detailed study due to their potentially broad geographic scope[15]. Similarly, this special report also does not discuss employer parking "cash-out" programs, which have been well-documented in the literature[16], and which can be implemented unilaterally by businesses and therefore are less of a planning issue.

Mixed Land Uses and Shared Parking

Differences in peak parking periods in mixed land use developments make shared parking possible. Shared parking is typically defined as: publicly and/or privately-owned parking that is used by two or more individual land uses without conflict. Combining land uses with different peak parking demands results in a demand for parking that is less than the demand generated by separate free-standing developments of similar size and character, allowing more land to be used for other purposes.[17]

The feasibility of shared parking depends on the specific uses on the site and the combination or interaction of uses. In particular, shared parking works best when adjacent land uses have different activity periods. To maximize the benefits of shared parking, land uses with dissimilar demand patterns are "combined". For example, an office building with high daytime demand could share parking with a cinema complex with higher evening demand.

Further reductions in parking can also be produced by the relationships between certain land uses. One example is a retail market that serves employees who work and shop within the same site. In this case, adjacent office and retail uses may not have significantly different peak hours of operation, but physical proximity allows internal trips to be made without using cars. Market synergies typically allow mixed-use developments such as this to draw from larger market areas than single uses. In this case, increased market size does not necessarily translate into an equivalent rise in parking demand. The result may actually be reduced demand for parking per unit of land use as patrons are able to link multiple trips from a single auto or transit trip.

[15] Readers should refer to Dueker et al. (TCRP Report 40) which includes an excellent discussion of pricing's effectiveness and complicating issues.
[16] See studies by Donald Shoup.
[17] Barton-Aschman Associates

Shared parking is one of the most promising tools to reduce aggregate parking levels in TODs. For example, the developers of Reston, Virginia, were allowed to reduce parking in the downtown core by 25% because of efficiencies anticipated through required shared parking. At Mockingbird Station (Dallas, Texas), the developer has been allowed to reduce total parking by 27% for a similar reason. While shared parking does not directly affect transit ridership, it may facilitate transit use indirectly to the extent that it promotes denser development clustered around shared facilities. (Please see Appendix A for a general methodology for determining shared parking requirements.)

District Parking and In-Lieu Fees

District parking is a large-scale application of shared parking, and is frequently implemented in urban commercial and retail areas utilizing multiple parking facilities. Parking districts allow businesses to work together and address issues such as lighting, maintenance and future parking needs, and when done well, can enhance the parking performance and perception of the district. Most parking districts are established by local business associations working in partnership with local government.

District parking can be particularly beneficial to new development, as it can significantly reduce the marginal costs of new construction. Many districts allow developers to contribute cash "in lieu" (i.e., instead) of providing parking[18]. Donald Shoup (1999) argues that replacing parking requirements with in-lieu fees is necessary to reduce the total number of parking spaces by making the cost of developing parking more explicit. Whereas parking requirements collectivize (and usually inflate) the cost of parking,[19] in-lieu fees (i.e., market prices) individualize the cost and create incentives to economize. In-lieu fees are most often a fixed dollar amount multiplied by the number of parking spaces that normally would have been required for the given land use(s)[20]. The district then uses the accumulated funds to construct parking structures or lots that can serve multiple purposes (i.e., shared parking). This option gives developers additional flexibility, and parking can usually be developed within a convenient distance and at less cost. Other benefits include improved urban design, fewer development variances, and enhanced historic preservation.

[18] See Shoup (1999) for information about 18 cities in California that have in-lieu fees.
[19] Initially, developers pay for the parking. These costs then translate into higher costs or lower value for other things. Residents pay for parking through higher housing prices, consumers pay more for goods, employers pay higher rents, and workers receive lower wages. Shoup goes on to state that planners cannot in fact "know" how many parking spaces are required for land uses without considering the price of parking, and that confusion generally reigns regarding parking ratios (some cities argue for parking minimums while others implement maximums). In 1991, the American Planning Association Planning Advisory Service reported 648 different parking requirements covering 179 different land uses in American cities.
[20] A case-by-case approach to fee setting can be complicated, time-consuming, expensive, and unpredictable. Some cities use graduated fee schedules reflecting land costs. Converting in-lieu fees to office development costs (based on the parking ratios in place) Shoup estimates these costs to amount to $71/sq. ft. in Palo Alto, $55/sq. ft. in Walnut Creek, $39/sq. ft. in Mountain View, and $20/sq. ft. in Davis.

The first step to create a district is to identify how much parking is available, where it is located, when it is available and whether it is free or paid. Surveys should be conducted at different times on “average” days and during the busiest periods to ascertain peak times and seasons. Next, determine how much parking is needed in the district using the shared parking methodology discussed in Appendix A. Comparing demand with supply will highlight areas of the district that may have surplus spaces. The district can set a target of how much of the parking demand will be met using available parking.

Using the target and information regarding supply, the district can then develop a plan to meet parking needs. Points to be considered include:

- Are there areas where new parking can be developed?
- Are there areas with surplus parking that can be used to meet peak demand?
- Would valet parking allow less convenient spaces to be used?
- Are employees and business owners parking in prime spaces?
- Should on-street parking time limits be imposed or changed?
- Are customers able to park and walk to a variety of destinations in the district?
- Would the owners of private parking be willing to share spaces in off peak hours?

Once a parking management plan is in place, it should be publicized with signs and flyers to encourage appropriate use of parking resources. If enforcement is necessary during peak times, it may be paid for through a local improvement district (LID). An LID must typically be approved by at least 50% of the property owners, and funds can be used for developing shared parking lots, maintenance, lighting and signage. LIDs can be assessed on any basis chosen by the district, including amount of street frontage or size of building. Much of the parking demand in a district will be from people who work there. It is essential that prime spaces near the businesses be available for patrons rather than used by employees and business owners. Time limits are one way to achieve this. Another method is to offer incentives for employees to take transit to work or to park in designated areas.

A primary source of friction between commercial districts and adjacent residential neighborhoods is parking. The problem can be reduced by giving employees an alternative to parking on residential streets and supporting residential parking permit programs that ban long-term parking by non-residents.

Transportation Demand Management (TDM)

Numerous TDM techniques exist (e.g., pricing, alternative work arrangements, on-site child care) to reduce trip making and parking demand. In this section we discuss a few techniques particularly relevant for TODs. While each of these strategies is likely to produce only modest benefits, in combination they can achieve significant results[21].

Satellite Parking

This strategy has single employers, groups of employers, or a transportation management association (TMA) providing dedicated off-site parking for employees, which is then served by specialized transportation (e.g., direct shuttle van service) or public transportation. At Lindbergh City Center (Atlanta, GA), for instance, BellSouth Corporation plans to build satellite parking facilities at four MARTA rail stations. In general, this strategy is likely to produce only small to moderate declines in overall auto use[22], but can potentially benefit multiple parties:

- The parties providing the parking may benefit by replacing high cost on-site parking with lower cost off-site parking. If no more on-site parking can be built, they may have to do this. It is primarily a mechanism to manage on-site supply and demand.
- Neighbors adjacent to the TOD can benefit when the satellite parking provides a good alternative to local spillover parking.
- Parking users will benefit if the overall service quality and cost of the parking/transit option is better than the on-site parking (e.g., travel times from the remote parking are comparable or reduced).

Carpool Parking

Under this strategy, employers or TMAs convert a fairly large amount of preferentially located single occupant vehicle (SOV) parking to preferentially priced high occupancy vehicle (HOV) parking. The effectiveness of this strategy is likely to be modest, and will depend on the price differential between the two modes and perhaps whether other HOV infrastructure (i.e., lanes) exists. In TODs, the potential for carpooling increases if a critical mass of employers can coordinate to offer ridesharing services. Carpool parking strategies do not positively impact transit use, and can reduce transit ridership if carpools realize significant travel advantages (e.g., direct non-stop service in carpool lanes).

[21] Warner Center, a large commercial complex near Los Angeles, was able to reduce SOV commuting from 85% in 1987 to 70% in 1994 by implementing several TDM tools despite having pervasive free parking. Dueker, et al.
[22] Dueker, et al.

Transit Pass Programs

One of the best times to affect travel decisions and to encourage transit use is when there is a change in home or job location. Thus new TOD development offers a good opportunity to implement transit pass programs to attract individuals to use transit, and in general encourage others to change their transportation habits.

At Orenco Station, a new TOD along Portland's Westside MAX (light rail) line, a Pilot TOD Pass Program was implemented in September 1998 to test the effectiveness of transit pass incentives. Some key findings include[23]:

- Whereas only 30% of respondents reported using transit prior to the Westside MAX opening, 83% reported that they used transit in May 1999 after the MAX opening.
- From September 1998 to May 1999, transit use for commuting purposes increased 22%.

Similarly, the LaSalle Apartments, another Westside TOD, reported a 79% increase in transit use after transit passes were offered there. It should be noted that, both of these studies only tested for impacts on transit ridership but not auto ownership. Additional research would be required to see if residents subsequently chose to own fewer automobiles (both Orenco Station and LaSalle provide 1.9 parking spaces per dwelling unit).

Shoup contends that employee transit pass programs should be used more aggressively and in conjunction with in-lieu fees to allow developers to reduce parking demand rather than increase parking supply[24]. Whereas subsidizing the transit system as a whole would improve transit service in general, it is not likely to reduce parking demand at any specific site. Demand-side subsidies (i.e., passes) are more likely to increase transit ridership and reduce parking at specific sites. Transit passes are also tax-deductible for employers and tax-free for employees.

Reducing parking demand can cost much less than increasing parking supply. A survey of commuters who were offered 'Eco Transit Passes' through the Santa Clara Valley Transportation Authority (SCVTA) found that the number of people driving a vehicle by themselves declined from 76 to 60 percent after passes were given away. It also found that transit's mode share increased from 11 to 27 percent, while parking demand declined roughly 19%. Based on the parking cost equivalents of in-lieu fees in two of the SCVTA-served cities that were surveyed ($39 per sq. ft. in Mountain View, $71 per sq. ft. in Palo Alto), Shoup estimates that a 19% parking reduction translates to cost

[23] Tri-Met.
[24] An example from Mountain View illustrates the concept. In this case, a six-story office/retail project was allowed to buy out of 19 on-site spaces in return for providing transit passes for employees. The project also paid in-lieu fees for 29 spaces at $29,000 per space. As a result, the developer was able to build one less level of underground parking and realize significant cost savings. Alison Kendall, Kendall Planning and Design.

reductions of $7.41 per sq. ft. in Mountain View and $13.49 in Palo Alto. Furthermore, based on the price of transit passes for Silicon Valley employers ($10 to $80 per employee) and assuming four employees per 1,000 sq. ft. of office space, Shoup estimates that for each $1 spent on transit passes per year, cities could save between $23 and $337 for the initial capital cost of parking[25].

