http://www.vtpi.org/tdm/tdm45.htm

Transit Oriented Development
Using Public Transit to Create More Accessible and Livable Neighborhoods

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TDM Encyclopedia
Victoria Transport Policy Institute

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This chapter describes Transit Oriented Development (TOD), which refers to residential and commercial districts located around a transit station or corridor with high quality service, with good walkability, parking management and other design features that facilitate transit use and maximize overall accessibility.

Description

Transit Oriented Development (TOD) refers to residential and Commercial Centers designed to maximize access by Transit and Nonmotorized transportation, and with other features to Encourage Transit Ridership. A typical TOD has a rail or bus station at its center, surrounded by relatively high-density development, with progressively lower-density spreading outwards one-quarter to one-half mile, which represents pedestrian scale distances. It includes these design features (Morris, 1996; Renne, 2009):

- The neighborhood is designed for Cycling and Walking, with adequate facilities and attractive street conditions.
- Streets have good Connectivity and Traffic Calming features to control vehicle traffic speeds.
- Mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighborhood.
- Parking Management to reduce the amount of land devoted to parking compared with conventional development, and to take advantage of the parking cost savings associated with reduced automobile use (NJDOT, 2007).
- Transit Stops and Stations that are convenient, comfortable and Secure, with features such as comfortable waiting areas, venders selling refreshments and periodicals, washrooms, Wayfinding and Multi-Modal Navigation Tools.

Transit Oriented Development generally requires at least 6 residential units per acre in residential areas and 25 employees per acre in Commercial Centers, and about twice that for premium quality transit, such as rail service (Pushkarev and Zupan, 1977; Ewing, 1999; Cervero, et al, 2004; Reconnecting America and the CTOD, 2008). These Densities create adequate transit ridership to justify frequent service, and help create active street life and commercial activities, such as grocery stores and coffee shops, within convenient walking distance of homes and worksites. However, other factors are also important beside simple density. Transit ridership is also affected by factors such as employment density and Clustering, demographic mix (students, seniors and lower-income people tend to be heavy transit users), transit pricing and rider

subsidies, Parking Pricing and Road Tolls, the quality of transit service, the effectiveness of transit Marketing, walkability, and street design. A particular density may be inadequate to support transit service by itself, but becomes adequate if implemented with a variety of Transit Encouragement and Smart Growth strategies. The assumption that transit cannot be effective except in large cities with high population densities can be a self-fulfilling prophecy, because it results in transport and land use decisions that favor automobile travel over transit.

How Far Will Transit Users Walk? How Large Can A Transit-Oriented Development Be?

There are often questions as to how far people will walk to a transit stop or station, and therefore the acceptable area that can be considered *transit oriented*. Experts generally conclude that transit riders will walk up to a quarter-mile to a bus stop and a half-mile to a train station, although in practice a portion of transit riders will walk somewhat more. Acceptable walking distances tend to be affected by:

- Whether travelers are transit dependent or discretionary users (transit dependent users tend to be willing to walk farther.
- Walking conditions are convenient and comfortable, with good Connectivity that creates direct routes, good sidewalks and crosswalks, minimum waits at crosswalks, safe and secure walking conditions, and attractive streetscapes (such as storefronts and shade trees).
- There is high quality transit service. People tend to walk farther if transit service is frequent, and vehicles and stations are comfortable and attractive.

For information see:

B. Alshalalfah and A. Shalaby (2007), "Case Study: Relationship Of Walk Access Distance To Transit With Service, Travel, And Personal Characteristics" *Journal of Urban Planning and Development*, Vol. 133, No. 2, June 2007, pp. 114-118.

M. Iacono, K. Krizek and A. El-Geneidy (2008), "How Close Is Close Enough? Estimating Accurate Distance Decay Functions For Multiple Modes And Different Purposes," University of Minnesota (www.cts.umn.edu); at www.cts.umn.edu/access-study/research/6/index.html.

Boris S. Pushkarev and Jeffrey M. Zupan (1977), *Public Transportation and Land Use Policy*, Indiana University Press (Bloomington).

Marc Schlossberg, Asha Weinstein Agrawal, Katja Irvin and Vanessa Louise Bekkouche (2008), *How Far, By Which Route, And Why? A Spatial Analysis Of Pedestrian Preference*, Mineta Transportation Institute (www.transweb.sjsu.edu); at http://transweb.sjsu.edu/mtiportal/research/publications/documents/06-06/MTI-06-06.pdf

C. Upchurch, M. Kuby, M. Zoldak and A. Barranda (2004), "Using GIS To Generate Mutually Exclusive Service Areas Linking Travel On And Off A Network," *Journal of Transport Geography*, Volume 12, Issue 1, March 2004, Pages 23-33.

F. Zhao, L. Chow, M. Li, I. Ubaka and A. Gan (2003), Forecasting Transit Walk Accessibility: Regression Model Alternative To Buffer Method," *Transportation Research Record 1835*, TRB (www.trb.org), pp. 34-41.

Transit Oriented Development is a particular category of Smart Growth, New Urbanism and Location Efficient Development. It can do more than simply shift some car trips to transit: it also

increases Accessibility and Transportation Options through land use Clustering and mix, and nonmotorized transportation improvements. This reduces the distance required for car trips, allows a greater portion of trips to be made by walking and cycling, and allows some households to reduce their car ownership, which together can result in large reductions in vehicle travel (Land Use Impacts on Transport). This reduces total transportation costs and helps create a more Livable community, in addition to supporting TDM objectives.

High-quality transit supports the development of high-density urban centers, which can provide accessibility and agglomeration benefits (efficiencies that result when many activities are physically close together), while automobile-oriented transportation conflicts with urban density because it is space intensive, requiring large amounts of land for roads and parking facilities (Voith, 1998; Boroski, et al, 2002). Large scale Park & Ride facilities tend to conflict with Transit Oriented Development, since a rail station surrounded by large parking lots and arterials with heavy traffic is unlikely to provide a good environment for residential development or pedestrian access. It is therefore important that such facilities be properly located, designed and managed to minimize such conflicts (CBF 2001).

Renne (2009) defines specific factors required for true Transit-Oriented Development, so residents own fewer cars, drive less, rely more on alternative modes (walking, cycling, public transit, carsharing and taxi), and have a high level of local accessibility, as opposed to Transit Adjacent Development, which is conventional, automobile-oriented development located near transit stations.

Table 1 **Transit Oriented Versus Adjacent** (Renne 2009)

Transit Oriented Development	Transit Adjacent Development
• Grid street pattern • Higher densities • Limited surface parking and efficient parking management • Pedestrian- and bicycle–oriented design • Mixed housing types, including multi-family • Horizontal (side-by-side) and vertical (within the same building) mixed use • Office and retail, particularly on main streets.	• Suburban street pattern • Lower densities • Dominance of surface parking • Limited pedestrian and cycling access • Mainly single-family homes • Segregated land uses • Gas stations, car dealerships, drive-through stores and other automobile-focused land uses.

Transit Oriented Development can stimulate local economic development (Adams and VanDrasek 2007). Transit Oriented Development location is a valuable and scarce resource, similar to waterfront property. It tends to increase property values 5-15%, reflecting the direct benefits to residents and businesses of having diverse transportation options, and resulting automobile and parking cost savings (Diaz, 1999; Weinberger, 2001; RICS, 2002; Smith and Gihring, 2003). As a result, such projects can often be funded through "value capture" strategies, in which the costs of improvements are paid through the additional tax revenue or a special Local Improvement District (LID) tax assessment in the affected area (Smith and Gihring, 2003). The development industry is finding that TODs tend to be profitable investments (Reconnecting America, 2004; Hoban, 2005) Improving transit stations and their neighborhoods can be a catalyst for economic development and urban renewal. Railway station surroundings are the

"shop window" of a town, a place where many people see what the community has to offer. It is therefore important that such areas be attractive and inviting to visitors.

Table 2 **Transit Density Requirements** (based on Pushkarev and Zupan 1977)

Mode	Service Type	Minimum Density (Dwelling Units Per Acre)	Area and Location
Dial-a-Bus	Demand response serving general public (not just people with disabilities.	3.5 to 6	Community-wide
"Minimum" Local Bus	1/2-mile route spacing, 20 buses per day	4	Neighborhood
"Intermediate" Local Bus	1/2-mile route spacing, 40 buses per day	7	Neighborhood
"Frequent" Local Bus	1/2-mile route spacing, 120 buses per day	15	Neighborhood
Express Bus – Foot access	Five buses during two-hour peak period	15	Average density over 20-square-mile area within 10 to 15 miles of a large downtown
Express Bus – Auto access	Five to ten buses during two-hour peak period	15	Average density over 20-square-mile tributary area, within 10 to 15 miles of a large downtown
Light Rail	Five minute headways or better during peak hour.	9	Within walking distance of transit line, serving large downtown.
Rapid Transit	Five minute headways or better during peak hour.	12	Within walking distance of transit stations serving large downtown.
Commuter Rail	Twenty trains a day.	1 to 2	Serving very large downtown.

This table, based on research by Pushkarev and Zupan (1977), indicates typical residential densities needed for various types of transit service. Such requirements are variable depending on other geographic, demographic and management factors.

Table 2 summarizes residential densities required for various types of transit services. These thresholds are guidelines that reflect "average" conditions and are highly variable depending on various factors, such as:

- *Service quality.* Improved Transit Service Quality (more comfortable vehicles and waiting areas, more frequent service, better user information, HOV Priority) increases ridership and reduces density requirements.

- *Transit service pricing.* Lower fares and wider distribution of passes (for example, by neighborhood UPass programs, through which all residents pay for a transit pass through their property taxes) increases ridership and reduces density requirements.

- *Demographics.* Lower-income, students, seniors and disabled populations ride transit more than average and so reduces density requirements.

- *Commuter Financial Incentives*. Expanding Commute Trip Reduction Programs will increase transit ridership and reduce density requirements.

- *Employment Density.* Larger and more Centralized Commercial Areas will increase transit ridership and reduce density requirements.

- *Walkability*. More Walkable neighborhoods and commercial centers increase the area conveniently accessible to transit and therefore reduce density requirements.

