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Final Technical Report

TransNow Budget No. 821528-4

Travel and Transit Use at Portland Area Transit-Oriented Developments (TODs)

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16. ABSTRACT In recent years there has been a growing interest in using land use planning to reduce reliance on the automobile long-term, through ideas such as smart growth, New Urbanism, pedestrian pockets, and transit-oriented development (TODs). Many growing regions throughout the United States, are turning to these concepts to address problems of traffic congestion and suburban sprawl. However, the effectiveness of such policies in reducing automobile travel and improving livability is largely unknown. Portland was one of the early adopters and is often pointed to as a model for other regions. The Region's 2040 Growth Concept, adopted by the Metro regional government, includes many smart growth concepts. Metro uses a number of programs and policies to implement the 2040 Growth Concept, including subsidies to transit-oriented developments. This research surveyed residents of TODs in the Portland area to help answer the following questions:
Do residents of transit-oriented developments (TODs) drive vehicles less, use transit more, and/or walk and bicycle more than residents of ther neighborhoods?
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Alternatively, are people who move to these neighborhoods already active transit users, walkers, or cyclists, i.e. they are seeking an environment in which to practice their preferred travel behaviors?
These questions are key to understanding the cause-effect relationship between the built environment and travel behavior.
How do people's attitudes toward travel and their neighborhood influence travel behavior?

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TABLE OF CONTENTS

1 INTRODUCTION 1

2 METHODOLOGY 3

2.1 Site Selection Process 3

2.2 Survey Sites 6
2.2.1 Orenco/NW 231st Station 6
2.2.2 Elmonica/SW 170th Ave Station 14
2.2.3 Beaverton Central 17
2.2.4 The Merrick (Convention Center MAX) 21
2.2.5 Summary of Sites 21

2.3 Survey Development and Distribution 24

3 FINDINGS 27

3.1 Demographics 27
3.1.1 Respondents 27
3.1.2 Survey respondents compared to population 28

3.2 Travel 29
3.2.1 Commuting 29
3.2.1.1 Commute Mode 29
3.2.1.2 Differences between Transit Commuters and non-Transit Commuters 31
3.2.1.3 Changes in Commute Mode 33
3.2.2 Non-Commute Travel 34
3.2.3 Overall Changes in Travel 37

3.3 Factors in Selecting Home 37

3.4 Travel Preferences 42

4 CONCLUSIONS AND FUTURE RESEARCH 49

4.1 Major Findings 49

4.2 Recommendations for Future Research 51

5 REFERENCES 52

6 DISCLAIMER AND ACKNOWLEDGEMENTS 53

7 APPENDIX 54

LIST OF TABLES

Table 1: Summary of Characteristics of the Developments 23

Table 2: Sampling and Response Rates 26

Table 3: Household Demographics 27

Table 4: Household Income and Vehicle Availability 28

Table 5: Comparison of Household Size and Age to Census 2000 29

Table 6: Commute Modes 30

Table 7: Mode to MAX Station for Commuters 30

Table 8: Estimated time (minutes) to walk from home to MAX station 32

Table 9: Changes in Commute Mode between Transit and non-Transit 34

Table 10: Walking and Biking for Non-commute Purposes 35

Table 11: Changes on Travel Modes Compared to Previous Residence and Weekly Miles Driven 37

Table 12: Importance of Factors when Selecting Current Home 39

Table 13: Importance of Transportation Factors in Looking for Current Residence 41

Table 14: Significant Differences Between Transit and non-Transit Commuters in Choosing Home 42

Table 15: Travel Preferences 43

Table 16: Travel Preferences (sorted by level of agreement) 46

Table 17: Travel Preferences - Significant Differences between Transit and Non-Transit Commuters 48

LIST OF FIGURES

Figure 1: New Single-family homes within ½ mile of MAX Stations 5
Figure 2: MAX Stations near Survey Sites 8
Figure 3: Survey Sites around Orenco/NW 231st Ave. Station 9
Figure 4: Orenco/NW 231st MAX station Area Land Uses 10
Figure 5: Original Orenco Station – Condominiums over Retail 10
Figure 6: Original Orenco Station - Single Family Homes 11
Figure 7: Original Orenco Station - Club 1201 Condominiums 12
Figure 8: Sunset Downs 12
Figure 9: Arbor Gardens at Orenco Station Single Family Detached Homes 13
Figure 10: Arbor Gardens at Orenco Station Single Family Townhomes 13
Figure 11: Elmonica Station Sites 14
Figure 12: Elmonica Station Area Land Uses 15
Figure 13: Elmonica Station Arbor Station Attached Single-family Homes 16
Figure 14: Elmonica Station Arbor Station Townhomes 16
Figure 15: Elmonica Station Condominiums 17
Figure 16: End of Sidewalk between Arbor Station and MAX Station 17
Figure 17: Survey Site at Beaverton Central MAX Station 18
Figure 18: Beaverton Round Condominiums 19
Figure 19: Beaverton Round Office Building 19
Figure 20: Beaverton Central Station Area Land Uses 20
Figure 21: The Merrick Apartments 21
Figure 22: Merrick Site Location 22
Figure 23: Commute mode and free parking 31
Figure 24: Transit Commuting and Walking Distance from MAX to Work/School 33
Figure 25: Percent of Residents Taking Transit to Non-commute Destinations Once a Week or more in Good Weather 36
Figure 26: Percent of Residents Taking Transit to Non-commute Destinations Once a Month or more in Good Weather 36