Hours Restrictions (Parking Management)

One way to promote shared parking and utilize parking efficiently is to encourage or require businesses to coordinate their business operations and peak period demand. At Orenco Station, realtors in the commercial core (high trip generators) have volunteered at the suggestion of the developer to not schedule meetings during lunchtime hours so that parking is available for three nearby restaurants (also high trip generators) during the peak lunch business hours. In this case, the realtors determined that they could adjust their business activities and create relatively little inconvenience for customers, thereby promoting the viability of businesses that continue to attract prospective residents.

Unbundling Housing and Parking

Based on their San Francisco study of parking requirements and housing affordability, Jia and Wachs question why parking spaces must be required with housing units (regardless of the number of actual cars in the household) and instead ask if housing and parking should always be unbundled and sold through separate markets[26]. In this case, vehicles would be parked off the street in parking garages independent of housing units, as is done in other (primarily urban) parts of the world. A 'real life' example of how this works is in Tokyo, Japan. Households there cannot register autos unless they have off-street parking for them, while families that do not own cars (or fewer of them) do not have to pay for parking spaces attached to their housing.[27]

Under this system, parking requirements would be linked to car ownership rather than housing ownership, and would create strong (and direct) incentives to reduce car ownership. This arrangement would require local police and traffic enforcement staff to strictly enforce parking restrictions and time limits to effectively eliminate free parking for local residents. Rather than perpetually search for on-street spaces, move cars frequently, or pay traffic fines, auto owners with sufficient incomes would purchase or rent spaces. Those wishing to save money and/or with viable transportation alternatives would give up cars they use less frequently.

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[25] As an intermediate calculation, Eco Passes would cost from 4 cents to 32 cents per sq. ft. of office space.
[26] In many inner city buildings in San Francisco, in fact, it is common for units to be rented or sold with the option for tenants to rent or purchase parking separately.
[27] Jia and Wachs.

There are numerous potential problems and opportunities with this strategy, and further research is probably warranted to explore what fully "unbundled" housing and parking markets might look like. On its face, this strategy has the potential to allow for more flexible supplies and uses of parking to satisfy changing household characteristics and parking demand. In addition, parking developers may have more incentive to not oversupply (expensive) parking, as the costs of underutilized supply could not be as easily recovered via higher prices on associated products (e.g., housing). In the short-run, however, housing without attached parking would likely sell or rent at a competitive disadvantage. Parking and housing development might also proceed at different rates, creating frequent market imbalances. Finally, city officials may have aesthetic or functional reasons for preferring widely distributed on-site parking to fewer but taller parking structures, which is a likely outcome of this strategy.

One permutation of this approach has been tried at the Streetcar Lofts in downtown Portland, OR (not profiled), which offers a $15,000 price reduction for condo owners who opt not to have a parking space in the building.[28] Although the Streetcar Lofts are immediately adjacent to the Central City Streetcar and enjoy good bus service, only two buyers out of 56 sales have taken advantage of the offer to date. According to the property manager, most buyers still choose to own and use cars (as would be predicted by their economic status) despite having excellent transit service. In addition, buyers who may be able to reduce auto ownership themselves are reluctant to give up their parking space, fearing this may negatively impact their resale value. The converse of this approach, which is common in many urban markets, is to require residents to pay a separate charge for on-site parking. The Yards at Union Station (see Profiles) is one such example, and also illustrates how difficult it can be to get households to relinquish parking spaces. Both of these examples show that it is not sufficient to just charge explicitly for parking, and how unbundling products on a large geographic scale could enhance incentives to reduce parking in the long term.

Car Sharing

Car sharing is an alternative to owning a personal vehicle for people who do not need access to a car every day. Car sharing groups provide members with access to a car on a reservation basis, and members typically only pay for the time and miles they drive (fees usually include insurance, gasoline, and maintenance)[29]. To use a vehicle, members walk or bike to a vehicle storage site, use an access key or card, and drive away. Users then typically receive a statement at the end of each month showing how much they owe based on their vehicle usage. Some of the advantages of car sharing include:

- Vehicles are usually more conveniently located than rental cars, can (potentially) be accessed 24 hours a day, and can be used for shorter periods of time

[28] Each space actually costs about $20,000, and they can be resold to other parties for greater amounts.
[29] Some groups may also charge administrative fees, application fees, and/or membership fees.

- Members do not have to maintain or clean cars
- Car sharing is frequently less expensive than car ownership for people who drive less than 10,000 miles per year. In the U.S., car sharing is most often used as an alternative to owning a second vehicle (in an urban environment)

Car sharing is more popular in places with superior transit systems (e.g., Europe and Canada), and has been established in numerous forms, including: cooperatives, non-profit businesses, professional services, short-term rental companies, and via private, neighborhood agreements. In the U.S., car sharing has been slow to take hold, and the largest systems (Boston and Seattle) have less than 50 vehicles spread across several locations[30]. In San Francisco, City CarShare has 23 vehicles at 6 locations. The Gaia Building in Berkeley and the apartments by Mission Housing in Mission Bay (San Francisco) are two examples of car sharing programs that were integrated directly into the projects specifically to reduce the number of parking spaces provided. These are two transit-oriented projects (by BART and Muni Metro/Caltrain, respectively) where car sharing would not have been implemented if transit stations were not nearby.

As part of its effort to reduce parking, The Streetcar Lofts, described previously, pays $5,000 a year to CarSharing Portland to have two shared vehicles parked on-site. While the vehicles anecdotally appear to be well-utilized, it is more likely that the vehicles are being used by other local residents/members not associated with the development (the project has not reduced car ownership significantly).[31]

Research sponsored by CarSharing Portland to evaluate its program indicates that[32]:

- Most members are in their late 20s to mid 30s, or aged 45 to 50.
- The average member household size is 1.8 (with no children) compared to 2.23 for the rest of the city.
- Members are likely to be better educated, earn higher incomes, and rent their housing. They tend to be “choice” transit riders (i.e., they use transit frequently, though they earn enough income to easily afford their own vehicle).
- Most trips are made by walking (36.8%), followed by: transit (19.7%), personal auto (14.7%), bike (10%), carpool/vanpool (8.4%), car sharing vehicle (5.3%), borrowed vehicle (3.9%), and other means (1.4%). Car sharing is most likely to substitute for owning a second car.
- The four most important travel purposes for car sharing are: grocery shopping (13.5%), medical purposes (11.1%), other shopping (7.5%), and recreation (6.7%).

[30] The Car Sharing Network
[31] Tiffany Sweitzer
[32] Portland State University

CarSharing Portland (Oregon)

To conclude, car sharing appears to offer marginal parking reduction benefits. The largest impediments to greater car sharing implementation and usage appear to be:

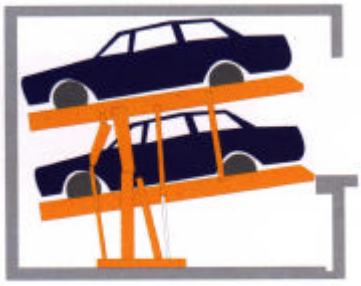
- Users must typically reserve cars at a specific location and time at least 24 hours in advance to have a good chance of securing the vehicle they desire. This requirement largely precludes spontaneous or unplanned trips and all trips incur additional “administrative” time.
- While transit is often well suited to serve peak period work-based trips, it is less able to serve other trip purposes that may be chained across a wide geographic area. Most potential users are likely to drive more than 10,000 miles per year, and thus not save money. Similarly, the potential hard cost savings for low mileage drivers may not outweigh the costs of reserving vehicles and adjusting schedules.
- A well-functioning program depends critically on the “good” behavior of multiple parties. Local jurisdictions and private towing companies must be quick to tow away cars illegally parked in reserved car sharing spaces (or cars get parked at random locations), and members must honor reservation schedules.

Mechanized and "Robotic" Parking Systems

Mechanized and robotic parking systems offer a potential “high-tech” solution to reduce the amount of physical space required for structured parking. Mechanized parking refers to smaller scale technology that can be used to vertically stack up to three cars in a space roughly equivalent to one level of parking, effectively creating structured parking where none existed. Because the lift (which holds multiple cars) must drop into a below-

grade "pit" to bring the topmost car to ground level, mechanized parking can only be used for small to mid-sized developments with one "level" of parking. Robotic parking refers to larger scale, modular parking systems that include a specialized parking structure (including façade), multiple parking lifts that move cars individually, and proprietary software to operate the system. To date, both technologies have had limited application in the United States.

Panoramic Interests, an infill development company in Berkeley, California, specializing in housing, live-work space, commercial space and mixed-use development, installed the first mechanized parking system in the U.S. about five years ago at its Shattuck Avenue Lofts, a mixed-use loft condominium project[33]. At this site, 17 cars are parked in an area that would normally accommodate nine cars using double stacked lifts, freeing up ground level space for more valuable commercial activity. Another system was subsequently installed at The Berkeleyan (also a residential/commercial project) where triple stacked lifts park 39 cars in the space of 13. The developer is extremely pleased with both systems (they are cost-effective, easy for tenants to activate, and do not break down) and plans to install mechanized parking systems in all his future housing developments. Several hundred of these systems are now planned for installation in the Bay Area (San Francisco just revised its code to allow them), and the Allegro Lofts development in Oakland will use the technology to park over 200 cars[34].



Klaus Parking Systems

Mechanized Parking

The first American application of a large scale mechanical parking will be in Hoboken, NJ, where Robotic Parking Inc. is installing a 334- car garage on a 10,000 square foot lot in residential section of the city[35]. While hundreds of multi-story mechanical garages have been built in Europe and Asia, interest in the U.S. has been relatively slow to

[33] The technology is provided by Klaus Parking Systems, USA Inc. The company offers a range of products that can be customized to accommodate different applications (e.g., new development, remodels) with varying amounts of available space. Customizable features include the amount of headroom between platforms (to accommodate a range of auto sizes), amount of incline (more incline reduces pit depth), and storage capacity (2 to 6 cars). The average cost per space is approximately $11,000, including the price of the pit.

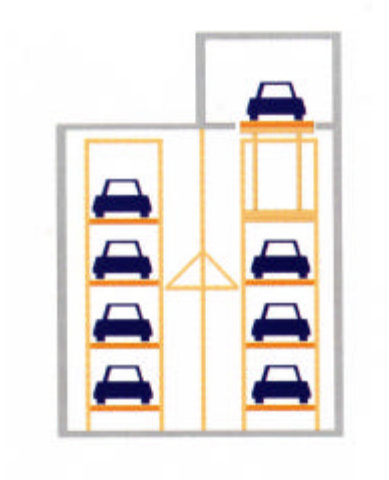
[34] Patrick Kennedy. The project, at Jack London Square, will include 312 residential units.

[35] The exterior will have a red brick façade and windows to blend in with the neighborhood. The owner will be the City of Hoboken Parking Authority.

develop[36]. As land values continue to escalate rapidly in many urban markets, however, other U.S. cities are also considering implementing this technology[37].