- *Marketing.* Targeted Marketing can increase transit ridership and reduce density requirements.

For example, Light Rail service may normally require a density of 9 units per acre within 1/4-mile of the rail line, but this may be reduced to 5 units per acre if the area is very walkable, a major portion of employed residents have Commute Trip Reduction Programs at their worksites that include financial incentives (such as priced parking or significantly subsidized transit passes), transit service quality is high, and if the transit agency applies affective marketing programs.

Is It Really TOD? (Patrick Siegman, in Tumlin and Millard-Ball, 2003)

What's the difference between a true transit-oriented development, which will deliver promised social and economic benefits, and a transit-adjacent development? A true TOD will include most of the following:

• The transit-oriented development lies within a five-minute walk of the transit stop, or about a quarter-mile from stop to edge. For major stations offering access to frequent high-speed service this catchment area may be extended to the measure of a 10-minute walk.

• A balanced mix of uses generates 24-hour ridership. There are places to work, to live, to learn, to relax and to shop for daily needs.

• A place-based zoning code generates buildings that shape and define memorable streets, squares, and plazas, while allowing uses to change easily over time.

• The average block perimeter is limited to no more than 1,350 feet. This generates a fine-grained network of streets, dispersing traffic and allowing for the creation of quiet and intimate thoroughfares.

• Minimum parking requirements are abolished.

• Maximum parking requirements are instituted: For every 1,000 workers, no more than 500 spaces and as few as 10 spaces are provided.

• Parking costs are "unbundled," and full market rates are charged for all parking spaces. The exception may be validated parking for shoppers.

• Major stops provide BikeStations, offering free attended bicycle parking, repairs, and rentals. At minor stops, secure and fully enclosed bicycle parking is provided.

• Transit service is fast, frequent, reliable, and comfortable, with a headway of 15 minutes or less.

• Roadway space is allocated and traffic signals timed primarily for the convenience of walkers and cyclists.

• Automobile level-of-service standards are met through congestion pricing measures, or disregarded entirely.

• Traffic is calmed, with roads designed to limit speed to 30 mph on major streets and 20 mph on lesser streets.

How It Is Implemented

Transit Oriented Development can consist of new urban transit lines and stations, new suburban neighborhoods designed around public transit stations, and incremental changes to existing urban neighborhoods that have public transit. PBQD (1996) and Robert Cervero, et al, 2004 describe Transit Oriented Development planning practices. Morris (1996), ARC (2001), Nelson/Nygaard (2002) and Dittmar and Ohland (2004) describe specific changes to zoning laws and policies to encourage TOD. Christopher (2007) describes land use policies to support bus transit.

Travel Impacts

Successful Transit Oriented Development can significantly reduce per capita motor vehicle travel, as discussed in the chapter on Land Use Impacts. See Kittleson & Associates (1999), Rood (1999), Cervero, et al. (2004), Tumlin, et al (2005), Evans and Pratt (2007), Gard (2007), and Cervero and Arrington (2008) for additional information on how TOD affects travel patterns.

Transit oriented development does much more than just shift automobile trips to transit. People who live or work in communities with high quality public transit tend to own fewer automobiles and drive fewer annual miles than they otherwise would. In Automobile-Dependent communities households use automobiles for most trips. In Transit Oriented Communities they rely on a mix of modes. In Carfree communities, most trips are by non-motorized modes and public transit, automobile travel is reserved for work trips (such as delivery and service vehicles) and out-of-town travel. Table 3 illustrates this concept.

Table 3 **Typical Mode Share By Trip Purpose For Various Transport Systems**

Trip Purpose	Automobile Dependent	Transit Oriented Development	Carfree
Work commuting	🚗🚗🚗🚗🚗	🚲🚌🚌🚗🚗	🚶🚲🚲🚌🚌
School commuting	🚲🚌🚗🚗🚗	🚶🚲🚲🚌🚗	🚶🚶🚲🚲🚌
Work-related business	🚗🚗	🚌🚗	🚲🚗
Personal travel (errands)	🚶🚗🚗🚗🚗🚗🚗	🚶🚶🚲🚲🚗🚗🚗	🚶🚶🚲🚲🚌🚌🚗
Social and recreation	🚶🚗🚗🚗🚗🚗	🚶🚶🚲🚌🚗🚗	🚶🚶🚲🚲🚌🚗
Total car trips	*21*	*9*	*3*
Total transit trips	*1*	*5*	*6*
Total non-motorized trips	*3*	*11*	*16*
Total trips	***25***	***25***	***25***

Residents of automobile-dependent communities use automobiles for most trips. Transit oriented development results in the use of mixed modes. Carfree development results in minimal driving.

Dill (2006) found that 30% or more of Portland area Transit Oriented Development residents commuted by MAX (the regional light rail system) at least once a week and 23-33% used transit as their primary commute mode. This compares to less than 10% of workers in the automobile-oriented suburbs of Hillsboro and Beaverton, and 15% of Portland workers. Overall, transit commuting increased when people moved to TODs. Nearly 20% of the commuters switched from non-transit to transit modes and 4% did the opposite, for a net of about 16%.

Evans and Pratt (2007) summarize extensive research on the effects of TOD on travel. They found:

- In Portland, Oregon, as of 1995, the average central area TOD transit share for non-work travel was roughly four times that for outlying TODs, which in turn had over one-and-two-thirds times the corresponding transit share of mostly-suburban, non-TOD land development.

- In Washington DC, work-commute transit mode shares decline from 75% at downtown office buildings right at Metrorail stations to just over 10% on average at office buildings within roughly 1/2-mile of a station but located in the suburbs outside of the Capital Beltway. Transit mode shares along the Washington Metro system were found to decrease by 7 percentage points for every 1,000 feet of distance from a station in the case of housing and by 12 percentage points in the case of office worker commute trips.

- A 2003 California TOD travel characteristics study found TOD office workers within 1/2 mile of rail transit stations to have transit commute shares averaging 19% as compared to 5% regionwide. For residents, the statewide average transit share for TODs within 1/2 mile of the station was 27% compared to 7% for residences between 1/2 mile and 3 miles of the station.

- TOD residents are generally associated with lower automobile ownership rates. For example, auto ownership in three New Jersey "Transit Village Areas," for example, averaged 1.8 vehicles per household compared to 2.1 outside the transit villages.

Arrington, et al. (2008) and Cervero and Arrington (2008) found that Transit-Oriented Developments generate much less (about half) of the automobile trips as conventional, automobile-oriented development. A parking and traffic generation study of Portland, Oregon transit oriented developments recorded 0.73 vehicles per housing unit, about half the 1.3 value in the ITE *Parking Generation Handbook*, and it recorded 0.15 to 0.29 vehicle trips per dwelling unit in the AM period and 0.16 to 0.24 vehicle trips per dwelling in the PM period, about half the 0.34 AM and 0.38 PM values in the *Trip Generation Handbook* (PSU ITE Student Chapter 2007). Research by Goldstein (2007) indicates that household located within walking distance of a metro (rail transit) station drive 30% less on average than they would if located in less transit-accessible locations, although far fewer than 30% of these residents regularly rely on metro for transportation. The author suggests that this reduction results, in part, from the concentration of retail services around transit stations and reductions in per capita vehicle ownership.

Table 4 **Land Use Impacts on Vehicle Ownership and Travel** (Ohland and Poticha 2006)

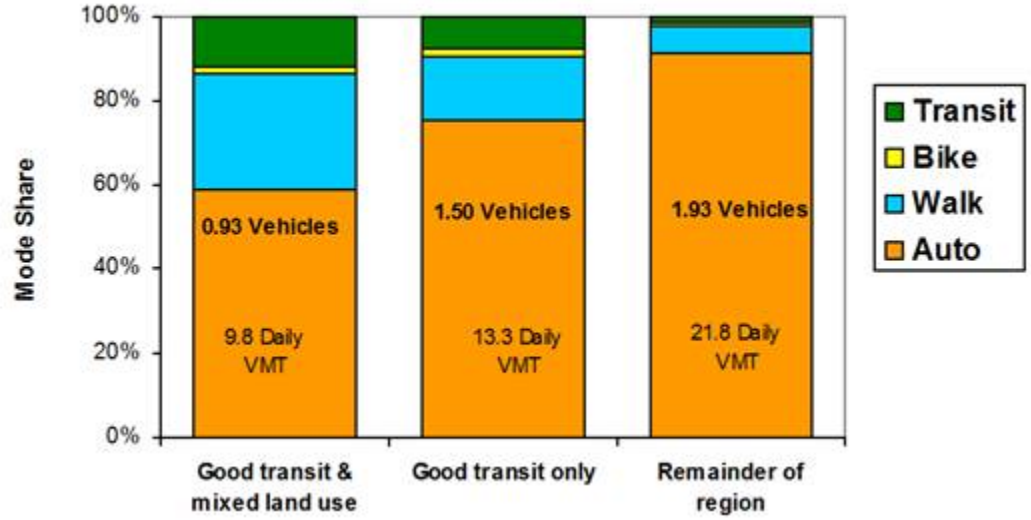
Land Use Type	Auto Ownership	Daily VMT	Mode Split				
	Per Household	Per Capita	Auto	Walk	Transit	Bike	Other
Good transit/Mixed use	0.93	9.80	58.1%	27.0%	11.5%	1.9%	1.5%
Good transit only	1.50	13.28	74.4%	15.2%	7.9%	1.4%	1.1%
Remainder of county	1.74	17.34	81.5%	9.7%	3.5%	1.6%	3.7%

Remainder of region	1.93	21.79	87.3%	6.1%	1.2%	0.8%	4.0%

Residents of transit-oriented neighborhoods tend to own significantly fewer motor vehicles, drive significantly less, and rely more on walking and public transit than residents of other neighborhoods.

Using a regression model that accounts for various demographic and geographic factors, Bailey (2007) found that household located within ¾-mile of high-quality public transportation service average 11.3 fewer daily vehicle-miles (a 26% reduction), regardless of land use density and vehicle ownership rates. Table 4 and Figure 1 show how land use affects vehicle ownership, daily mileage and mode split in the Portland, Oregon region. Transit-Oriented Neighborhoods, which have both good transit and mixed land use, have far lower vehicle ownership and use, and far higher rates of walking and public transit than other parts of the region.