ABSTRACT

In recent years there has been a growing interest in using land use planning to reduce reliance on the automobile long-term, through ideas such as smart growth, New Urbanism, pedestrian pockets, and transit-oriented development (TODs). Many growing regions throughout the United States, are turning to these concepts to address problems of traffic congestion and suburban sprawl. However, the effectiveness of such policies in reducing automobile travel and improving livability is largely unknown. Portland was one of the early adopters and is often pointed to as a model for other regions. The Region's 2040 Growth Concept, adopted by the Metro regional government, includes many smart growth concepts. Metro uses a number of programs and policies to implement the 2040 Growth Concept, including subsidies to transit-oriented developments. This research surveyed residents of TODs in the Portland area to help answer the following questions:

- Do residents of transit-oriented developments (TODs) drive vehicles less, use transit more, and/or walk and bicycle more than residents of other neighborhoods?
- To what extent can TODs increase transit ridership?
- How do the features of the TOD influence travel choices?
- Do the features of TODs induce people to change their travel behavior? Alternatively, are people who move to these neighborhoods already active transit users, walkers, or cyclists, i.e. they are seeking an environment in which to practice their preferred travel behaviors? These questions are key to understanding the cause-effect relationship between the built environment and travel behavior.
- How do people's attitudes towards travel and their neighborhood influence travel behavior?

The survey collected a large amount of data from over 300 residents near four different light rail stations in the Portland region. The neighborhoods were selected to represent a range of types of TODs, while controlling somewhat for income (through housing styles and prices) and regional and transit accessibility. None of the neighborhoods completely satisfies generally agreed upon standards for good TODs: higher density, good land use mix, pedestrian friendly, and close to transit. Several key findings include.

- **Responding households in the neighborhoods tend to be smaller, without children.**
- **Some of the TODs appear to be attracting older adults.**
- **The residents of the surveyed TODs are not transit dependent.**
- **Respondents take transit to work or school at a higher rate than residents citywide.** About 30% or more of the respondents in each neighborhood commuted by MAX at least once a week and 23-33% used transit as their primary commute mode. This compares to less than 10% of workers in Hillsboro and Beaverton and 15% of Portland workers.
- **The varying physical features of the TODs does not appear to affect transit commuting.** But, parking pricing at work or school is an important factor in commute mode choice. Workers and students who would have to pay to park at work were far more likely to use transit.

- **Distance from home to the MAX station may not affect the level of transit commuting, but does affect the mode used to get to the station.** Residents of the developments further from a rail station than the other neighborhoods, were more likely to drive or be dropped off at the station, rather than walk.

- **A significant share of respondents now commute by transit who did not before.** Overall, nearly 20% of the commuters switched from non-transit to transit modes and 4% did the opposite, for a net of about 16%. Response bias may affect this finding.

- **The features of the TODs appear to 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. But, 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.

- **A majority of respondents in all the neighborhoods claim to be using transit and walking more and driving less now compared to where they used to live.** The higher use of transit and walking and the changes in modes are likely due, in part, to "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.

Further analysis of the data, including multivariate analysis, will help sort out the relationships between urban form and travel behavior, including the relative importance of demographics and travel preferences. Further GIS analysis will also allow us to develop additional urban form indicators for each respondent, such as the network distance from their home to the MAX station and other destinations.