Robotic Parking Inc.'s modular automated parking system (MAPS) integrates auto transport technology used in auto assembly plants with state-of-the art warehousing technology to double the number of cars that can be parked in a typical garage. Drivers park their car on an at-grade, leak proof pallet and then take a ticket, punch in a code, or swipe a card to activate the system. Then three autonomous robots move the pallet and car to an open stall. Drivers use their ticket or card to retrieve their car, which is returned within a few minutes to the ground level bay.

Robotic Parking



Klaus Parking Systems

Other companies also offer "robotic" systems with similar features (e.g., Klaus Parking Systems). Some of the advantages of robotic parking include:

- Competitive costs for above-ground structures, and significantly reduced costs for below-grade installations (up to 30% less)
- Increased security for vehicles and drivers
- Reduced personnel costs (one person can operate a large system)
- Reduced vehicle damage and insurance claims
- Reduced costs for concrete repair, lighting, and ventilation

[36] Robotic Parking Inc.
[37] The company's second installation will be in Pinellas Park (Tampa Bay), Florida, where a four-level, 80'x100' garage will serve 150 vehicles.

- Enhanced flexibility; the systems can be modified, added to, and disassembled and relocated. Modules can be designed in a variety of configurations to accommodate as few as 20 cars and up to several hundred.

IV. CITY, STATE, AND REGIONAL APPROACHES

Robert Cervero (1998) has found that places in the world where parking is most reduced tend to take a regional or a national approach recognizing existing high rates of transit use and to further encourage additional transit use. If transit and other modes are not time-competitive with autos for many types of trips, however, auto ownership rates tend to increase and parking requirements must be maintained. For example, the European and Asian cities that have reduced parking supplies most drastically are those cities and regions that -- from the start -- have emphasized travel by transit, and where governments have broad powers to shape land development and implement regional traffic controls to influence transit use.[38] Although the specific approaches may vary, these places have superior transit systems with respect to geographic coverage, ease of access, service frequency, passenger amenities, and other factors.

Comparatively, in places where transit ridership is low or reduced parking standards are intended as a tool to induce additional transit ridership, regional or statewide policies and regulations may be necessary to maximize the regional potential of transit and TOD, and to minimize the relocation of development activity (e.g., shifting development away from places with more stringent parking and other requirements to locations with relatively lax standards). The remainder of this section describes some city, state and regional efforts to reduce parking in areas that are well-served by transit and to provide more efficient (i.e., structured) parking so that land use densities can be increased in the vicinity of transit stations.

City of San Diego, California
In 1992, 'TOD Design Guidelines' prepared by Peter Calthorpe were adopted by the City of San Diego as development guidelines, as opposed to regulatory prescriptions. While not adopting the 'TOD Design Guidelines' document in it's entirety, some of the parking concepts in Calthorpe's work were subsequently incorporated into the City's Municipal Code.

Although San Diego does not specifically reduce parking for TOD, its 'Transit Area Overlay Zone' does allow a small parking reduction in areas that are adjacent to identified transit stations nodes and corridors. For example, the Transit Area Overlay

[38] Cervero, 1998. In The Transit Metropolis, Cervero describes numerous European and Asian cities that have aggressively reduced parking, implemented other auto disincentives, and generally have adopted "transit-first" policies. Specific tools include: limited parking, reserved parking, expensive parking, superior bike/pedestrian infrastructure, and good traffic management to keep cars and transit moving.

allows 0.25 fewer spaces for each multiple dwelling unit. The city also generally uses either a "CC-3-4" or "CC-3-5" as the primary commercial/mixed use zoning designations for TOD projects. In the case of "CC-3-4", the code establishes the minimum number of parking spaces per 1,000 square feet of floor area as 2.5 spaces outside of Transit Areas and 2.1 spaces for projects inside the Overlay Zone. In the "CC-3-5" zone, the parking maximum is 5 spaces per 1,000 square feet, compared to the standard suburban shopping center maximum of 5.5 spaces.

Ten years ago, parking maximums were adopted for the downtown area of San Diego. However, in 2001, all downtown parking restrictions were lifted with the sole exception of a required minimum of 0.5 spaces per residential unit. San Diego had been in an economic recession for much of the last decade and developers claimed that the parking limits were one of the primary reasons for not building downtown (the downtown was not competitive with surrounding areas that do not have parking limits).

In this particular case, removing the maximum parking ceilings, and thereby promoting growth in the downtown, may help to increase transit ridership because more residential development has occurred downtown, where transit can serve a higher percentage of trips. In addition, relative to other large cities in California, San Diego does not have an expansive freeway network, so a large number of downtown-oriented trips are still likely to use transit. According to some parties, the effects of lifting the parking restrictions have generally been positive. There are now two major office buildings under development, one of which has been pre-leased and has secured financing, the second of which is expected to follow suit soon.[39] Other parties, however, remain skeptical about the wisdom of lifting the parking maximums, and contend that it is still too early to tell if this was the best policy decision.[40]

Metro (Portland, Oregon)

Adopted in 1996, Portland Metropolitan ('Metro') Government's "Urban Growth Management Functional Plan" is a set of requirements and tools for local governments in the Portland metropolitan region to use to manage growth in accordance with policies established under the 2040 Growth Concept. Generally speaking, the Growth Concept defines the future form of regional growth and development, and calls for more compact development as a means to encourage more efficient use of land, promote non-auto trips and protect air quality. Importantly, the federally-mandated air quality plan adopted by Oregon relies on the 2040 Growth Concept's ability to fully achieve its transportation objectives in order to comply with clean air regulations. Functional Plan requirements are also linked to other statewide regulations (e.g., Transportation Planning Rule), which aim to reduce the number of non-residential parking spaces per capita by 10% by 2015.

[39] Pam Hamilton, City Centre Development Corporation (San Diego)
[40] Miriam Kirshner, City Planning Liaison to MTDB (San Diego)

Title 2 of the Functional Plan includes regional policies that establish the number of minimum and maximum parking spaces that can be required by local governments for certain types of new development. Table 1, in Appendix C of this report, lists these regional parking ratios[41]. Notably, areas that are well served by transit ('Zone A' land uses) have lower permitted parking maximums for non-residential uses, although minimum parking requirements are largely uniform throughout the region. More specifically, 'Zone A' areas are properties located within a one-quarter mile walking distance of 20-minute peak hour bus service, or within a half mile walking distance of light rail.

Regional parking standards have not been developed for residential uses in Portland. This in part is due to the complexity of predicting household types likely to occupy different types of housing, and because excessive parking was perceived to be more of a problem for commercial and retail land uses. Other types of parking that are exempt from these standards are: structured parking; fleet parking; parking for vehicles for sale, lease, or rent; employee carpool parking; dedicated valet parking; user-paid parking; and other high-efficiency parking management alternatives. For sites where mixed land uses are proposed, jurisdictions are encouraged to establish 'blended' parking ratios.

To establish the reduced standards, Portland Metro staff reviewed the parking ordinances of all local jurisdictions and generally incorporated the lowest ratio per land use (the lowest ratio effectively became "best practice"). The reduced ratios were then reviewed by each jurisdiction before being formally adopted by Metro[42]. Generally speaking, maximum parking amounts are equal to 125% of the minimum amount. For compliance purposes, Title 2 requires jurisdictions to:

- Amend their comprehensive plans and implementing regulations to meet or exceed the standards listed in Table 1 (this is the "standard option"). Jurisdictions may request that they be exempted from these standards if they are very small or have extenuating circumstances.

- Establish processes to consider variances to these standards (providing jurisdictions with a "local option").

To date, most jurisdictions have changed their parking requirements to be consistent with the Title 2 regulations. Assessing the results of these relatively new parking standards, however, is difficult. Metro staff anecdotally reports that most jurisdictions attending a recent post-implementation evaluation workshop claim that they are not having significant difficulty implementing Title 2 parking requirements. At the same time, each jurisdiction still retains the right to allow variances from parking requirements, and no one has systematically determined the degree to which variances are being granted. Although Title 2 also requires jurisdictions to report to Metro the number and location of

[41] Jurisdictions may use other measurement standards than those listed if the effect of the local regulations will be essentially the same when applied.
[42] Some negotiations were required as suburban commercial developers wanted to provide more parking.

newly-developed parking spaces (indicating where variances have been granted), this reporting has not yet been implemented, so Metro is not fully able to track its progress towards reducing parking in transit-accessible areas. Similarly, no one has undertaken a comprehensive analysis to determine the effects of the regulations, such as deflecting development from Zone A locations to other areas, continued excess parking, or spillover impacts.

State of Maryland

In September, 2000, Maryland Governor Parris Glendening signed and an executive order which established a Special Task Force to study TOD. The charge to the Task force was, by December, 2000, to identify various benefits of TOD and develop a prioritized set of recommendations for maximizing TOD benefits in the State.

At the conclusion of their study, the TOD Task Force developed a recommendation that the State of Maryland create a program to fund parking structures and bicycle and pedestrian amenities in TODs. More specifically, the recommendation acknowledges that structured parking is necessary to promote higher density development, but that the high cost of providing structured parking acts as a financial barrier to TOD development. Thus the Task Force recommended that the State, acting through the Maryland Transportation Authority (MdTA), provide financial support for structured parking in (strictly defined) TODs where aggressive demand management strategies[43] have been implemented, and where the supply of parking has been "pinched" by the redevelopment of surface lots or by reductions in the amount of allowed parking. In this case, State financing of structured parking was deemed to be "necessary and appropriate" to overcome current market weaknesses and to promote TOD throughout the State to create new markets.

Although many of the details of a potential finance program have yet to be determined, some basic actions needed to implement the recommendation include:

- Establish TOD zones to determine needs and focus incentives;
- Establish more detailed eligibility requirements;
- Define program parameters and roles and responsibilities of MdTA and other potential finance partners; and
- Develop an award system.

The State of Maryland is currently considering enabling legislation (House Bill 334) that would allow this Task Force recommendation to be implemented, although many details of the program remain undefined.

[43] Applicable demand management strategies are not specified.

V. PLANNING FOR REDUCED PARKING

This section of the report describes a simplified, "generic" planning process that can be customized to plan for parking in TODs and other developments. This section draws primarily from the Local Government Parking Management Handbook: Using Demand-Based Parking Strategies to Meet Community Goals.[44] Readers are encouraged to refer to this Handbook for more details.

The right mix of parking management strategies, tailored to fit the unique needs of specific locations, can result in significantly reduced parking. Strategies to use parking resources more efficiently may include changes in parking location, cost, supply or demand. Not every location, however, will benefit from parking management. Worksheets included in Appendix D can be used to conduct a preliminary assessment and generally evaluate:

- Economic and financial feasibility (e.g., developers facing high costs for parking structures and underground facilities);
- Characteristics of the site and the surrounding neighborhood (e.g. transit accessibility, potential for shared facilities);
- Parking demand, supply, requirements and attitudes (e.g., are the developer, lender and land owner willing to explore parking management options?);
- Market issues (e.g., land values are rising, but parking costs still hinder development).