Figure 1 **TOD Impacts On Vehicle Ownership and Use** (Ohland and Poticha 2006)



Residents of transit-oriented developments tend to own fewer vehicles, drive less and rely more on alternative modes than in more automobile-oriented communities. "Daily VMT" indicates average daily vehicle miles traveled per capita.

Community design features of TODs also affect non-commute travel mode choice. There were significant differences between respondents in the different neighborhoods in the share that walk and take transit to non-commute destinations. However, few respondents take transit to non-commute destinations on a regular basis. In most cases, less than ten percent of the respondents used transit to non-commute destinations on a weekly basis.

These higher rates of transit and walking travel may partly reflect self selection. Many of the residents of the TODs, particularly those that commute by transit, placed a high importance on transit and walking accessibility when choosing their home. Many also prefer walking and transit to driving and agree with "pro-environment" statements. Even if self-selection explains a large share of the effects on mode choice, this should not detract from the finding that these developments are providing a desired housing option that facilitates such choices.

Kuby, Barranda and Upchurch (2004) evaluate the effects of local station conditions on light rail transit ridership in U.S. cities. They find that local accessibility factors are important, including

employment, population, portion of renters, bus lines, airports, park-and-ride spaces and centrality. They calculate that, on average, each 100 jobs leads to 2.3 daily boardings, each 100 residents to 9.3 daily boardings, each 100 park-and-ride spaces leads to 77 boardings, each bus to 123 boardings, and an airport to 913 boardings. Similarly, Cervero, et al. (2004) develop a model for predicting the effects of increased residential and commercial density, and improved walkability around a station on transit ridership. For example, increasing residential density near transit stations from 10 to 20 units per gross acre increases transit commute mode split from 20% to 24%, and up to 28% if implemented with pedestrian improvements. Krygsman, Dijst and Arentze (2004) and Pushkarev and Zupan (1997) identify the distribution of access/egress trip times (which average about 6 minutes for bus and tram, and 10 minutes for trains), indicating acceptable TOD service areas.

Renne (2005) found that in major U.S. metropolitan regions transit commuting decline dramatically during the last three decades (from 19% in 1970 to 7.1% in 2000), but in the 103 TODs within those regions transit commuting increased from 15% in 1970 to 17% in 2000, an 11% growth rate. The percentage of transit commuting was over three times higher in TODs compared to averages for maturing – heavy rail regions and over twice as much for TODs in new start – light rail regions. TODs in Portland, Oregon, and Washington D.C., which have aggressive policies to promote transit, have experienced even greater ridership growth (58% for both). Households in TODs also owned fewer vehicles: only 35% of TOD households own two or more vehicles compared with 55% in metropolitan regions overall, although TOD residents have slightly higher average incomes.

A study of neighborhoods around SkyTrain rail transit stations in Vancouver, BC found that households located within 300 metres of a station owned about 10% fewer vehicles on average than households located more than 1,000 meters from the station, and that average household vehicle ownership is 31% lower than at suburban locations a few miles away (Bunt and Joyce 1998). This could partly reflect self-selection (households that own fewer than average automobiles choose to live in such areas), but there is evidence that many residents actually reduce their vehicle ownership when they move to such areas. A study of Orenco Station, a New Urbanist community on Portland's Westside MAX light rail line found that 22% of the residents commute by public transit, far higher than the 5% average for the region, and 69% use public transit more often than they did in their previous community (Podobnik 2002). Bento, et al, (2003) find that, in cities with rail transit services, a 10% reduction in the average distance between homes and rail transit stations reduces VMT about 1%.

Beaton (2006) found that in the Boston region, rail transit zones (areas within a 10-minute drive of commuter rail stations) had higher land use density, lower commercial property vacancy rates, and higher transit ridership than other areas. Regional transit ridership declined during the 1970s and 80s (it has rebounded since 1900), but declined significantly less in rail zones, indicating that TOD increases ridership compared with what would otherwise occur. In 2000, transit mode split averaged 11-21% for rail zone residents, compared with 8% for the region overall. Areas where commuter rail stations closed during the 1970s retained relatively high transit ridership rates, indicating that the compact, mixed land use patterns that developed near these stations has a lasting legacy. Land use density did not increase near stations built between 1970 and 1990, but did increase near stations build after 1990. This can be explained by the fact that the value of smart growth development (using land use policies to create more compact, mixed, multi-modal

land use) only became widely recognized in the 1990s, and much of the research and literature on transit oriented development is even more recent (Cervero et al. 2004).

Lund, Cervero and Willson (2004) found that residents living near transit stations in various California cities are around five times more likely to commute by transit as the average resident worker in the same city. Various factors influence transit ridership rates. TOD residents are more likely to use transit if there is less of a time benefit for traveling via highways (compared to transit), if there is good pedestrian connectivity at the destination, if they are allowed flexible work hours, and if they have limited vehicle availability. TOD residents are less likely to use transit if the trip involved multiple stops (or "trip chaining"), if there is good job accessibility via highways, if they can park for free at their workplace, and if their employer helps to pay vehicle expenses (such as tolls, fuel, etc.). Physical design factors such as neighborhood design and streetscape improvements show some influence in predicting project-level differences, but have relatively minor influences on transit choice among individual station area residents.

Reconnecting America (2004) studied demographic and transport patterns in "transit zones," defined as areas within a half-mile of existing transit stations in U.S. cities. It found that households in transit zones own an average of 0.9 cars, compared to an average of 1.6 cars in the metro regions as a whole. These lower rates of car ownership near transit may be by choice rather than poverty: car ownership rates near Metro stations in Arlington County are much lower than in the region as a whole, while average household income is higher than the regional average.

This study also found that automobile travel is also much lower in transit zones. Only 54% of residents living in transit zones commute by car, compared to 83% in the regions as a whole. More residents commute by car in the regions with small and medium-sized systems (72% and 77%, respectively) than in the large and extensive systems (65% and 49%, respectively). The regions with the lowest percentage of residents commuting by car are New York (36%), Washington D.C. (54%), and Seattle (54%). The regions with the highest percentage of residents commuting by car are Memphis (86%), Dallas (86%), Tampa (79%) and Sacramento (89%) — all systems with newer, smaller fixed-guideway transit networks. The size of the transit system seems to be a significant determinant of whether or not residents commute by car, with more transit ridership in cities with larger rail transit systems.

Schlossberg, et al. (2004) describe methods of evaluating transit oriented development, taking into account urban form, pedestrian accessibility, transit usage, and socio-demographic change before and after transit-oriented development in two U.S. cities. They find that many transit stations are not optimally located to maximize pedestrian access, and that automobile-oriented streets (wide, with heavy and fast traffic) can create a significant barrier to walking.

One major study predicted that Transit Oriented Development would reduce single-occupant vehicle commuting by 22.5%, increase transit and nonmotorized travel by 27%, and reduce congestion 18% compared with increasing highway capacity (1000 Friends, 1997). Another study predicts that TOD reduces automobile travel by 20-25% compared with conventional development (Cambridge Systematics, 1992). The table below indicates how land use design features typically reduce per capita vehicle trips in an area.

Table 5 **Travel Impacts of Land Use Design Features** (Dagang 1995)

Design Feature	Reduced Vehicle Travel
Residential development around transit centers.	10%
Commercial development around transit centers.	15%
Residential development along transit corridor.	5%
Commercial development along transit corridor.	7%
Residential mixed-use development around transit centers.	15%
Commercial mixed-use development around transit centers.	20%
Residential mixed-use development along transit corridors.	7%
Commercial mixed-use development along transit corridors.	10%
Residential mixed-use development.	5%
Commercial mixed-use development.	7%

Land use patterns at both origins and destinations affect travel behavior. Employees who work in areas with high employment densities, good pedestrian conditions and attractive urban environments with shops and restaurants nearby are more likely to commute by transit and rideshare use (Davidson, 1994; Evaluating Nonmotorized Transport).

Table 6 **Travel Impact Summary**

Travel Impact	Rating	Comments
Reduces total traffic.	3	Reduces per capita vehicle travel.
Reduces peak period traffic.	2	"
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Encourages transit and nonmotorized travel.
Improves access, reduces the need for travel.	3	Increases density and land use mix.
Increased ridesharing.	0	
Increased public transit.	3	
Increased cycling.	2	
Increased walking.	3	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Besser and Dannenberg (2005) used the 2001 National Household Travel Survey to analyzes the amount of walking associated with public transit trips, and factors that affect this activity. They found that Americans who use public transit on a particular day spend a median of 19 daily minutes walking to and from transit, and that 29% achieve the recommended 30 minutes of physical activity a day solely by walking to and from transit. In multivariate analysis, rail transit, lower-income, age, minority status, being female, being a nondrivers or zero-vehicle household, and population density were all positively associated with the amount of time spent walking to transit.

Benefits and Costs

Transit Oriented Development reduces transportation costs and externalities, increased travel choice, and reduced land paved per capita (Transit Evaluation). It can help achieve virtually all TDM objectives (Cervero, et al., 2004). TOD can increase transit service the efficiency, resulting in improved performance and cost effectiveness. It can help create more Livable Communities, meaning that neighborhoods are physically and socially more desirable places to live. TOD

typically reduces parking requirements by 20%, and more if implemented with other Parking Management strategies (Boroski, et al., 2002). Bailey (2007) estimates that households in Transit-Oriented Developments drive 45% less than residents of automobile-dependent neighborhoods, saving an average of 512 gallons of fuel and $1,400 in fuel expenses annually. Other studies indicate even larger total transportation cost savings (TransForm 2009).

These benefits are reflected in higher property values and increased commercial activity, which can result in increased tax revenue. Proximity to transit stations typically increases property values by 10-20% (Smith and Gihring 2003; Mathur and Ferrell 2009). Rodriguez and Targa (2004) found that, after controlling for structural and neighbourhood attributes, for every 5 minutes of reduced walking time to a BRT station in Bogotá, property rental prices increase by 6.8% to 9.3%. Rodriguez and Targa (2004) found that, after controlling for other factors, a reduction of 5 minutes walking time to BRT stations increases property prices 6.8% to 9.3% in Bogotá, Colombia. Munoz-Raskin (2007) found that middle-income households, who tend to use BRT most, are willing to pay 2.3% to 14.4% more for housing located close to Bogotá BRT stations, but lower-income households (which rely more on walking and mini-buses) and upper-class households (which rely more on automobile travel) do not. This suggests that to maximize BRT ridership and benefits planners should work with real estate developers to identify the best type of housing to locate nearby.

Table 7 **Rail Station Proximity Impacts on Property Values** (Hass-Klau, Cramption and Benjari 2004)

City	Factor	Difference
Newcastle upon Tyne	House prices	+20%
Greater Manchester	Not stated	+10%
Portland	House prices	+10%
Portland Gresham	Residential rent	>5%
Strasbourg	Residential rent	+7%
Strasbourg	Office rent	+10-15%
Rouen	Rent and houses	+10%
Hannover	Residential rent	+5%
Freiburg	Residential rent	+3%
Freiburg	Office rent	+15-20%
Montpellier	Property values	Positive, no figure given
Orléans	Apartment rents	None-initially negative due to noise
Nantes	Not stated	Small increase
Nantes	Commercial property	Higher values
Saarbrűcken	Not stated	None-initially negative due to noise
Bremen	Office rents	+50% in most cases

This table summarizes how property values are affected by proximity to rail stations in various cities.

EDRG (2007) used quantitative analysis to estimate that the current Chicago region transit plan provides an estimated 21% annual return on investments, an enhanced plan provides a 34% return, and adopting Transit-Oriented Development, as proposed in the region's official comprehensive plan, would increase the return to 61%. E.V. Hovee (2007) found that the new Portland streetcar line stimulated significant new compact development. Developers maximized their building capacity (that is, they built as much as zoning codes allow) close to the streetcar line, with declining rates of development further away.

Research suggests that transit use also promotes physical activity, since most transit trips involve walking or cycling links. Analysis of U.S. travel survey data indicates that 16% of all recorded walking trips were part of transit trips, and these tend to be longer than average walking trips (Weinstein and Schimek, 2005). Transit Oriented Development can provide a catalyst for urban redevelopment, and help create more Accessible communities, where people can obtain the things they need with less physical movement (Voith 1998). These indirect impacts can be significant. Average vehicle ownership, vehicle travel, and vehicle expenditures per household decline with increasing residential densities, proximity to public transit, and the portion of regional travel by rail transit (Holtzclaw 1994; Litman 2004a).

Residents of cities with large, well-established rail transit systems spend an average of $2,808 on personal vehicles and transit (12.0% of their total household expenditures), compared with $3,332 in cities that lack rail systems (14.9% of total household expenditures), despite higher incomes and longer average commute distances in rail cities (Litman 2004b). Similarly, McCann (2000) finds that per-household transportation expenditures vary significantly from one metropolitan region to another, due to land use and transportation factors. She found that households in automobile dependent regions devote more than 20% of household expenditures to surface transportation (more than $8,500 annually), while those in communities with more efficient land use and better transit service spend less than 17% (less than $5,500 annually), representing savings of hundreds of dollars a year. Similar differences are likely to exist between different neighborhoods within a metropolitan region, indicating that a household which chooses a more accessible location can save thousands of dollars annually on transportation costs. McCann also found that consumer expenditures on motor vehicles provide little economic return: a $10,000 spent on motor vehicles provides just $910 in equity, compared with $4,730 for the same investment in housing. This suggests that there are significant potential consumer savings from Transit Oriented Development.

Some research indicates that where transit creates more efficient land use, each transit passenger-mile represents a reduction of 3 to 6 automobile vehicle-miles (Neff, 1996; Newman and Kenworthy, 1999, p. 87; Holtzclaw, 2000). The table below summarizes estimates of these indirect travel impacts.

Table 8 **Transit Leverage: VMT Reductions Due to Transit Use** (Holtzclaw 2000)

Study	Cities	Vehicle-Mile Reduction Per Transit Passenger-Mile	
		Older Systems	Newer Systems
Pushkarev-Zupan	NY, Chicago, Phil, SF, Boston, Cleveland	4	
Newman-Kenworthy	Boston, Chicago, NY, SF, DC	2.9	
Newman-Kenworthy	23 US, Canadian, Australian and European cities	3.6	
Holtzclaw, 1991	San Francisco and Walnut Creek	8	4
Holtzclaw, 1994	San Francisco and Walnut Creek	9	1.4
Litman, 2004	50 largest U.S. cities.	4.4	
ICF, 2008	U.S. cities	3-4	

This table summarizes results from several studies indicating that transit can leverage automobile travel reductions by changing transportation and land use patterns. This indicates that each transit passenger-mile represents 1.4 to 9.0 miles of reduce vehicle-miles.

This does not mean that every transit improvement leverages automobile travel reductions of this magnitude. Basic transit service or a single transit improvement does not necessarily cause such reductions. Significant transit service improvements integrated with more accessible land use and incentives to reduce automobile use are generally needed to cause significant reductions. Rail transit tends to have the greatest impact on per-capita vehicle travel because it tends to have the greatest land use impacts. Busways probably have smaller impacts. Even rail systems can have little effect if other transportation and land use policies are not supportive, for example, if most riders drive to transit stations located in sprawled, automobile-dependent communities.

Costs include any incremental transportation expenditures (pedestrian and cycling facility improvements, additional public transit services), and disamenities associated with higher density development, including increased local traffic congestion and noise exposure (as discussed in the Smart Growth chapter, and Litman, 2003).

Table 9 **Benefit Summary**

Objective	Rating	Comments
Congestion Reduction	2	Reduces total automobile trips, although congestion may increase within the TOD due to high densities.
Road & Parking Savings	2	Reduces automobile use.
Consumer Savings	2	Provides affordable mobility.
Transport Choice	3	Increases access and transport choices.
Road Safety	2	Reduces automobile use. Also provides health benefits.
Environmental Protection	2	Reduces automobile use.
Efficient Land Use	3	Reduces automobile use. Encourages higher-density development.
Community Livability	3	Reduces automobile use and increases local access.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Equity Impacts

Transit Oriented Developments can benefit virtually all groups of people, although some may benefit more than others. TODs can significantly benefit lower income people and non-drivers by improving income and racial diversity and household affordability (FTA, 2008), although some TODs are relatively expensive, and some transit oriented urban renewal projects may displace some low-income residents (CTOD, 2006). Location Efficient Development strategies that increase the supply of affordable housing in TODs increase housing Affordability. It may require additional public expenditures for nonmotorized transportation facilities and public transit, but these are often comparable to current public expenditures on automobile (roads, parking, traffic management, etc.). By improving travel options and accessibility, it improves Basic Mobility.

Table 10 **Equity Summary**

Criteria	Rating	Comments
Treats everybody equally.	2	Generally benefits all groups.
Individuals bear the costs they impose.	0	May involve public costs, but these are not necessarily greater than current public costs for automobile travel.
Progressive with respect to income.	3	Increases affordable transportation, provides savings.
Benefits transportation disadvantaged.	3	Increases transport choices for non-drivers.
Improves basic mobility.	3	Increases basic transport choices.

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

Applications

Transit Oriented Development can be implemented in urban and suburban areas where there is adequate public transit service. It is implemented by regional and local governments in conjunction with private developers and businesses.

Table 11 **Application Summary**

Geographic	Rating	Organization	Rating
Large urban region.	3	Federal government.	1
High-density, urban.	3	State/provincial government.	2
Medium-density, urban/suburban.	3	Regional government.	3
Town.	3	Municipal/local government.	3
Low-density, rural.	1	Business Associations/TMA.	3
Commercial center.	3	Individual business.	3
Residential neighborhood.	3	Developer.	3
Resort/recreation area.	3	Neighborhood association.	3
		Campus.	3

Ratings range from 0 (not appropriate) to 3 (very appropriate).

Categories

Land Use Management and *Improved Transport Choice*

Relationships With Other TDM Strategies

Transit Oriented Development is a particular category of New Urbanism and Smart Growth, Location Efficient Development and Access Management. TOD supports and is supported by most other TDM strategies, such as Commute Trip Reduction, Public Transit Improvements Nonmotorized Transportation, Universal Design, Location Efficient Development, Parking Management, Parking Solutions, Parking Pricing, Traffic Calming, School Trip Management and Campus Trip Reduction, and Carsharing.

Role Of Stakeholders In Implementing This Strategy

Transit Oriented Development usually requires the coordinated support of local governments, private developers and transit agencies. Some measures, such as increased development density, may be opposed by some residents.

Barriers That Need To Be Overcome For Full Implementation

Transit Oriented Development may require changes in zoning codes and development practices to allow and encourage higher density development and lower parking requirements around transit stations (Venner and Ecola, 2007) It may also require additional funding for pedestrian and bicycle facility improvements.

Best Practices

A number of studies provide best practices recommendations for TOD development and design, including Dittmar and Ohland (2004), FTA (2008), Reconnecting America (2009), NYSMPO (2009), and Wolf and Symington (2009). Best practices include:

- Create a vision for an attractive community.
- Integrate transit and land use planning.
- Provide high quality pedestrian and cycling facilities around transit stations, based on Universal Design.
- Manage Parking to minimize the amount of land devoted to vehicle parking around stations.
- Encourage Carsharing to reduce the need to own automobiles.
- Create compact, mixed-used communities. Transit-Oriented Development generally requires at least 6 dwelling units or 25 employees per acre, and more if possible.
- Create complete communities, with shops, schools and other services within convenient walking distances within the TOD neighborhoods.
- Structure property taxes, development fees and utility rates to reflect the lower public service costs of clustered, infill development.
- Understand and expand the market for Transit Oriented Development. Identify the types of households and businesses that are most amenable to TODs. Educate public officials, planners, developers, residents and business managers concerning the potential benefits of locating in a Transit Oriented Development.

Wolf and Symington (2009) lists the following tools for effective Transit Oriented Development:

1. *Accommodate Pedestrians.* Reflect a pedestrian-orientation in built environments. Every transit trip begins and ends on foot, dictating a pedestrian emphasis.