Implementation of a successful parking management program begins with a feasibility study of potential changes to existing policies or to an individual project. The goals and objectives of the program should define what will be accomplished with the program, what options and resources are available, and which strategies make sense for the community. More specifically, this step should begin to define where and when a parking program should be established, and to develop a shortlist of strategies for further evaluation.

The feasibility study will help to focus efforts on specific parking issues and a program customized for the community. It should include an analysis of current parking, with estimates of future demand and evaluations of various strategies, as well as examining ways to improve the efficiency of existing facilities. Components include:

- An inventory of all on and off street parking spaces in the project;
- A survey of parking charges;
- Peak and off-peak occupancy counts;
- Long and short-term estimates of the mix for all of the above;
- Tabulations of the amount of floor area by type of use to determine demand;

[44] Kodama, et al.

- An analysis of traffic and parking impacts associated with on and off-street parking; and
- Tabulations of existing and projected parking utilization rates for the area.

Employee and/or resident surveys may also be useful to estimate parking requirements and utilization, and may be economical than conducting full-blown parking utilization studies. In California, for instance, Principal Capital Group Development conducted the following survey of office tenants in a Phase I development to estimate parking requirements for Phase II development also in proximity to a (Fremont) BART station:

- Number of projected employees;
- Number of employees that will drive their own car to work the majority of the time;
- Number of employees that will take BART, carpool, or use alternative transportation the majority of the time;
- Number of employees requiring weekend parking that will drive their own cars;
- Number of employees requiring weekday after-hours parking that will drive their own cars.

The process of developing a program should be inclusive, bringing together key stakeholders early in the process. The major parties may include local government staff and elected officials, residents and neighborhood representatives, developers, lenders, investors, landowners, leasing agents, employer/tenants, and employees.

Community outreach efforts should have “champions” who are from the community and can help present the information. One important goal of this step is to identify concerns that must be addressed, and another is to inform the community of expected benefits. A formal communication plan with an agreed-upon process, ground rules and a timeline are recommended. Through a series of workshops and small group discussions, participants can explore what each party has to gain or lose, as well as the pros and cons of each strategy. Based upon this groundwork, the focus can shift to examining potential procedures and models, and developing constructive ways to collaborate.

A realistic understanding of existing and future conditions and stakeholder expectations is necessary to develop a successful action plan, which is the next step in the process. Specifically, participants must know:

- How does the local government prepare ordinances, plans, developer agreements and parking districts?
- Will the parking management strategies address a particular project or an area?
- Will the strategies require policy changes or a developer agreement?

The development of policies or agreements will involve negotiations that must be based upon the issues of all key participants. The discussion should cover as many

alternatives as possible in an atmosphere that encourages everyone to see other points of view.

Once agreements have been reached, the program must be monitored as each of the elements are put in place. Parties with a vested interest should have access to accurate, current information. This will allow them to assist in periodic reviews and adjustments of the program to ensure that the elements are functioning well. At an agreed-upon time, the program results should be evaluated to assess the level of success and potential need for revisions.

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APPENDIX A – GENERAL METHODOLOGY FOR DETERMINING SHARED PARKING

Importantly, the actual results of a shared parking strategy will depend upon specific site characteristics and should be estimated through a detailed demand analysis. The general four- step methodology outlined below can be used to estimate the amount of shared parking needed for either an existing or proposed project[45]. This methodology draws primarily from the Urban Land Institute's (ULI) Shared Parking handbook; readers are encouraged to refer to the original source for a more detailed approach.[46]

Step 1. Initial Project Review
In this step, the physical and functional relationships between land uses are described. Physical issues include the site layout and organization, including distances between land uses, barriers to pedestrian flow, and surrounding land uses and proximity to transportation. Functional relationships pertain to the intended "character" and type of land uses. If it is too early in the planning process to know this information, a set of assumptions should be developed. Examples include square footage by use, hotel room counts, convention facilities (e.g., number of meeting rooms and intended audiences), and assumed on-site market patronage for retail and entertainment uses.

Step 2. Adjustment for Peak Parking Factor
Several subtasks are then necessary to determine the peak parking demand factor. Parking demand factors represent the number of spaces needed per unit of land use or other parameter.

- Verify land uses and select parking parameters

Examine the land uses in step 1 to define the factors. . Examples include square feet of floor area or number of dwelling units are generally used, but unique activities may warrant the use of other variables. Specifically, verify if occupied gross leasable area (GLA) is to be used, including or excluding common areas, and convert convention facilities to equivalent square feet if capacity per person is used in the building program.

- Select peak parking demand factors

Next, select preliminary values for peak parking factors, using one of the following sources; (1) factors documented in other sources (e.g., ULI, ITE, local jurisdiction), (2) validate experience of the developer, or (3) conduct new parking field surveys. Whichever source is used, it is important to know the time of year and modes of travel

[45] Implementing shared parking at existing developments can be problematic if jurisdictions require a legal instrument from each participating property or must attach conditions to a land use application. In Portland, OR, for instance, one shared parking arrangement had to be abandoned because the existing adjacent properties did not have land use applications upon which to attach conditions (while the City was able to attach conditions on the new proposed building). Dueker, et al.
[46] See Barton-Aschman Associates in the "Sources" list.

reflected in the data (i.e., is transit available). The resulting data should be described by land use and note the estimated percent of trips made by non-auto modes (e.g., office = 3 spaces/1,000 sq. ft. GLA (weekday); 0.5 spaces for weekends; no monthly variation; no transit available).

- Adjust for seasonal peaks

Next the peak season for each land use must be determined, based on developer's data or a documented source. Since the design month is generally different for each land use in a multi-use development, it is necessary to determine which month produces the highest parking demand.

- Adjust for mode of transportation

The parking demand factors must then be adjusted to reflect available modes of transportation. First, peak parking demand factors are adjusted upward to reflect 100% auto use. Second, the parking factors are adjusted downward to reflect expected local transit use at the development. For the typical suburban project without access to transit, no second adjustment is necessary. In urban areas where transit is frequently used, the adjustment can be significant.

- Adjust for captive markets

An optional step is to adjust for captive markets. This step is optional because of the potential difficulty in determining the effects of a captive market . Its omission will result in a more conservative estimate of reduced parking. These relationships can be confirmed, however, via surveys of employees, visitors, and patrons, as well as by parking surveys or site-specific market analyses.

Step 3. Analyze hourly accumulation

This next step produces an estimate of hourly parking accumulations for each land use over an average day. When charted, the results typically show a curve that is fairly consistent for a wide range of office, regional retail and residential uses. Entertainment and hotel non-room-related activities, however, tend to vary significantly. Accumulation curves are then estimated for each land use, based upon the selected hourly values described in terms of the percent of maximum design-day parking demand expected at every hour during the day. The parking demand factor (step 2) multiplied by the quantity of land use (step 1) produces an estimate of peak parking demand. This value, multiplied by each hourly percentage yields an estimate of demand for every land use by hour of day.

Step 4. Estimate shared parking

Finally, the hourly parking demand for each land use is merged to estimate overall shared parking demand for a project.

<u>Design, Operation & Management Considerations for Shared Parking</u>

Several areas of concern are unique to shared parking, and can be addressed in the design, operation and management of the facilities.

- Paid versus Free Parking

Charging a fee for parking is a primary means of controlling the use, which may be important to a shared facility in an urban location where parking is at a premium. Validated parking can be provided to encourage its use by hotel guests, shoppers and others. The rate structure will depend on the variety of land uses in the mixed-use development and the need to control use of the parking. If parking is free, strict enforcement must be provided to control its use.

- Access

Shared facilities may require separate access systems for specific land uses within the mixed-use development (e.g., to access hotel valet service).

- Directional Signing

Signage is particularly important in a multi-use development with shared parking. Signs internal to parking facilities can direct drivers to spaces located near specific land uses and provide information directing them to their destinations.

- Design of the Pedestrian System

The connections between parking facilities and destinations are particularly important in a shared facility where parkers may visit multiple locations. Signage, safety and security, an attractive environment, lighting and direct pedestrian paths are primary considerations.

- Flexibility of the Internal Design

The design and operation should be flexible to accommodate future changes to the facility, including the dimensions of spaces and the addition or deletion of valet parking.

- Exclusive Spaces

Some spaces may be exclusively reserved for particular user groups, including persons with limited mobility, and valet parking. Although marked for a specific use, these spaces would remain part of the overall supply.

- Guaranteed Spaces

Some land uses may require that a guaranteed number of spaces be available to serve their customers or events, although these spaces are not signed for exclusive use. For example, a hotel may require an adequate number of spaces in a parking lot shared with a retail complex. Locational guarantees may require office and retail workers to park on the periphery of the development to “guarantee” parking for visitors and customers. In either case, the guaranteed spaces would still be included in the overall shared supply.

- Impact of Competition

The appearance of ample parking may give a competitive advantage to nearby establishments. The key to a successful development is having shared parking that is

sufficient to accommodate demand, and which is well located with appropriate signage and pedestrian linkages. Shared (and reduced) parking should include a small surplus to prevent drivers from endlessly searching for very few empty spaces. The purpose of shared parking is to reduce the number of spaces to a reasonable number, but not less than necessary.

- Encroachment by “Outside” Parkers

In shared parking facilities, it may be more difficult to identify and control unauthorized parkers than at a single use location. Paid rather than free parking may become necessary, charging fees to outside parkers and issuing permits for employees and customers of the development. Certain areas of the facility may be closed at specific times to reserve space for various users, and enforcement may be also be necessary depending upon the situation.

APPENDIX B: PARKING PROFILES FOR SELECTED TODS

I. PARKING PROFILES OF SELECTED TODs IN CALIFORNIA

(Please note: Additional detailed information about each of these TODs is available in another California Department of Transportation report: "Statewide Transit-Oriented Development Study: Factors for Success in California" September 2002.)

Pacific Court (urban area) — Long Beach, California

Special TOD Parking Standards: Yes

Transit Mode: Light rail and bus.
Transit Service Frequency: Light rail, every 5 to 10 minutes.

TOD Land Uses / Characteristics: The project is a mixed-use, infill development on a 2-acre site in an urban location. Completed in 1992, it includes 142 apartments above 96,000 square feet of retail and commercial development.

Parking Characteristics: The developer constructed 400 underground parking spaces on-site, and the Redevelopment Agency also operates several parking lots in the area.

Parking Ratios:

Standard:
Retail = 5 spaces per 1,000 square feet
Residential = 1 space / studio; 2 spaces / 1+ bedroom unit
Guest parking = 3 spaces / 10 units

TOD:
Retail = 2 spaces per 1,000 square feet
Residential = 1 space / studio; 2 spaces / 1+ bedroom unit
Residential = No guest parking required

Method used to develop TOD parking ratio: The reduced parking was established via negotiations between the developer and City. Guest parking was eliminated through a variance process and the retail parking requirement was cut by 2/3 due to good transit access.

Creative Parking Strategies: None

Experience: Parking appears to be sufficient but not excessive.