2. *Improve Access from Transit to Jobs and Residences.* Locate new development in proximity to transit opportunities to leverage the public's investment in transit capital and operating budgets.

3. *Move from Node to Place.* Create places for people, not cars. A place-making orientation should take precedence over creating a node for commuters and drivers.

4. *Resolve Fiscal Challenges and Barriers.* Continue diligent attention to resolution of public and private fiscal barriers. The public sector is handicapped by limited financing mechanisms for needed infrastructure.

5. *Depoliticize Transit Service.* More fully fund transit operations and focus new service in areas with the greatest demand for transit service.

6. *Integrate Views Among Actors.* Approach urban centers and TODs in an interdisciplinary fashion. To reach its potential, TOD should benefit from integrated goals, resources and policies.

7. *Enhance Leadership and Vision.* Continue leadership and articulation of a regional vision, consistent with GMA goals and objectives for development of urban centers and TODs.

8. *Enhance Transportation Demand Management (TDM) and Related Tools.* Governments should continue to moderate auto use through TDM, balanced

parking requirements, emphasis on traffic calming approaches and expanded social-cost pricing mechanisms.

9. *Implement Proactive Zoning and Land Use Regulations.* Seek graceful growth and quality living environments through proactive planning. Zoning and development regulations should reflect comprehensive planning objectives and integrate with transit agency planning and implementation.

10. *Acknowledge Political Opposition to Growth and Density Imposition.* Offset resistance to density by corresponding investments in services and amenities. Public outreach should better anticipate "NIMBY" backlash and instill a sense of ownership in projects and plans.

Wit and Humor

A New England dairy farmer was showing a Texas rancher around his farm. The Texan asked, "How big is your spread."
The farmer answered, "About 40 acres. How big is your ranch?"
The Texan replies, "Well, I can get into my truck and drive from sunrise to sunset and never reach the end of my land."
"Oh yes," says the farmer, "I once had a truck like that too."

Examples and Case Studies

Cervero, et al. (2004), PPS (1997), Reconnecting America (2009) and NYSMPO (2009) describe numerous successful TOD case studies. The California Transit-Oriented Development Searchable Database (http://transitorienteddevelopment.dot.ca.gov) has information on various transit oriented developments.

Sunnyside Transit Village

The Sunnyside Village Transit Plaza is a Transit Oriented development located about 10 miles from downtown Portland, built with $2 million in combined federal, state and local funds. Apartments, townhouses, small-lot single-family residences, and professional offices surround a core of retail and public services, including a library, community center and daycare, around a transit plaza, all in a dense and walkable setting. The goal is to allow Sunnyside residents to satisfy more of their needs without adding to regional highway traffic congestion.

Philadelphia Region Maps Child Care-Rich Transit Stations

The Delaware Valley Child Care Council and the Southeastern Pennsylvania Transportation Authority (SEPTA) recently developed a map showing where more than 1,600 licensed childcare centers are in relation to bus, train, subway and trolley routes in the Philadelphia metropolitan area. The Kids' Care Connections map, a colorful, two-sided spread, is expected to be particularly useful to parents starting new jobs and to businesses seeking workers in a competitive labor market. The map helps identify where child care services may be inadequate, noting that there are few accredited child care facilities in some of the outer counties despite a high concentration of jobs and children in these areas.

King County TOD Program (www.metrokc.gov/kcdot/alts/tod/todindex.htm)

King County, Washington, has been working on bus-related TOD joint-development projects since 1998. King County projects are under way in the cities of Redmond, Renton, Seattle and Shoreline. These projects include transit centers, park-and-ride lots, off-street bus-layover facilities, and residential,

institutional, retail, office, hotel and entertainment uses. Project concepts range from 300 apartments above a park-and-ride lot in Redmond (near Microsoft world headquarters) to four skyscrapers above an underground bus-layover facility in downtown Seattle near the state Convention &Trade Center.

Cochrane Village (Nelson/Nygaard 2002)

Cochrane Village is an affordable housing development located in Morgan Hill Ranch Business Park. In the late 1980s the business park struggled to find business occupants, in part because of the high cost of housing for employees. As a result, businesses, local government and a non-profit developer worked together to build 96 apartments and town houses, a playground and daycare facility within the office park, located with convenient access to retail shops.

Maplewood New Jersey (www.stationfoundation.org)

Maplewood New Jersey is a quaint little village that grew up around its rail station in the early 1900s and still looks like a Norman Rockwell Painting, although it is just 15 miles from downtown New York. Maplewood is hometown to many who work on and off Broadway. Yet the narrow, tree-lined main street in this town of 22,000 has little traffic and not even one traffic light.

The townspeople like it that way. So when the Township of Maplewood and New Jersey Transit, in an effort to accommodate steadily increasing ridership in the early '90s, proposed constructing a 400-car parking garage next to the Tudor-style train station in the heart of the picturesque downtown, people mounted a vigorous campaign against it. No one was going to turn their quiet little village into a parking lot.

The Township Committee huddled, then came up with an alternative: Why not use the town's senior citizen bus as a jitney for commuters who could leave their cars at home? New Jersey Transit gracefully backed down in favor of this homegrown alternative. And it has proven such a successful partnership -- the agency has provided three small buses and some operating money, the state Department of Transportation has provided two more, and the Maplewood Township maintains and operates the jitneys -- that New Jersey Transit is now providing jitneys to another 20 stations.

But this was just the beginning of what turned out to be an enormously successful station revitalization experiment. New Jersey Transit had hired the non-profit Project for Public Spaces to help with the renovation of five of its 173 stations, including Maplewood. While the century-old station was one of the busiest on the Morristown rail line with some 1,200 daily riders, it was dilapidated. Commuters didn't want to hang around, and they certainly didn't want to use the restroom.

New Jersey Transit has been one of more progressive transit agencies in the U.S. ever since its creation in 1979 to coordinate and operate this most-densely populated state's rich and historic transit network. Early on the agency understood that making its stations into good public spaces that could serve as a catalyst for the revitalization of town centers could have a dramatic impact on ridership.

"Many communities in New Jersey grew up around their train stations and we wanted to make these stations the center of community life once again," says New Jersey Transit's Mark Gordon. "So we began working with communities to make the stations more people-friendly and to make them relate better to the communities."

In Maplewood, New Jersey Transit was spending $650,000 to renovate the station. Project for Public Spaces' Kathy Madden remembers her early meetings with Maplewood residents, and the slide show she did that included a photo of a stern-looking concierge who kept watch over a neighborhood street in France while its inhabitants were away at work.

The image provoked interest: The idea of hiring a concierge to tend to the needs of commuters and watch over the station was very intriguing.

“Because I grew up I a hotel I thought it might work,” explains Madden. “At PPS we’ve found that 80 percent of the success of a public space has to do with management, which is why you need a human presence in train stations, especially now that electronic ticket machines mean there are fewer ticket sellers.”

It took a sales pitch by New Jersey Transit to convince the business community, but once businesses were on board the Chamber of Commerce ran with the idea, creating a for-profit entity called the Maplewood Concierge Company. It was decided this was better than creating a private venture because the Chamber could ensure that the concierge service would feature local businesses. Chamber volunteers run the business, and hire staff.

The service is similar to that provided by a concierge in a quality hotel, and commuters can get almost anything that’s available in Maplewood -- groceries, take-out food, car repair, film developing, dry-cleaning, videos, the return of library books, travel arrangements, the purchase of tickets to events. A dentist, doctor or roof repairman will be recommended, and the concierge can help with all municipal services, whether it’s payment of a parking ticket or purchase of a garage sale permit or dog license, or signing up for tennis lessons.

Local businesses become “passive” shareholders in the Maplewood Concierge Company for $500 plus an annual $399 fee, entitling them to advertise in the station, or “active” shareholders for $1,000, which means that they pick up and deliver orders and that the concierge will also promote them. The concierge charges customers 10 percent of the total bill; businesses are charged 5%.

After the initial burst of enthusiasm and media hoopla -- with newspaper and TV coverage as far away as Japan and Germany, and blanket coverage in the U.S. in publications from the New York Times to Family Circle -- business was spotty. It was hard to get commuters to slow down in their rush to catch the train. But gradually the concierge has become part of commuter culture. About half of the station’s 2,200 commuters are now registered with the concierge, and the number of participating businesses has climbed from 25 to 50 to 70.

Paige Kelley, who’s been concierge since the service opened, staffs the station counter from 6-9:30 a.m. High school students are hired to dispense people’s orders from 4-8 p.m. Most of the pick-up and delivery work is done by local businesses, but Kelley also runs errands. “I’ll do pretty much what anyone asks -- as long as it’s not illegal,” she says, laughing. She’s done research on the Internet for one customer, picked up another customer’s dog at the groomer, took it for a walk and then took it back to its home, and she delivered groceries for a stay-at-home new mother while her husband commuted to work.

“The company was never intended to make a profit but rather to promote local businesses, as well as to make riding transit more convenient,” says local realtor Robert Klein, who has led the business community’s effort to implement the concierge concept. “Entrepreneur Magazine says the most successful business enterprises are those that save people time, because people are willing to pay for it. If commuters use the concierge they don’t need to run errands on weekends. The weekend can last two whole days -- and that’s a heck of a thing.”

Moreover, the station has come to life again. New Jersey Transit landscaped and built a pedestrian plaza opening onto a large park on one side of the station and on the other side built another plaza opening onto the business district. There’s a picnic spot, and local garden clubs have ensured that the station area is blooming. Ridership has doubled since the introduction of Midtown Direct service, meaning that one of every ten residents now commutes -- there’s a commuter in one of every three households -- and more than three-quarters of them arrive at the station either by jitney or on foot.

“It’s a selling point for realtors in town,” says Kelley. “People want to live in a place where they don’t have to worry about sitting in traffic in order to get to work, where they don’t need to own a second car or have to worry about parking.” Klein agrees. “In Maplewood we’re selling a lifestyle, not bricks and mortar.”