Sources: Robert ZurSchmiede, Long Beach Redevelopment Agency, Long Beach
Gary Felgemaker, Community Planning Manager, City of Long Beach

Hollywood / Highland (urban area) — Los Angeles, California

Special TOD Parking Standards: No

Transit Mode: Heavy rail and bus
Transit Service Frequency: Heavy rail, every 10 minutes

TOD Land Uses / Characteristics: This station area is a major regional entertainment and retail complex on 8.7 acres. The subway station was opened in 2000 and the remaining development is expected to be complete by November 2001. It includes a 640 room hotel, six screen multiplex theater, specialty shops, restaurants, a food court, 40,000 square foot ballroom, 3,300 seat live broadcast theater for the Academy Awards, as well as pedestrian walkways and landscaped areas. Transit amenities at the site include an MTA bus transfer station, tour and shuttle bus loading zones, and a general public drop-and-ride zone.

Parking Characteristics: The site includes a 3,000-space underground parking structure.

Parking Ratios:

Standard: Local standards range from 2 to 4 spaces per 1,000 square feet of commercial use.

TOD: There is no special parking ratio for TOD, but there is a reduced parking requirement in redevelopment areas of 2 spaces per 1,000 square feet for office/retail.

Method used to develop TOD parking ratio: The specific basis for the reduced parking requirement in redevelopment areas is not documented, but generally assumes that less parking is necessary to stimulate development in blighted communities.

Creative Parking Strategies: The Redevelopment Agency is considering implementing a District Valet program that would pick up cars at the Hollywood/Highland TOD or nearby and park them in the structure. Shared parking is also encouraged between different tenants.

Experience: The project has not been completed.

Sources: Kevin Michel, Project Manager, Metro Transit Authority, Los Angeles
Kip Rudd, City Planner, Los Angeles Community Redevelopment Agency

North Hollywood (NoHo) Arts District (urban area) — Los Angeles, California

Special TOD Parking Standards: No

Transit Mode: Bus
Transit Service Frequency: Four bus lines with service ranging from 25 to 40 minutes

TOD Land Uses / Characteristics: This project created an "art park" from a vacant lot, planted trees, painted a mural on a building and added pedestrian lighting along a one-eighth mile section of a major arterial. Planned by a nonprofit organization, the improvements have drawn new businesses to the area and previously vacant buildings are now in use.

Parking Characteristics: An 85 space parking lot owned by the Redevelopment Agency is leased to the nonprofit, which added landscaping and lighting.

Parking Ratios:

Standard: Local standards range from 2 to 4 spaces per 1,000 square feet of commercial use.

TOD: There is no special parking ratio for the TOD, but there is a reduced parking requirement in redevelopment areas of 2 spaces per 1,000 square feet for office/retail.

Method used to develop TOD parking ratio: The specific basis for the reduced parking requirement in redevelopment areas is not documented, but generally assumes that less parking is necessary to stimulate development in blighted communities.

Creative Parking Strategies: None

Experience: As the area attracts more retail patrons, parking is becoming more scarce. The impact of the new subway station three blocks away is also being felt. Insufficient parking at the subway station has been a problem since opening day last summer. Short-term solutions such as paving vacant property and re-striping existing lots have provided a total of 1,101 spaces. MTA is initiating a study to examine longer term parking solutions.

Sources: Ken Banks, Executive Director, North Hollywood Community Forum, LA
Andrea Burnside, Project Manager, Metropolitan Transit Authority (MTA), LA

Uptown District (urban area) — San Diego, California

Special TOD Parking Standards: The City adopted TOD design and parking guidelines (not requirements) in 1992, after this TOD was developed.

Transit Mode: Bus. The TOD is located in a major transit corridor served by 4 or 5 bus routes with several bus stops in the District.

Transit Service Frequency: 15 to 30 minutes

TOD Land Uses / Characteristics: This mixed-use, infill development covers a 14-acre urban site and was completed in 1989. Land uses include a 42,500 square foot market, 66,000 square feet of additional ground level retail uses, 28,500 square feet of limited, upper level commercial uses, a 3,000 square foot community center and 320 dwelling units.

Parking Characteristics: The developer constructed 1,068 parking spaces. Residential and supermarket parking is underground. Street level spaces are available for retail shoppers. No parking is provided specifically for transit riders. Residents walk to local bus stops, and there is no reason for people living outside the district to drive in for bus service.

Parking Ratios:

Standard: Commercial = 1 space per 250 square feet
Residential = 2.25 spaces per unit

TOD: Commercial = 1 space per 285 square feet
Residential = 2.25 spaces per unit

Method used to develop TOD parking ratio: Negotiations between developer and City.

Creative Parking Strategies: Shared parking.

Experience: Parking is not a problem in the District. There are generally some spaces available, especially in the underground parking lots. Two-bedroom units are assigned two spaces each, and some households rent out their extra space. Visitors either park on the street or in a space assigned to the resident they are visiting.

Sources: Miriam Kirshner, City Planning Liaison to MTDB, San Diego
Michael Stepner, Dean New School of Architecture & Design, San Diego
Bill Liben, resident of Uptown District since 1992, San Diego

Rio Vista West (suburban area) San Diego, California

Special TOD Parking Standards: Yes. Transit Area parking ratios apply to development that is at least partially within a Transit Area Overlay Zone or Urban Village Overlay Zone.

Transit Mode: Light rail.
Transit Service Frequency: 15 minute headways

TOD Land Uses / Characteristics: This project is a mixed-use development on a 95-acre site that is owned by a single developer. The first phase was completed in 1997 and included 480 units. At build-out, there will be 1,700 housing units at densities ranging from 33 to approximately 70 units per acre, with 30,000 to 50,000 square feet of small office and neighborhood retail.

Parking Characteristics: The developer constructed 970 parking spaces on the mixed-use portion of the site, the majority of which are underground.

Parking Ratios:

		Minimum Required	Maximum Permitted
Standard:	Single Family units	2 spaces per unit	
	Senior Citizen (1 bedroom units)	1 space per unit	
	Multiple dwelling units range	1.25 to 2.25[47]	
	Retail Sales/Commercial Services	2.5 to 5.0 per 1,000 square feet	6.5
	Planned Districts (Mission Valley)	2.5 to 5.0 per 1,000 square feet	6.5
	Eating & Drinking Establishments	2.5 to 15.0 per 1,000 square feet	20.0 to 25.0
	Planned Districts (Mission Valley)	5.0 to 15.0 per 1,000 square feet	25.0

		Minimum Required	Maximum Permitted
TOD:	Single Family units	2 spaces per unit	
	Senior Citizen (1 bedroom units)	1 space per unit	
	Multiple dwelling units range	1.0 to 2.0	
	Retail Sales/Commercial Services	2.1 to 4.3 per 1,000 square feet	6.5
	Planned Districts (Mission Valley)	2.1 to 4.3 per 1,000 square feet	6.5
	Eating & Drinking Establishments	2.1 to 12.8 per 1,000 square feet	20.0 to 25.0
	Planned Districts (Mission Valley)	4.3 to 12.8 per 1,000 square feet	25.0

Method used to develop TOD parking ratio: Not known

Creative Parking Strategies: Shared parking.

Experience: The project has not been completed.

Sources: Nancy Bragado, Senior Planner, City of San Diego
Chris Kluth, Transportation Planner, MTDB, San Diego

American Plaza (urban area) — San Diego, California

Special TOD Parking Standards: No standards were in place when this project was developed.

Transit Mode: Light rail and bus.
Transit Service Frequency: Two light rail lines serve the station, one every 7.5 minutes and the other every 15 minutes during peak hours. The station is also served by 21 bus routes.

TOD Land Uses / Characteristics: The Trolley line runs through this structure, which was completed in 1992. The project is a mixed-use development on a 2-block site, and includes a 34 story office tower with specialty retail, a galleria/food court, the San Diego Museum of Contemporary Art and outdoor plazas.

Parking Characteristics: The developer constructed 1,250 spaces of underground parking on the site.

Parking Ratios:
Standard: No standards were in place when this project was developed.

[47] Number of spaces per unit varies by number of bedrooms.

TOD: Negotiated

Method used to develop TOD parking ratio: The number of parking spaces was driven by the bank financing the project and office space marketing concerns.

Creative Parking Strategies: Shared parking is allowed throughout the city, in accordance with parking regulations.

Experience: Generally, downtown San Diego developers build an excess of parking as a way to market the office space in their buildings. For this project, sources only report that parking is "sufficient" (no mention of excess or not).

Sources: Jack Limber, General Counsel & Deputy General Manager MTDB, San Diego

Ohlone-Chynoweth (suburban area) San Jose, California

Special TOD Parking Standards: Yes. The City does allow reduced parking for TOD but it was not done in this case.

Transit Mode: Light Rail
Transit Service Frequency: 10-minute headways during peak hours, 20 minutes in the off-peak

TOD Land Uses / Characteristics: This mixed-use project on 7.3 acres will be completed in 2001. It includes 195 units of affordable rental housing, 4,400 square feet of retail space, a 3,000 square foot day care center and a community room.

Parking Characteristics: The site was formerly an underutilized 1,100-space park-and-ride lot owned by the transit agency. The lot was reduced to 240 spaces for transit users and reconfigured to accommodate the TOD on the remaining property. Podium (semi-depressed) parking for residents is located below the housing units and some units have garages. Parking is also provided for the retail space and the day care center.

Parking Ratios:

Standard: Residential = 1 .7 spaces/unit (334 spaces for 195 units)
Commercial/retail = 1 space per 231 square feet (19 spaces for 4,400 square feet)
Day care = 13 spaces

TOD: The TOD was required to meet the standard parking ratios to ensure no spillover parking into the adjacent residential neighborhoods.

In other circumstances, reduced parking for TOD is addressed through a variance procedure.

Method used to develop TOD parking ratio: Does not apply

Creative Parking Strategies: None

Experience: The project has not opened yet.

Sources: Grieg Asher, TOD Program Manager, Valley Transportation Authority, San Jose
Michele Campos, Senior Planner, City of San Jose
Gary Richert, Senior Development Officer, City of San Jose

Moffett Park (suburban area) — Sunnyvale, California

Special TOD Parking Standards: No

Transit Mode: Light rail
Transit Service Frequency: Not yet determined (the station is not open yet).

TOD Land Uses / Characteristics: This project is an office park on 26 acres. In order to qualify for an increase in the floor area ratio (FAR), the developer changed the proposed project from office buildings surrounded by parking lots to a more transit supportive design. The revised design has buildings clustered along a walkway leading to the new Tasman West light rail line immediately adjacent to the property. The walkway features open spaces with fountains and seating. The developer approached VTA and offered to pay the full cost of constructing a new station to serve the site (estimated at $2.5 million). The station will be built within two years.

Parking Characteristics: The developer is constructing 2,000 parking spaces on surface lots. In the future, if need is proven, 100 additional spaces may be developed out of the landscape reserve.

Parking Ratios:

Standard: The Industrial/R&D/Office zone ranges from a maximum of 1 space per 250 square feet to a minimum of 1 space per 500 square feet.

TOD: There is no separate ratio. The number of spaces is negotiated. In this case, the developer agreed to a range of 1 space per 310 to 320 square feet of office space.

Method used to develop TOD parking ratio: N.A.

Creative Parking Strategies: None

Experience: The project is not completed yet.

Sources: Grieg Asher, TOD Program Manager, Valley Transportation Authority, San Jose
Trudi Ryan, Planning Director, City of Sunnyvale
Paul Spence, Associate Planner, City of Sunnyvale

Emeryville (urban area) — Emeryville, California

Special TOD Parking Standards: No

Transit Mode: Heavy rail and local shuttle
Transit Service Frequency: Amtrak has 13 daily trains. The Emery Go-Round Shuttle serves the BART station and runs every 10 to 15 minutes during peak hours and every 20 to 30 minutes off-peak.

TOD Land Uses / Characteristics: The 20-acre site is a former industrial area and a Brownfield. The project was initiated by Amtrak, which was interested in having a facility in Emeryville. The City negotiated the purchase of the three-acre site and leased about a quarter of it to the developer (Wareham) to build the station, which opened in 1993. In 1998, Wareham completed EmeryStation Plaza, a 550,000 square foot, multi-use complex on the north, east and south sides of the station. EmeryStation North is now under construction. Emery Go-Round, a free shuttle service, meets the BART trains and links the city's business, retail and entertainment centers. Upon completion, the project will have:

Office = 363,000 square feet
Retail = 25,000 square feet
Residential = 101 units (about 1.75 bedrooms per unit)

Parking Characteristics: Structured parking (1,184 spaces) was built under the new mixed use and residential developments. Two acres of the Amtrak station site were conveyed to Wareham to construct a parking structure and the parking air rights were assigned to the developer to build affordable housing. The Amtrak station has 125 public spaces.

Parking Ratios:

Standard: Retail/office/commercial = 3 spaces per 1000 square feet
Residential = 1 space for 1 bedroom; 1.5 spaces for live/work and for 2+ bedroom units; plus 0.25 space per unit for visitors

TOD: Negotiated on a case-by-case basis

Method used to develop TOD parking ratio: Negotiation

Creative Parking Strategies: Valet parking is available. The Emeryville Go-Round also reduces the need to park to ride BART or Amtrak.

Experience: There is not enough parking at this time. However, a new parking structure is being planned that will serve train patrons, shoppers, employees and residents.

Sources: Ignacio Dayrit, Project Manager, City of Emeryville
Wendy Silvani, Director Emery Go-Round, Emeryville

Pleasant Hill (suburban area) Contra Costa County, California

Special TOD Parking Standards: Yes. A Specific Plan for the TOD has been developed.

Transit Mode: Heavy rail
Transit Service Frequency: Every 5 to 10 minutes during weekday peak hours, every 15 minutes during non-peak hours.

TOD Land Uses / Characteristics: This 18.8-acre BART site is part of a larger TOD that was established by the County 20 years ago. Contra Costa County and its Redevelopment Agency took the initiative in conducting a public workshop to reach agreements necessary to develop the BART property. As of March 2001, the draft project proposal includes:

* More than 411,000 square feet of office space, split between a seven-story building at Treat Boulevard and Oak Road, and a 12-story tower at Oak and Wayne Drive.

* Up to 345 apartments and townhouses, most of them clustered in the southeast quadrant of the site, at Treat and Jones Road. Up to 50 units may be larger and offered for sale. If the entire residential section is rental units, the total number will be 370 units.

* A town square and community green space, modeled after Concord's Todos Santos Plaza. The area would connect the BART station to the adjacent Iron Horse Trail.

* About 40,000 square feet of retail shops and restaurants. The retail space would be on the ground floor of the apartment buildings, facing toward Treat and the town square.

Parking Characteristics: Under the draft proposal, parking garages will be built beneath the office and residential buildings, and the BART parking garage will be expanded to recover the spaces lost to the development.

Parking Ratios:

Standard: Office / Retail = 5.0 spaces per 1,000 square feet
Residential = 1.75 spaces per unit

TOD: Office = 3.3 spaces per 1,000 square feet
Retail = 4.0 spaces per 1,000 square feet
Residential = 1.35 spaces per residential unit

Method used to develop TOD parking ratio: The original planning for the larger TOD included parking surveys upon which the lower parking ratios were based. The early plans were very aggressive in reducing parking. Subsequent experience modified the standards to their current level.

Creative Parking Strategies: Shared parking between hotels and office uses.

Experience: Early development of areas in the larger TOD used even lower office ratios of 2.6 to 2.8 spaces per 1,000 square feet, and these portions of the project have been shown to

be under-parked from time to time. Developments that used higher ratios of 3.3 to 4.0 per 1,000 square feet of office/retail appear to have sufficient parking and are now able to lease some spaces on a monthly basis to BART patrons.

Sources: Jim Kennedy, Deputy Director, Contra Costa County Redevelopment
Patty Hirota Cohen, Project Manager, BART

Fruitvale Transit Village (inner city) Oakland, California

Special TOD Parking Standards: Yes. S-15

Transit Mode: Heavy rail and bus
Transit Service Frequency: Heavy rail, every 5-10 minutes during weekday peak hours, every 15 minutes during non peak hours.

Bus, every 12-30 minutes during weekday peak hours, every 30 minutes during non-peak hours.

TOD Land Uses/ Characteristics: This project involves the redevelopment of 5.3 acres of BART surface parking. The first phase of the Transit Village is scheduled to be completed by 2004. The plans include a senior center, a day care center, family housing, community resource center, a health clinic, shopping, library, retail and office space and a pedestrian plaza that will connect the BART station with International Boulevard, the main commercial area of Fruitvale.

- 39,000 square feet of retail and restaurant use.
- 40,000 square feet of non-profit health care clinic.
- 16,500 square feet of child care facility.
- 5,800 square feet of library.
- 30,000 square feet fitness center.
- 12,000 square feet senior center.
- 13,000 square feet of Unity Council office.
- 47 units of senior housing.
- On-site parking for 150 cars.
- One BART parking garage for approximately 500 cars.

Parking Characteristics: The Unity Council helped secure a State grant and County of Alameda Transportation Tax monies allowing BART to construct a parking structure on replace 278 spaces lost to BART patrons. The parking structure will be built on land acquired from the Union Pacific Railroad west of the station and on an existing BART parking area. The Unity Council also advocated that the City of Oakland adopt a special transit village zoning overlay ordinance that would allow maximum flexibility in the required parking ratios for the private Transit Village project (see below). The City of Oakland passed the ordinance in 1996.

Parking Ratios:
Standard: Retail = 1.0 space per 200 - 900 square feet floor area
Residential = 1.0 to 2.0 spaces per residential unit

TOD: Retail = No space required
Residential = .5 space per residential unit

Creative Parking Strategies: None

Experience: The project has not been completed.

Sources: Peter Albert, Manager, BART Planning/San Francisco and West Bay, Oakland
Patty Hirota Cohen, Project Manager, BART Real Estate, Oakland
Evelyn Johnson, Project Director, Fruitvale Development Corporation
A support corporation of The Unity Council, Oakland

II. PARKING 'PROFILES' OF SELECTED TODs OUTSIDE OF CALIFORNIA

(Some of the TODs below are also profiled in another California Department of Transportation report, "Statewide Transit-Oriented Development Study: Factors for Success in California: Technical Appendix." These are indicated by a footnote.)

St. Louis, Missouri (general comments regarding multiple stations)

Special TOD Parking Standards: No

Transit Mode: Light rail
Transit Service Frequency: 6 to 30 minutes

Creative Parking Strategies: Shared parking has been implemented at the Delmar Station, where there is a 260 car surface lot for Metrolink patrons. During off-peak and non-revenue hours, parking is shared with an adjacent 1,800 seat music venue.

Experience: St. Louis has generally not realized any reductions or waivers of municipal codes/parking requirements due to the presence of a Metrolink station or nearby Metrolink parking lot. Little new development has occurred near stations (growth continues unabated at the edges of the region), and "traditional" development plans with abundant parking are still being required by local jurisdictions. According to the survey respondent from Bi-State Development Agency, there remains a need to demonstrate "real, long-term changes in travel behavior. Until then, municipalities will continue to require traditional parking ratios rather than rely on light rail."

Source: Tina Votaw, Bi-State Development Agency, St. Louis

Dr. Martin Luther King Jr. Plaza[48] (urban) Miami, Florida

Special TOD Parking Standards: Yes (negotiated variances are allowed in station areas)

Transit Mode: Light rail and bus
Transit Service Frequency: Light rail is 5 minutes peak, 15 minutes off-peak; bus is 10 minutes

TOD Land Uses / Characteristics: Office = 191,000 square feet
Retail/restaurant = 3,000 square feet

Parking Characteristics: 800 existing garage spaces constructed by the transit agency

Parking Ratios:

Standard: Office: 1 space/250 square feet
Retail/restaurant: 1 space/50 square feet
(Total: 824 spaces)

TOD: 478 spaces would have been required (based on the methodology below), but were not built.

Method used to develop TOD parking requirement: Urban Land Institute shared use parking methodology

Creative Parking Strategies: The project did not add any parking capacity at the rail station. Instead, existing underutilized parking for transit patrons will be shared with the new development.

Experience: Use of the existing garage was a significant financial incentive that enabled the project to proceed in an economically depressed area. The deal was negotiated under the County's Transit Zone ordinance, which allows for the creation of project-specific development standards in station areas. The project has not been completed, so it is too early to tell if too little or too much parking will be provided.

Source: Frank Talleda, Joint Development and Leasing (Chief), Miami-Dade Transit Agency

Dadeland South[49] (suburban) Miami, Florida

Special TOD Parking Standards: Yes (negotiated variances are allowed in station areas)

Transit Mode: Light rail and bus
Transit Service Frequency: Light rail is 5 minutes peak, 15 minutes off-peak; bus is 10 minutes

[48] Additional information can be found in another California Department of Transportation report; "Statewide Transit-Oriented Development Study: Factors for Success in California: Technical Appendix"
[49] Additional information can be found in another California Department of Transportation report; "Statewide Transit-Oriented Development Study: Factors for Success in California: Technical Appendix"

TOD Land Uses / Characteristics: Office (Phase I, in operation) = 210,000 square feet
Hotel (Phase 2, in operation) = 305 rooms
Office (Phase 3, in operation) = 210,000 square feet
Office (Phase 4a, under construction) = 80,000 square feet
Hotel (Phase 4b, to be completed by 2004) = 300 rooms

Parking Characteristics: Each project/phase is built over its own parking structure by the developer.