But it’s inside the station where the change is most notable. The Heavenly Scent Cafe has opened for business in the morning, replacing a coffee concession, because there are so many commuters, many of whom come early to meet up with friends. There are coffee tastings, coffee klatches and business card exchanges, and at night there have been high school band concerts and other entertainment. Upcoming will be a “Taste of the Town” event featuring local restaurants. “People used to just race for the train, and they used to be so darned grumpy,” says Klein. “Now you don’t have to worry about getting into somebody’s space in the morning. The atmosphere has changed completely. People come early to meet friends over coffee. We’ve even created a Maplewood blend.”

TRAX drawing development and new housing to Murray

Zack Van Eyck, *Deseret News*, Salt Lake City, Sunday, March 9, 2003

MURRAY — You won't find a lot of vacant, undeveloped land in this mature Salt Lake Valley community. But that doesn't mean large housing projects — like the massive subdivisions popping up in the southern end of the valley — can't find a home in Murray.

Traditional, prosperous Murray is growing and changing with the times, targeting former industrial areas for transformation into housing and commercial centers. The Utah Transit Authority's TRAX light-rail line is proving to be a catalyst for that transition. Murray's trademark chimneys came down to make room for a new Costco and, eventually, a five-hospital medical campus near the Murray Central TRAX station.

Now Murray officials, regional planners and developers are turning their attention to the area surrounding the Murray North TRAX station at about 4400 South. Call it suburban renewal. Call it transit-oriented development. Or just call it the future of Murray — reshaping how the city's land is used to generate more tax revenue and meet the population's future needs.

Proterra Inc. is planning an apartment/townhouse project that could bring about 500 housing units to a 21-acre parcel between the TRAX and freight lines, north of 4500 South at Fireclay Avenue (4295 South). A second group of developers is looking at an adjacent 15-acre parcel, which may need some environmental work before being
redeveloped.

"These projects will provide the impetus for revitalization and redevelopment of this underutilized portion of Murray city," said Murray Mayor Daniel Snarr. Proterra and the city have been working with Envision Utah to create the Fireclay Transit Community, which could be one of the larger transit-oriented developments along the north-south TRAX line.

As originally proposed to the city more than a year ago, Proterra's plans called for 504 housing units, 766 parking spaces and a convenience store with the possibility of office space and other small shops. The apartments would be within a quarter-mile walking distance of the TRAX line. Gerry Tully, executive vice president of Proterra, said Proterra is waiting for the city to finish an upgrade of its zoning ordinance for the area, which would give the company more flexibility in how it develops the property.

"Their zoning ordinance wasn't really written anticipating the types of development that are available to people around rail transit, but they are in the process of doing that right now," Tully said. "They've got an incredible opportunity in the 45th South area.

"Murray is fortunate to have a station right in the middle of an area that, really, there's nothing keeping the whole neighborhood from turning over into a better use." Between 80 and 200 acres of property located in the area, bordered by I-15 and State Street, could eventually be revitalized as part of the Fireclay Transit Community.

"There's excellent transportation access on TRAX, by 4500 South or the freeway or State Street," said Keith Snarr, Murray's economic development director. "Part of the surrounding property has some land uses that are underused, or perhaps uses where there might be opportunities for transition."

Jarret Wicker, a planner with Envision Utah, said the types of projects that could materialize at 4500 South should create a "destination" around the TRAX stop to enhance the transit system. "That area has an awful lot of open land that could be redeveloped fairly easily," he said. "It's not historic buildings. It's not going to have tenants that are going to be there, it seems like, forever. It's a good place. Plus, the city was fairly excited about it when we contacted them initially." Tully said Proterra would like to begin construction this summer or fall.

Portland TOD Zoning Code #33.450.010
(www.planning.ci.portland.or.us/zoning/ZCTest/400/450_Transit.pdf)

Purpose

The Light Rail Transit Station overlay zone encourages a mixture of residential, commercial, and employment opportunities within identified light rail station areas. The zone allows for a more intense and efficient use of land at increased densities for the mutual re-enforcement of public investments and private development. Uses and development are regulated to create a more intense built-up environment, oriented to pedestrians, and ensuring a density and intensity that is transit supportive. The development standards of the zone also are designed to encourage a safe and pleasant pedestrian environment near transit stations by encouraging an intensive area of shops and activities, by encouraging amenities such as benches, kiosks, and outdoor cafes, and by limiting conflicts between vehicles and pedestrians.

Vancouver, BC Transit Oriented Development

PBQD (1996) describes how SkyTrain transit stations have been a catalyst for regional town centers in Vancouver, British Columbia. Each center is intended to serve 100,000 to 200,000 people living and working in the area. Development within each center is controlled by local governments. There is a strong emphasis on pedestrian orientation with the centers, resulting in buildings with limited or no setbacks and minimal surface parking. Governments encourage commercial, employment and residential development within the centers by leasing office space, and by addressing developers needs, such as building parks. The result has been hundreds of millions of dollars in development and hundreds of thousands of square feet of new office and residential buildings, high population densities, and high levels of transit use.

Portland, Oregon Transit Oriented Development
(www.trimet.org/inside/publications/sourcebook.htm)

Portland, Oregon has implemented several successful transit projects and Transit Oriented Developments, including the MAX regional rail system, Portland Streetcar, transit-oriented development projects like Orenco, and programs like TOD property tax exemptions. Portland's transit agency, Tri-Met, has produced a *Community Building Sourcebook* which describes many of the projects, plans, programs and organizations that make the Portland region a national model for linking land use and transportation initiatives. This document discusses specific TOD projects, with information on their goals, design, real estate market, financing, neighborhood issues, and lessons learned.

"Economy Booms Along Light-rail Path" Home News Tribune*, 24 April 2000*

Jersey City– There are no locomotives powering trains on NJ Transit's Hudson-Bergen light-rail system. There's a different kind of engine at work: an economic one. Development is sprouting alongside the first segment of the Hudson-Bergen light rail, through Jersey City and Bayonne, which opened April 15, 2000. Hundreds of town houses and apartments are being built on Essex Street in Jersey City. Scrapyards and old warehouses are being cleared for office buildings and Jersey City Medical Center's new complex. Union County officials hope economic growth for major cities, such as Plainfield and Elizabeth, will follow the tracks of the county's proposed light-rail system.

Their line is being developed by the county and Raytheon Infrastructure, which is a partner with NJ Transit in the Hudson-Bergen line. "When the light rail is complete, you'll see Union County totally changed," said Union County Freeholder Lewis Mingo Jr. "It will make our major cities more valuable to the state." More than 50 years ago, light-rail systems were electrically powered trolley cars, which ran on streets and private rights of way. The first 5.8-mile section of Union County's light rail would connect Elizabeth's train station, on the Northeast Corridor line, with stops at Elizabethport, the former Singer plant, a ferry to New York, Jersey Gardens Mall, IKEA and Newark Airport.

"This is a good plan, because if they never built another inch of track, it would be successful, would drive development and have good ridership," said Bill Wright, secretary of the New Jersey Association of Railroad Passengers, about the first phase. A draft environmental-impact study of that line has been completed. Two other sections of the proposed light-rail system are still being debated and only exist on paper. One, an 11-mile section could operate on unused Central Railroad of New Jersey tracks from Elizabeth to Cranford. The other, paralleling the Raritan Valley Line to Plainfield, is possible if diesel-powered rail cars are used. Extending the line between Elizabeth and Plainfield could cost an estimated $228 million, according to a Raytheon study. Developers already have invested in light rail by donating land for the first phase of the Union County system, said Jeff Warsh, NJ Transit executive director. "It will save the project enormous amounts of time and money," Warsh said. "Hudson-Bergen was built without a single penny of contribution from businesses and developers along the right of way."

Developers along the Hudson-Bergen system will reap profits from having a rapid transit system. Some land owners along the line report property values already have increased because of light rail, Warsh said. "The landowners are donating land for the right of way because it increases the opportunity for development," said Michael Lapolla, Union County manager. "We view this as an economic development tool," Lapolla said. "For every piece of land, five-six developers are looking to build on it.

We foresee the same kind of development at each stop." About 700,000 square feet of office space is being proposed in Elizabeth, Lapolla said. Developers are considering Elizabethport for hotels and conference centers, he said. Estimated cost of the first segment is $230 million to $250 million, Lapolla said. Newark Airport is the key to immediate success of the first segment. The airport could generate 12,000 light-rail trips per day from airport employees, Warsh said. Now, workers have to park off airport grounds to provide room for passenger parking, which is also in demand.

TOD Parking Management

There are often tradeoffs between devoting land around transit stations to development (housing, employment and commercial buildings) rather than parking facilities. Analysis by Tumlin and Millard-Ball (2006) and Willson and Menotti (2007) indicate that Transit-Oriented Development often results in more total ridership gains, lower total costs and greater revenue gains compared with devoting land to Park&Ride facilities, and Parking Management to maximize utilization of existing supply and support TOD design objectives (compact, multi-modal development).

Arlington County (www.co.arlington.va.us; Dittmar & Ohland, 2004)

Arlington County, adjacent to Washington DC, is one of the most successful examples in the U.S. of transit-oriented development. Nearly 18,000 residential units and more than 46 million square feet of office and retail space have been built during the last two decades. This type of development would not be possible without the Metrorail transit system. Prior to the development of this system the Rosslyn-Ballstron corridor was an aging, low-density commercial stretch with declining commercial activity. To help support the areas economic development County leaders insisted that Metro be built underground rather than in the freeway medians.

In return, the County channeled nearly all development along the Metrorail lines. It promoted high-density development adjacent and above rail stations, with relatively high density housing within convenient walking distance. Development follows a *Bulls Eye* pattern, with the greatest density around the rail station, where there are high-rise commercial and residential buildings (up to 20 stories), which declines with distance away from the center, into medium-density residential (apartments, duplexes and townhouses), and then into two-story single-family neighborhoods established prior to 1960. The areas General Land Use Plan (GLUP) has been adjusted as needed to allow additional development in the center while preserving older, established residential neighborhoods and historic buildings.