Phase 1 – 650 spaces
Phase 2 – 250 spaces
Phase 3 – 900 spaces
Phase 4a – 400 spaces
Phase 4b – 150 to 200 spaces

Parking Ratios:

Standard: Residential: 1.5 spaces/1 bedroom, 1.75 spaces/2 bedrooms, 2 spaces/3 bedrooms
Office: 1 space/250 square feet
Hotel: 1 space/ 2 rooms
Retail: 1 space/250 square feet

TOD: Residential: 1 space/unit
Office: 1 space/400 square feet
Hotel: 1 space/ 2 rooms
Retail: not addressed in code

Method used to develop TOD parking ratio: The standards were negotiated under the County's Transit Zone ordinance, which allows for the creation of project-specific development standards in station areas.

Creative Parking Strategies: The Phase I garage was built as part of a joint Metrorail/Phase I structure containing 1,650 total parking spaces, reducing total construction costs. 1,000 spaces are dedicated to Metrorail parking and 650 for the private development (the structure is jointly owned).

Experience: The developer had to build more parking than required by the negotiated TOD standards in order to meet tenant requirements. The amount of parking that has been constructed, however, is still below standard requirements for the area.

There are two separate areas of the garage for transit and office users, and the two sides have separate entrances/exits. Problems arose when office workers began parking in the transit portion of the garage, which is less expensive. Initially, "master" parking meters were installed in the garage at a single location. Patrons parked, noted their parking space number, and entered this number into the meter when they paid for parking. Under this system, there was no way to distinguish Metrorail riders from other users. To prevent this, separate parking meters have been installed. Transit users now have to pay in the transit station or can purchase a monthly parking pass with a monthly Metrorail pass which can be used at any Metrorail parking facility. Office users now pay at a booth at the exit on the office side of the garage.

Parking for transit patrons is completed utilized, whereas there is generally excess capacity (unused spaces) in the Phase 1 and 3 office garages. Occasionally the transit agency will lease blocks of parking spaces from the office tenants.

Source: Frank Talleda, Joint Development and Leasing (Chief), Miami-Dade Transit Agency

Dadeland North[50] (suburban) Miami, Florida

Special TOD Parking Standards: Yes (negotiated variances are allowed in station areas)

Transit Mode: Light rail and bus
Transit Service Frequency: Light rail is 5 minutes peak, 15 minutes off-peak; bus is 10 minutes

TOD Land Uses / Characteristics: Retail (Phase 1, in operation)=320,000 square feet
Hotel or residential (Phase 2, completed by 2005) = 200,000 square feet
Office or residential (Phase 3, completed by 2010) = 200,000 square feet

Parking Characteristics: Phase I includes a 1,600 space garage built by the developer.

Parking Ratios:

Standard: Residential: 1.5 spaces/1 bedroom, 1.75 spaces/2 bedrooms, 2 spaces/3 bedrooms
Office: 1 space/250 square feet
Hotel: 1 space/ 2 rooms
Retail: 1 space/250 square feet

TOD: Residential: 1 space/unit
Office: 1 space/400 square feet
Hotel: 1 space/ 2 rooms
Retail: not addressed in code

Method used to develop TOD parking ratio: The standards were negotiated under the County's Transit Zone ordinance, which allows for the creation of project-specific development standards in station areas.

Creative Parking Strategies: None were used for Phase 1.

Experience: The Dadeland TOD subzone does not include parking requirements for retail uses, however the developer had to build more parking than even the standard requirements

[50] Additional information can be found in another California Department of Transportation report; "Statewide Transit-Oriented Development Study: Factors for Success in California, Technical Appendix"

call for in order to satisfy prospective retail tenants. For the Phase 1 retail component, there is a surplus of parking most of the year, although no excess parking exists during peak shopping periods.

Source: Frank Talleda, Joint Development and Leasing (Chief), Miami-Dade Transit Agency

Arlington, Virginia[51] (comments regarding multiple stations in two suburban corridors)

Special TOD Parking Standards: Yes

Transit Mode: Rail
Transit Service Frequency: 6-7 minute peak hour service

TOD Land Uses / Characteristics: These figures pertain to two corridors (RiB Corridor/Orange Line, J.D. Corridor/Blue Line), comprising about 5% of Arlington's 26 square miles:

Office = 30.3 million square feet
Residential = 22,000 units
Retail = 3.5 million square feet
Total jobs = 189,000

Parking Characteristics: Parking is structured in underground garages.

Parking Ratios:

Standard: Office: 1 space/250-300 square feet
Residential: 1 1/8 spaces/unit (high rise)
Hotel: 1/room

TOD: Office: 1 space/580 square feet
Residential: 1 space/unit (high rise), 2 spaces/unit (townhouse)
Hotel: 0.7 space/ room

Method used to develop TOD parking ratio: The ratios were developed and continue to be revised based on previous development experience. All TOD goes through a "special exception" permitting process, and some projects have been approved with less parking than the general TOD standards.

Creative Parking Strategies: Shared parking has been attempted and has worked to a limited degree. Developers are reluctant to mix residential and office parking, which could be primary beneficiaries of shared parking. Shared parking is utilized more between retail and office uses.

[51] Additional information can be found in another California Department of Transportation report; "Statewide Transit-Oriented Development Study: Factors for Success in California, Technical Appendix"

Experience: There is little evidence that parking is not sufficient. While there have been complaints about insufficient residential parking, they may pertain more to visitor parking, parties and deliveries than project-based demand. Parking for residential uses is currently being studied to learn if parking needs to be increased and/or if visitor parking needs to be accommodated. While the Department of Public Works would like to reduce parking requirements for office uses further to reduce auto trips, there is significant pressure to maintain or increase parking to remain competitive with suburban markets.

There have been some operational problems with retail parking. Retail uses are not required to provide parking, and some don't. Parking garages, however, operate as separate businesses, charge for parking, and often don't provide readily available, convenient spaces for retail in mixed-use buildings. In addition, these garages often close after 7pm after office users leave, but when restaurants and other uses are still open. In some cases, retailers have been able to negotiate extended parking hours.

Compared to most American suburban cities, Arlington has developed very intensely around transit stations, with stations typically including a very rich mixture of land uses (residential, employment, leisure, and convenience). Arlington is a leading example of how intense and multi-faceted development can be integrated with transit, and gives an idea of the magnitude and scope of land uses required to significantly reduce parking in TODs.

Source: Robert E. Brosnan, Planning Division Chief, Arlington County Department of Community Housing and Development

Lindbergh City Center[52] (suburban) — Atlanta, Georgia

Special TOD Parking Standards: Yes

Transit Mode: MARTA heavy rail and bus
Transit Service Frequency: 4 minute peak hour service to downtown, 8 minute service to other locations. 9 Bus routes with 8 to 32 minute peak hour service.

TOD Land Uses / Characteristics: Phase I is proposed to include:

1. 200,000 useable square feet in MARTA Headquarters office building (existing)
2. 1,000,000 square feet of office space owned and occupied by BellSouth Corporation (under construction)
3. 225,000 square feet of speculative office space
4. 330,000 square feet of "Main Street" and other retail/restaurant space
5. 105 residential condominium units
6. 316 rental apartment units
7. 175-room hotel

[52] Additional information can be found in another California Department of Transportation report; "Statewide Transit-Oriented Development Study: Factors for Success in California, Technical Appendix"

Parking Characteristics: Phase 1 is proposed to have 5,907 parking spaces in five parking decks distributed throughout the site. This includes an existing, 495-space, MARTA deck.

Parking Ratios:

Standard: 1,2,3. 3.3 parking spaces per 1,000 square feet of office space
4. 5.0 parking spaces per 1,000 square feet of retail space, and 10.0 parking spaces per 1,000 square feet of restaurant space
5. 1.0 space per condominium bedroom
6. 1.0 space per apartment bedroom
7. 1.0 space per hotel guest room, plus 0.5 space per employee

TOD:
1. MARTA HQ = 1.0 parking space per 1,000 square feet of office space
2. BellSouth offices = 2.34 spaces per 1,000 square feet
3. Speculative office space = 2.67 spaces per 1,000 square feet
4. Retail/restaurant space = 3.7 spaces per 1,000 square feet of floor area
5. Condominiums = 1.85 spaces per residential unit
6. Apartments = 1.0 to 1.5 spaces per residential unit
7. Hotel = 0.5 spaces per guest room

Method used to develop TOD parking ratio: As part of the zoning process, there was an extended series of facilitated negotiations that included MARTA, its selected developers, City of Atlanta Planning, and representatives of five, surrounding, residential neighborhoods.

Creative Parking Strategies: BellSouth proposes to build satellite parking facilities for its office employees at four of MARTA's end-of-line rail stations. Certain areas of the parking decks will allow for shared parking among office and retail employees, retail customers and other visitors to the complex, and transit patrons from surrounding neighborhoods bound for other destinations. A shuttle van service will operate between the TOD complex and several surrounding neighborhoods.

Experience: The project's lenders initially exerted pressure for somewhat higher, but still reduced parking ratios (they ultimately relented). As the project is still under construction, it is too early to tell if too much or too little parking is provided.

At final build-out (4.84 million square feet of total floor area), the zoning allows for a maximum of 10,461 parking spaces. If Phase 1 parking (5,907 spaces) is not fully utilized in stabilized operations, some spaces will be reassigned to support the parking needs of Phase 2 development. Therefore, it is possible that the Phase 2 development will include less than the 4,554 additional parking spaces allowed by the zoning.

Source: Scott Pendergrast, Senior Development Specialist, MARTA

Reston Town Center (suburban) Reston, Virginia

Special TOD Parking Standards: Yes

Transit Mode: Bus
Transit Service Frequency: 5-10 minute peak hour service connecting to the Washington DC Metro system

TOD Land Uses / Characteristics: Reston is a planned community that was designed and re-zoned in 1980s. Phase I of the town was built by 1991, and the mixed-use "core" has 1.3 million square feet of office, retail, and hotel uses.

Parking Characteristics: There are 3,063 spaces in a combination of surface and structured parking. Phase I parking is owned and operated by property owners in the Town Center, who are prohibited from charging for its use in accordance with the Shared Parking Agreement (described below). Surface parking is generally located in areas slated for Phase II and III development, and will subsequently become structured parking dedicated to those properties.

Parking Ratios:

Standard: 4,066 total spaces

TOD: 3,063 total spaces (will eventually be reduced to 2,800 spaces)

Method used to develop TOD parking ratio: Reduced parking requirements were negotiated with Fairfax county, resulting in a Shared Parking Agreement which requires shared parking among all tenants. The total number of parking spaces that would have been required by considering each use separately was reduced by 25% to account for/encourage shared parking and internal trip making. The agreement permitted a further reduction to 2,800 spaces following a four-year test period (ending in 1998) during which the County and the developer monitored the effectiveness of the parking reduction. When the County found no shortage of parking, the required number of spaces decreased from 3,063 spaces to 2,800 spaces. One explanation for this finding, though, is the availability of surface parking in Phase II and III areas not covered by the agreement, which currently function as an "outlet valve". Eventually, these spaces will become dedicated to other properties.

Creative Parking Strategies: All parking is shared in the Phase I Town Center ("core").

Experience: Reston's parking experience has generally been positive, as the mixture of land uses and shared parking encourages people to walk from work to movies, shopping, and restaurants (transit has a low mode share and does not really contribute to the reduced parking). A recent traffic study shows that traffic generated by the Town Center is close to 50 percent lower than would be expected in a comparably sized suburban development (based on Institute of Transportation Engineers standards). Seventy percent of evening restaurant traffic is generated by pedestrians coming from the area, as is 40 percent of

cinema patrons and 15 percent of retail patrons[53]. At the same time, parking shortages sometimes result for particular uses during peak periods (e.g., restaurants attract significant traffic from outside the core during the lunch hour).

Phase II development is currently underway, although parking will not be covered under an amended Shared Parking Agreement due to the administrative difficulties associated with frequent revisions (the initial agreement, though successful, was also very time-consuming to develop). In addition, the market for office parking in particular has changed dramatically since the 1990's when Phase I was developed. Whereas parking reductions were "in vogue" when Phase I was planned/built due to high costs for structured parking, now office tenants are requiring much higher ratios (in excess of "standard" ratios). In short, office buildings are being used much more efficiently by housing more employees per square foot. Arthur Anderson, for example, has a "hoteling" plan whereby a large pool of workers report to the "home" office each day, where they may be assigned to work in the office or the field for the day. The company, however, requires parking sufficient to cover peak office occupancy, which can sometimes reach 130% of "normal" occupancy (i.e., everyone is working in the office). This trend is increasing throughout the Washington DC region, with many office tenants requiring an additional parking space per 1,000 square feet over standard parking ratios. Because of this, Phase II and III development is likely to exceed even the standard parking requirements.

Parking charges are likely to levied for Phases II and III and for the surface spaces already in use. There are problems with commuters parking in the surface lots and forming carpools in the Town Center - over 100 cars per day do this. Hence, the developer is about to start charging to park in the surface lots in the hope of discouraging all-day commuter parking, which takes up valuable parking spaces.

Source: Mark Looney, Real Estate Associate, Cooley Godward, LLP

Alexandria, Virginia (general comments about multiple stations in an urbanizing area)

Special TOD Parking Standards: Yes, negotiations permitted within transit zones

Transit Mode: Rail
Transit Service Frequency: 6 to 7 minute peak hour service

Experience: Maximum parking amounts were established for the Cooper Robinson development, which includes 6 million square feet of mixed-use development. In other station areas, parking reductions are allowed but not required. Generally speaking, transit ridership for office tenants has been around 20% lower than projected, resulting in

[53] New Urban News. October/November, 2000.

parking shortages. Condominium tenants, who tend to have higher incomes, still generally require a car for each worker/driver, even if they use transit for work trips (transit is typically not used for non-work trips). Formal surveys near the Braddock Road station show that 60% of apartment workers use transit for work trips, and many households have one or zero cars. Condo owners use transit for 40% of work trips, but typically have a car for each licensed driver. In addition, auto owners are increasingly purchasing SUVs, so that even more space is required for parking (Alexandria, a very upscale suburb of Washington, D.C., has the region's highest rates of auto and SUV ownership). Parking reductions are most feasible for apartment tenants, as up to 80% of residents in some developments use transit to get to work and for other trips. Parking reductions are often not granted, however, as apartment building owners will not guarantee that they will not convert to condominiums, which would likely attract more auto users. City staff suggest that Alexandria has probably not promoted development in TODs that is sufficiently mixed to affect auto use significantly. In comparison, Arlington (a nearby "first tier" suburb, also profiled) has developed much more intensely around stations and has been very successful at reducing parking. Station areas in Arlington usually include multilevel shopping malls, high rise office and residential, and lots of amenities (e.g., galleries, restaurants, dry-cleaners, video rentals).

Source: Al Cox, City Architect, Department of Planning and Zoning, City of Alexandria, Virginia
Betsy Massie, Transit Department, City of Alexandria, Virginia

The Yards at Union Station (urban) — Portland, Oregon

Special TOD Parking Standards: Yes

Transit Mode: Light rail and bus
Transit Service Frequency: Light rail and bus service every 5-10 minutes during peak periods

TOD Land Uses / Characteristics: This project is located in Portland's River District, a redeveloping area of surplus rail yards and underutilized industrial properties, and is located near downtown Portland's (bus) Transit Mall and MAX light rail service. The project includes 479 built apartment units targeted towards a range of income groups. At build-out, the project will have 650 units (including 56 condos) covering 7 acres. Other high-density housing and mixed-use development will eventually surround the project.

Parking Characteristics: 197 structured spaces (at $75/month) and 80 on-street spaces (at $40/month) are reserved for residents. Visitors use metered on-street parking. No creative finance was used to fund the parking structure; funding for the parking structure is included in the loan for the whole project.

Creative Parking Strategies: None

Experience: More parking was planned for the site (to achieve a ratio of 0.75 spaces/unit), but was eliminated when contaminated soils were discovered and some of the taller buildings were disallowed, significantly impacting the final development program. There are currently long waiting lists for both parking areas, and the property manager could

easily fill another 150 parking spaces. Many "affordable" studio unit tenants rely on the bus system for work and other trips, but still desire on-site parking. Many tenants utilize other nearby lots at higher expense and/or greater inconvenience (e.g. $85/month at Union Station, or metered street parking). Four percent of the units cannot be rented due to the lack parking.

Source: Tillman Richter, GSL Properties, Portland, Oregon

Mockingbird Station[54] (suburban) Dallas, Texas

Special TOD Parking Standards: No

Transit Mode: Light rail and bus
Transit Service Frequency: Two light rail lines have a combined peak frequency of five minutes, and 10 minutes in the off-peak; numerous regional bus routes connect with light rail at the transit center.

TOD Land Uses / Characteristics: Retail, theatre, restaurants = 180,000 square feet
Hotel = 250+ rooms (not built)
Office = 140,000 square feet
Residential = 211 loft apartments

Parking Characteristics: 1,600 total spaces will be built by the developer (1,418 have been constructed so far). 1,150 spaces will be underground; the rest is surface parking and above ground structures.

Parking Ratios:
Standard: Not given, but would have totaled 2,200 spaces

TOD: Residential: 1.16 space/unit
Office: 3 spaces/1,000 square feet
Retail: 4 spaces/1,000 square feet
Hotel: 1 space/room

Method used to develop TOD parking ratio: The standards were negotiated and the project received mixed-use (i.e., shared parking) reduction credits. Dallas does not offer parking reductions based on transit proximity or orientation. The developer initially asked to provide only 1,300 spaces but was denied. The develop reports that he arrived at this figure without first checking with prospective tenants regarding viability.

Creative Parking Strategies: Shared parking for most land uses.

[54] Additional information can be found in another California Department of Transportation report: "Statewide Transit-Oriented Development Study: Factors for Success in California, Technical Appendix"

Experience: Only some parts of the development are currently open and leased (some parts are still under construction), so it is too early to tell if parking will be adequate.

Source: Ken Hughes (developer), UC Urban

APPENDIX C – METRO REGIONAL PARKING STANDARDS (IN PORTLAND, OREGON)

Table 1
Title 2 Regional Parking Ratios (Portland, OR)
(spaces per 1,000 sq. ft. gross leasable area unless otherwise noted)

Land use	Minimum parking requirements (may not exceed)	Maximum permitted parking - transit accessible areas (Zone A)	Maximum permitted parking - rest of region (Zone B)
General Office	2.7	3.4	4.1
Light Industry, Manufacturing	1.6	None	None
Warehouse (>150,000 gsf)	0.3	0.4	0.5
Universities/high schools (spaces/#of students and staff)	0.2	0.3	0.3
Tennis racquetball court	1.0	1.3	1.5
Sports club/recreation facility	4.3	5.4	6.5
Retail/commercial, including shopping centers	4.1	5.1	6.2
Bank with drive thru	4.3	5.4	6.5
Movie theatre (spaces/# of seats)	0.3	0.4	0.5
Fast food with drive thru	9.9	12.4	14.9
Other restaurants	15.3	19.1	23.0
Place of worship (spaces/seats)	0.5	0.6	0.8
Medical/dental clinic	3.9	4.9	5.9
Residential uses			
Hotel/motel	1.0	none	none
Single family - detached	1.0	none	none
Residential unit < 500 sq. ft. per unit, one bedroom	1.0	none	none
Multi-family - townhouse, one bedroom	1.25	none	none
Multi-family - townhouse, two bedrooms	1.5	none	none
Multi-family - townhouse, three bedrooms	1.75	none	none

Note: Ratios do not pertain to downtown Portland, which has its own standards. Ratios for uses not included in this table would be determined by cities and counties. Other measures are allowed if Metro deems that they are comparable to the regional standards above.

APPENDIX D – SUGGESTED PARKING PLANNING WORKSHEETS

Preliminary Parking Policy Feasibility Worksheet
(Local Jurisdiction or Sub-Area)

Check the appropriate box.	Yes	Probably	Maybe	Probably Not	No
Do current minimum parking requirements exceed the demand for parking?					
Does the area have a pool of excess parking that could be more efficiently used?					
Is there demand for development that could use unused parking spaces as development sites?					
Are developers encountering high costs in providing parking structures and subterranean facilities?					
Are there mechanisms to address neighborhood spillover parking?					
Does the physical layout of the project area enable shared parking between sites?					
Does the diversity of land uses and peak parking periods support shared parking?					
Are land values rising?					
Are the costs of providing parking limiting the development potential of the project?					
Are the development and lending communities willing to explore parking management options?					
Does your local jurisdiction experience significant traffic congestion problems?					
Does the local corporate/business leadership support reduction of costs through air quality/congestion mitigation programs?					
Does the area support viable alternative modes of transportation? (Carpools, vanpools, transit, bicycling, pedestrians or shuttles?)					
Is there rapid growth in your city?					
Are there areas where a lack of parking has contributed to an economic decline?					

Source: Kodama, et al.

Preliminary Parking Project Feasibility Worksheet (Specific Project)

☑ Check the appropriate box.	Yes	Probably	Maybe	Probably Not	No
☑ Do current minimum parking requirements exceed the likely demand for parking?					
☑ Does the area have a pool of excess parking that could be more efficiently used?					
☑ Is there demand for development that could use unused parking spaces as development sites?					
☑ Does the project need more parking structures or subterranean facilities?					
☑ Are there mechanisms to address neighborhood spillover parking?					
☑ Does the physical layout of the project area enable shared parking between sites?					
☑ Does the diversity of land uses and peak parking periods support shared parking?					
☑ Are there market prices for parking in the area?					
☑ Are the costs of providing parking limiting the development potential of the project?					
☑ Are the developer, lender and land owner willing to explore parking management options?					
☑ Will the project increase congestion in the project area?					
☑ Will the proposed parking strategies improve the traffic level of service (LOS) in the project area?					
☑ Are there viable alternative modes of transportation available? Does the project area support carpools, vanpools, transit, bicycling, pedestrians and/or shuttles?					
☑ Will the development project be accessible to alternative modes, e.g. bicycle parking facilities, pedestrian friendly, or preferential parking?					

Source: Kodama, et al.