Despite population and employment growth, traffic volumes on local roads has increased little, and the area has far less commuter parking than would normally be required, due to high levels of transit ridership (most transit riders get to the rail station by foot, bicycle or bus), frequent local bus service, excellent walking and cycling conditions, and mixed land use that locates so many activities close together, minimizing the need to drive. As a result, the County has grown rapidly without major expansion of the highway network or parking facilities, while maintaining low tax rates. The Metrorail corridors provide 50% of the County's tax base on only 7% of the land. The area enjoys low vacancy rates and higher lease and sale prices than otherwise comparable locations. Transit ridership has grown steadily. Mixed land use has resulted in relatively balanced ridership over the day, rather than two sharp peaks experienced on some systems.

The area also has aggressive Transportation Demand Management programs implemented by local governments, employers, developers, transit agencies, a local Transportation Management Association (TMA), and residents to encourage efficient travel behavior (Table 12). Performance guarantees and fines are applied if developers fail to implement required programs.

Table 12 **Developer/Employer TDM Program Requirements**

	Consistent with Land Use Plan	Consistent with Land Use Plan But Traffic Problems Forecasted	Requires Land Use Variation, No Traffic Problems Forecasted	Requires Land Use Variation, Traffic Problems Forecasted
Rideshare Promotion				
Distribute brochures and posters	X	X	X	X
Conduct travel surveys	X	X	X	X
Operate vanpool program		X		X
Subsidize vanpool program		X		X
Employee transportation coordinator		X	X	X
Support TMA	X	X	X	X
Guaranteed Ride Home		X	X	X
Parking Management				
Rideshare vehicle priority parking	X	X	X	X
Price SOV parking	X	X	X	X
Discounted vanpool parking	X	X	X	X
Transit Programs				
Help fund shuttle buses	X	X	X	X

Commuter transit subsidy		X	X	X
Provide Onsite Facilities				
Bike Parking & Showers	X	X	X	X
Van accessible garage	X	X	X	X
Off-street delivery	X	X	X	X
Roadway improvements	X	X	X	X
Help Fund Off-site Facilities				
Pedestrian systems (SKYWALK)	X	X	X	X
Direct connections to Metro	X	X	X	X
Intersection improvements			X	X
New Metrorail station				X

This table indicates the TDM program measures required for development. Requirements vary depending on the location and size of development and whether it is forecast to cause significant traffic problems.

A survey performed in 2000 found that worksites that had TDM programs generated 1.97 vehicle trips per 1,000 square feet of gross floor area, about 10% less than the 2.17 vehicle trips generated at worksites that lack such programs (which is itself a low generation rate). The area also has between half and a quarter of the parking supply as would be required at an automobile-oriented development (buildings in the area have 1 to 2 parking spaces per 1,000 square feet of gross floor area, compared with the 3 to 4 spaces normally required), providing huge cost savings and allowing greater design flexibility and development density.

TOD Performance Evaluation

Renne (2009) makes the following recommendations for developing sustainable transportation proformance evaluation:

1. *Understand that most decisions are ultimately political* – Planners need to understand that no matter how much data experts analyze, decisions are mostly made based on political factors. The importance of data is to confirm or reject assumptions that local communities make based on gut feelings. Data can assist to refine goals and objectives and ultimately create better policies to produce more sustainable outcomes.
2. *Define the goals of TOD* – Each community needs to define their own goals for TOD. If multiple goals exist, they should be ranked. Some communities might encourage TOD primarily from a mobility perspective while others see it as a driver of economic development. Other communities might use TOD as a way to encourage location efficient affordable housing. Without specific prioritized goals for TOD, it becomes very difficult to define success.
3. *Establish baseline data across sustainability dimensions* – This paper attempts to create multiple dimensions to evaluate TOD success. Baseline data is needed to track future changes to ensure that goals are not achieved at the expense of some other unintended negative externality. Collecting data from both primary (ie. the TOD Household Survey) and secondary sources (ie. census) is often necessary. Secondary sources do not provide the coverage and scope of data needed to fully evaluate TOD from a sustainability perspective. It is also important to ensure that at least some of the data collected can be compared to regional or sub-regional averages.
4. *Collect data at regular intervals to track success* – Once the baseline data has been established, the only way to determine success is to collect the same data, using the same methodologies, at regular intervals. Change within the TOD could be compared to change within the region (or sub-region) to determine if the TOD is becoming more or less sustainable in comparison to the average.
5. *Analysis of data should include local and regional stakeholders* – A mechanism needs to be established for local and regional stakeholders to discuss and debate the outcomes of the analysis. Local planners need to seek the input of the community and regional planners need to work collaboratively across agencies and layers of government to ensure political coordination.

Light Rail Encourages High Density Mixed Use Redevelopment Near Stations (Kittrell 2009)
Zoning around Phoenix area METRO light rail stations should allow high density mixed use development, encouraging pedestrian-friendly environments and utilizing creative and innovative urban design, according to a recent ASU study. Land with zoning that prescribes pedestrian environments and allows high density mixed use buildings near light rail stations has had the greatest recent appreciation in value, which indicates high demand and successful redevelopment.

The study uses two decades of commercial vacant land sales data and stratifies these sales before and after the light rail station locations were announced. Sales examined are within a half-mile radius of each of the 28 METRO light rail stations. Land appreciation rates are also compared to areas not served by light rail. The study compares the median of pre-1998 inflation-adjusted sales (before light rail station locations were announced) and the median of post-1998 inflation-adjusted sales.

Light rail proponents say that it attracts redevelopment and can help cities create focal neighborhoods for commerce and the arts and rejuvenate wilting inner city neighborhoods. This study measured how much more desirable their focal neighborhoods have become without waiting for new development. An important finding is that new zoning and related services to developers really matter. Tempe's aggressive response to light rail has added value that shows up in increased land sales prices. The station with the highest appreciation in the report is Veterans Way and College Avenue in Tempe. The inflation-adjusted median sales price from 1998-2008 (after station locations were announced) was 1639% higher than that of 1987-1997, before light rail was announced. Tempe's lowest appreciating station, Priest Road and Washington Street, increased 28%. The average change for all Tempe stations with sales transactions was 429%. This compares to a 128% average increase for stations on Central Avenue in Phoenix where zoning and development services have been enhanced for light rail, but less dramatically than in Tempe.

Vacant land near two light rail stations actually decreased in value for the time period studied. The light rail station serving Sky Harbor Airport, 44th Street and Washington Street, received no new zoning for light rail as of 2008, and land values decreased 5%.
Mesa's only station at Sycamore Street and Main Street experienced a 12% decline in value. In contrast, Tempe's Price Road and Apache Boulevard station, located one mile west of Mesa, increased 74%. At the time of the study, Mesa had not enacted any significant changes to zoning or other development services policies to encourage redevelopment at their light rail station. Mesa zoning code is being rewritten to leverage light rail investment by rezoning proposed station areas.

Tempe has set the standard for zoning at METRO stations and now Mesa must exceed this standard to effectively compete for new development. High density mixed use entitlements and pedestrian environment prescriptions are a requirement to attract redevelopment at light rail stations.

Bus Transit Oriented Development

Park East Development, Milwaukee, WI

As a part of the Milwaukee Master Plan there was a scheduled teardown of an antiquated freeway spur and the associated exits. The roadway separated two vibrant neighborhoods in the center of the city. In its place the city has planned a 64-acre TOD site that is pedestrian friendly, mixed-use and transit accessible. The project resulted from a community benefits agreement established between the city and a group called the Good Jobs and Livable Neighborhoods Coalition that focused on bringing jobs and affordable housing along with the aforementioned transit access and walkability. Currently two parcels have been sold by the city RSC and Associates and the third parcel is in the final stage of sale to MLG Development Inc. This project has been a model for other redevelopment projects in Milwaukee, which are starting to include TOD in their plans.

Linden Transit Center, Columbus, OH

The transit center is in a fairly blighted community in Columbus and COTA (the transit agency) has long been trying to connect the community with job opportunities through the transit center. The transit center is used like a community center, they hold jobs fairs and have even brought in services like dry cleaners and day cares to really use the facility as a way to increase the accessibility to jobs. More recently the city has chosen the transit center to anchor a Four Corners redevelopment project. There was a strong, diverse community coalition that promoted transit accessibility as an employment creation strategy.

Village at Overlake, Redmond, WA (www.overlakestation.com/photos.htm)

This development includes two four-story buildings and a five-story building with apartments, a day-care facility, a parking structure and the transit center, located in Redmond, a mid-sized city located about 20 minutes east of Seattle. Public officials saw the vast surface parking lots around the existing center as a wasted space that could be used to connect residents with existing retail and commercial opportunities. Since the construction of the development transit ridership has almost tripled.

Redeveloping Transit-Station Area Parking Lots (CNT, 2006)

The study, *Paved Over: Surface Parking Lots or Opportunities for Tax-Generating, Sustainable Development?*" (www.cnt.org/repository/PavedOver-Final.pdf) by the Center for Neighborhood Technology, evaluates the potential economic and social benefits if surface parking lots around rail transit stations were developed into mixed-use, pedestrian friendly, transit-oriented developments, with case studies of nine suburban communities with rail transit service in Cook County, Illinois. The analysis concludes that such development could help to meet the region's growing demand for affordable, workforce, senior, and market rate housing near transit, and provide a variety of benefits including increased tax revenues and reduced per capita vehicle travel.

The parking lots in these nine case studies are estimated to be able to generate 1,188 new residential units and at least 167,000 square feet of new commercial space, providing additional property tax revenues in the hundreds of thousands of dollars per year at each site, plus significant reductions in trip generation and transportation costs compared with more conventional development.

Lloyd District, Portland (http://downtownaustin.com/downloads/RickWilliamsLloydTMA0509.pdf)

The Lloyd District is a TOD in East of downtown Portland, Oregon, across Willamette River. As of 2008 it had 275 acres, 600+ businesses, 23,000 employees and 1,000 residential units. It has achieved the following:

- Public transit service improvements. 3 new bus lines since 1997, rerouting of existing service to the commercial core, and a Fareless Square (area with free transit service).
- Over $1.5 million annual private investment in transit program.
- Restrictions on surface parking lot development and elimination of free commuter parking.
- Avg. built ratio of parking to 1.8 stalls per 1,000 SF (from 3.5+).
- Revenue sharing of meters and transit pass sales.

- Employee transit passes from 1,250 (1997) to 6,000+ (2008).
- Transit Commute Mode Splits from 21% (1997) to 41% (2008).
- Bicycle Mode Splits from 1% (1997) to 5% (2008).
- Pedestrian commute trips up 46% over three years.
- Commercial office vacancy rate 12% (2001) to 4% (2008)
- Over 1.75 million SF of new public/private development since 1995, no net increase in total parking supply (includes Convention Center expansion).

Demand for Transit Oriented Development (BBPC, 2008)

The City and County of Denver, Regional Transportation District, Metro Denver Economic Development Corporation, and Denver Regional Council of Governments hired a consultant team to develop a market study to assess the regional and station-specific potential for transit-oriented development (TOD) as part of the FasTracks regional transportation program. Work on the study began in 2007, and was completed in 2008. The goals of the market study were to:

- Understand regional and station-specific TOD potential
- Evaluate transit potential to induce demand
- Gauge short and long-term TOD demand
- Align station area plans with market realities
- Address phasing issues and implementation strategies
- Optimize future development opportunities

Six transit corridors and ten station areas were selected for in-depth analysis to help the City gauge the short and long-term demand for TOD and to better align station area planning with market realities and dynamics. The analysis indicates that a significant portion of regional employment and housing would choose TOD locations, and that accommodating this demand will increase total regional economic activity.

DART Property Value Gains

Clower, Weinstein and Seman (2007) evaluated the fiscal impacts of transit oriented development associated with development of the Dallas Area Rapid Transit light rail system. The analysis considers development near existing and planned light rail stations. The findings support the conclusion that the transit-oriented developments associated with DART Rail stations offer substantial fiscal impacts for local taxing entities. These findings include:

- The announced existing and projected values of development projects located near DART Rail stations have increased by almost 50% since 2005.
- While there are many factors contributing to development investment decisions, proximity to an LRT station is often an important site location factor. The total value of projects that are attributable to the presence of a DART Rail station since 1999 is $4.26 billion.
- Adjusting for tax exemptions and the value of public buildings, the taxable value of real and business personal property associated with the projects reviewed in this analysis along existing DART Rail corridors and the planned Green, Orange, and Blue Line extensions exceed $2.84 billion.
- In total, once all announced projects are completed, state and local tax revenues associated with development near DART Rail stations will exceed $127 million per year.

Transit-Oriented Development Reduces Parking Demand

Cervero, Adkins and Sullivan (2009) investigated the degree to which residential developments near urban rail stations are "over-parked," that is, more parking is provided than needed. They found the mean parking supply of 1.57 spaces per unit was 31% higher than the 1.2 spaces recommended in ITE *Parking Generation*, and 37% higher than the weighted-average peak demand of 1.15 parked cars per unit at 31 residential projects near BART rail stations. The analysis indicates that increased parking supply tends to increase vehicle ownership: an increase of 0.5 spaces per unit is associated with a 0.11 additional cars parked per unit at the peak. Parking demand tends to decline with improved pedestrian access to stations and improved transit service frequency. Rail access reduces vehicle trips at a faster rate than vehicle ownership, indicating that transit commuters still want vehicles for other trips, and so recommends incorporating carshare services into transit-oriented development as a substitute for private vehicle ownership.

Transit Oriented Development for Housing Affordability (www.hud.gov/offices/cpd/about/conplan/todjobs.pdf)

Grady and LeRoy (2006) evaluated Transit Oriented Developments concerning their ability to provide affordable housing and jobs suitable for non-professional workers, called "location-efficient job incentives." The researchers found the most effective projects:

- Incorporated Community Benefits Agreement with a private developer for guaranteed concessions such as local hiring, living wages and affordable housing set-asides.
- Involved a community development corporation (CDC) that initiated the project and made it integral to the organization's neighborhood improvement mission.
- Had exceptional private developer intentionally designed a project for the benefit of low-income families and/or commuters.

Transforming Tyson's Corner (www.fairfaxcounty.gov/dpz/tysonscorner/finalreport.htm)

The Tyson's Land Use Task Force developed a plan for transforming Tyson's Corner from automobile-dependent commercial center to a multi-modal, mixed-use community. In the transformed Tysons, over 95% of development will be within walking distance of transit, and all land uses in Tysons will be mixed, allowing people to live, work, play, and participate in the arts and civic life of a vibrant 24-hour community. Residential capacity will increase significantly, providing housing for up to 100,000 residents. Employment, too, will increase to as many as 200,000 jobs by the end of the planning horizon. The influx of housing will provide a better balance between jobs and households which will ultimately improve the livability of Tysons.

The Task Force's land use and transportation concepts constitute a fundamental evolution of Tysons from a suburban place to an urban place. The transformed Tysons will be a place built for people. By linking development to the four Metrorail stations that will serve Tysons by 2014, the Task Force envisions a Tysons that will grow into the "downtown" for Northern Virginia, extending the benefits of compact development to the entire region. It will be a place where people can walk from their homes in Tysons to their jobs in Tysons; a place where people can take transit to the mall to run errands during their lunch hour; and a place to play outdoors or enjoy performances, galleries and restaurants.

Attracting Residents to Transit-Oriented Neighborhoods (MTC 2010)

The report, *Choosing Where We Live: Attracting Residents to Transit-Oriented Neighborhoods in the San Francisco Bay Area*, identifies various housing market segments and describes ways to make transit oriented development more attractive in response to each groups' specific needs and preferences. It includes specific recommendations for improving walking and cycling condition, transit service quality,

neighborhood livability (quiet, cleanliness and safety), school quality and accessibility, parking management, and urban housing affordability.

Westside MAX Light Rail Project Transit Oriented Development Program (www.todadvocate.com/pdxcasestudy.htm)

Westside Station Area Development -- About 7,000 dwellings and more than $505 million of residential and non-residential development have been built, permitted or proposed since 1990 within one-half mile of west side light rail stations. About 3,600 of the dwellings were completed in 1998. Over 3,000 of them are located in two station areas. One developer is building about 2,000 of these units in three station areas with backing from a pension fund.

Westside Station Area Planning -- A four year intergovernmental effort to update comprehensive plans, development regulations and capital improvement programs for areas within one-half mile of westside light rail stations. Hillsboro, Portland and Washington County adopted interim development regulations early in the process to minimize parking, increase density, prohibit inappropriate land uses, and require pedestrian oriented design. By 1998, new plans and development regulations had been adopted for almost all of the light rail station areas.

Sunset Transit Center -- Detailed design standards were adopted in October 1997 by Washington County for an area including 190 acres under a single ownership. This was a major milestone in a debate that has lasted more than a decade on the best use of this property. The new plan and code was based on intensive discussions between adjacent neighborhoods, the property owner and county staff as well as urban design, market analysis and transportation consultants. A mixed use center is planned adjacent to the station and more than 2000 housing units in the balance of the area.

Beaverton Central Mixed Use Project -- One day the "The Round" will be the "jewel" of Westside Light Rail. Ground breaking was in October 1997 for this $100 million mixed-use project. The light rail station is in the middle of the site. The project includes a civic plaza with amphitheater, 154 for-sale dwellings, 152,000 square foot of class A office, 70,000 square foot of retail/office flex space, sister cities garden, 109 unit hotel, 10 screen movie theater, and 810 space parking garage. City staff are managing the project; regional technical and financial assistance is being provided. It took five years from the first study to ground breaking.

Murray West Master Plan -- A preliminary public/private master plan for a 120-acre area around the Beaverton Creek light rail station was completed in 1995. Trammell Crow Residential (TCR) completed construction of 830 dwelling units in 1998. Tri-Met's park & ride was relocated, redesigned and coordinated with TCR's project to create a pedestrian friendly environment. Nike plans to expand its world headquarters campus on 75 acres north of the station. City plan and code amendments for the 120-acre area were adopted in December 1997. Tri-Met managed the master plan effort. The City of Beaverton was lead on the plan/code amendments.

Hillsboro Light Rail Station Area Urban Design -- In 1993, this project dealt with issues that were not resolved during preliminary engineering and the draft EIS. There was concern that intergovernmental consensus would be difficult to achieve. In a five-week intensive effort, agreement was reached to remove two stations and redesign or relocate four others to reduce costs, improve access, and preserve opportunities for station area development. This was a joint effort with Metro, the City of Hillsboro and Washington County. Tri-Met was the lead agency. This is an excellent example of an interagency, interdisciplinary team approach with the right people with the right assignment at the right time.

Orenco/PacTrust Master Plan -- In January 1999, the National Home Builders selected "Orenco Station" out of nearly 1,000 entries for their "Master Planned Community of the Year" gold award. In 1998, it won the Governor's Livability Award. See www.orencostation.com for more information. More than 2,000

dwellings, a mixed use center, parks, and a sub-regional retail "power" center are planned, permitted or under construction between the light rail station and the new $2 billion Intel facility. The City of Hillsboro was the lead agency. Six-hundred apartments and the small lot single family home models were completed in 1997.

Downtown Hillsboro LID -- The City Council approved the Hillsboro Downtown Business Association petition for creation of a local improvement district (LID) in August 1996. The project implements the vision of the downtown (TOD) plan and began construction in summer 1997. The design for new sidewalks, curbs, decorative paving, street lamps, and greenery are complementary to light rail street improvements.

Portland TOD Property Tax Exemption Ordinance - It provides for a ten-year exemption for high density housing and mixed use projects. The City of Portland adopted an ordinance in October 1996 based on state legislation passed in 1995. Washington County and Tri-Met sought passage of the new state law; Tri-Met prepared a model ordinance.

Joint Development Projects -- Tri-Met has four projects in the Goose Hollow station area just west of downtown Portland. Arbor Vista ("Tree House" site) and Stadium Station Apartments ("Civic Stadium") are done; the project at Collins Circle is under construction; and the Butler Block project is in process. These projects pioneered the FTA waiver to the common grant rule for joint development; now all USA transit agencies can take advantage of these opportunities to increase ridership through TOD based on new regulations adopted in spring 1997 by FTA.

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