Introduction

Transportation – namely traffic congestion – usually tops the lists of concerns for residents and politicians in urban areas. In the 1970s, communities throughout the country revolted against building new freeways as a way to meet the growing use of private automobiles for travel. Concerns about the environmental and neighborhood impacts of expanding roadways, the energy crisis, increasing infrastructure costs and decreasing funding all combined to lead planners and policymakers to look for other solutions. Areas adopted a range of measures to reduce demand and manage the system better, such as carpool matching programs and synchronized traffic signals. While some of these programs were effective, the growth in vehicle travel continued to outpace growth in road capacity and the benefits of demand and systems management programs. In the 1990s major federal legislation – the Intermodal Surface Transportation Efficiency Act (ISTEA) and the 1990 Clean Air Act Amendments – placed an increased emphasis on integrating transportation and air quality planning and created a greater role for regional agencies in addressing these issues. At the same time, there was a growing interest in using land use planning to reduce reliance on the automobile long-term, through ideas such as smart growth, New Urbanism, pedestrian pockets, and transit-oriented development (TODs). These concepts attempt to reduce dependence on the automobile by mixing land uses (e.g. having shops and services close to homes), increasing density near transit stops and stations (to increase access and ridership), and creating a walkable and bikeable environment (e.g. with sidewalks, bike lanes, etc.).

Many growing regions throughout the United States, are turning to these concepts to address problems of traffic congestion and suburban sprawl. However, the effectiveness of such policies in reducing automobile travel and improving livability is largely unknown. Portland was one of the early adopters and is often pointed to as a model for other regions. The Region's 2040 Growth Concept, adopted by the Metro regional government, includes many smart growth concepts. Metro uses a number of programs and policies to implement the 2040 Growth Concept, including subsidies to transit-oriented developments. The public commitment to policies to reduce reliance on automobiles through integrating land use and transportation in this region is significant, despite the limited evidence that such policies will have a significant impact on travel behavior (Boarnet and Crane, 2001). And, even though Portland was an early adopter of these policies, only a handful of studies have attempted to collect evidence in this region that they are working. Some that have (e.g. Podobnik, 2002) have not focused on travel behavior.

This research surveyed residents of TODs in the Portland area to help answer the following questions:

- Do residents of transit-oriented developments (TODs) drive vehicles less, use transit more, and/or walk and bicycle more than residents of other neighborhoods?
- To what extent can TODs increase transit ridership?
- How do the features of the TOD influence travel choices?
- Do the features of TODs induce people to change their travel behavior? Alternatively, are people who move to these neighborhoods already active transit users, walkers, or cyclists, i.e. they are seeking an environment in which to practice their preferred travel behaviors? These questions are key to understanding the cause-effect relationship between the built environment and travel behavior.

- How do people's attitudes towards travel and their neighborhood influence travel behavior?

This research builds upon a body of existing research in the planning field. Other researchers have examined the difference in travel patterns between traditional and suburban neighborhoods, often comparing neighborhoods built before WW II (which exhibit the features of New Urbanism) with newer, auto-oriented neighborhoods. Because modern transit-oriented neighborhoods are relatively new, very few empirical studies exist that measure the actual travel behavior of residents. Yet, policy makers, including the City of Portland and Metro, are promoting these types of designs to accommodate future growth. With many TODs recently completed in the Portland region, this is an ideal time to empirically test the travel impacts of this increasingly popular form of development.

Methodology

1.1 Site Selection Process

There is some debate over how to define TODs. Cervero et al (2004) decide not to "parse definitions of TOD" but do state that "there is agreement within the professional transit community as to what constitutes a TOD: a pattern of dense, diverse, pedestrian-friendly land uses near transit nodes that, under the right conditions, translates into higher patronage" (page 7). Hank Dittmar and Shelley Poticha propose a performance-based definition of a TOD that achieves five goals: (1) location efficiency; (2) rich mix of choices; (3) value capture; (4) place making; and (5) resolution of the tension between node and place (Dittmar and Ohland, 2004). Their key components of location efficiency include density, transit accessibility, and pedestrian friendliness – three of the five components in the Cervero definition. Diverse land uses – Cervero's fourth component – is included in the "rich mix of choices." Value capture is defined by Dittmar and Poticha more broadly than higher transit patronage, though that could be a component of value capture. Their definition of place making includes several components: places for people; enrich the existing; make connections; work with the landscape; mix uses and forms; manage the investment; and design for change. Their discussion of resolving the tension between node versus place focuses on the potential conflicts between a station's role as an access point and a TOD's role as a neighborhood. In their study of TODs in California, Lund, Cervero, and Willson (2004) use a definition from the California Department of Transportation that includes moderate to higher-density development, an easy walk to transit, a mix of land uses, and pedestrian-oriented design – all achieved through new construction or redevelopment. In their TOD program, Portland's regional government, Metro, also focuses on higher-density, mixed-uses, pedestrian amenities, and closeness to transit (Dow, 2001). Based upon these sources, there are four generally agreed-upon physical elements of a TOD upon which this research will focus:

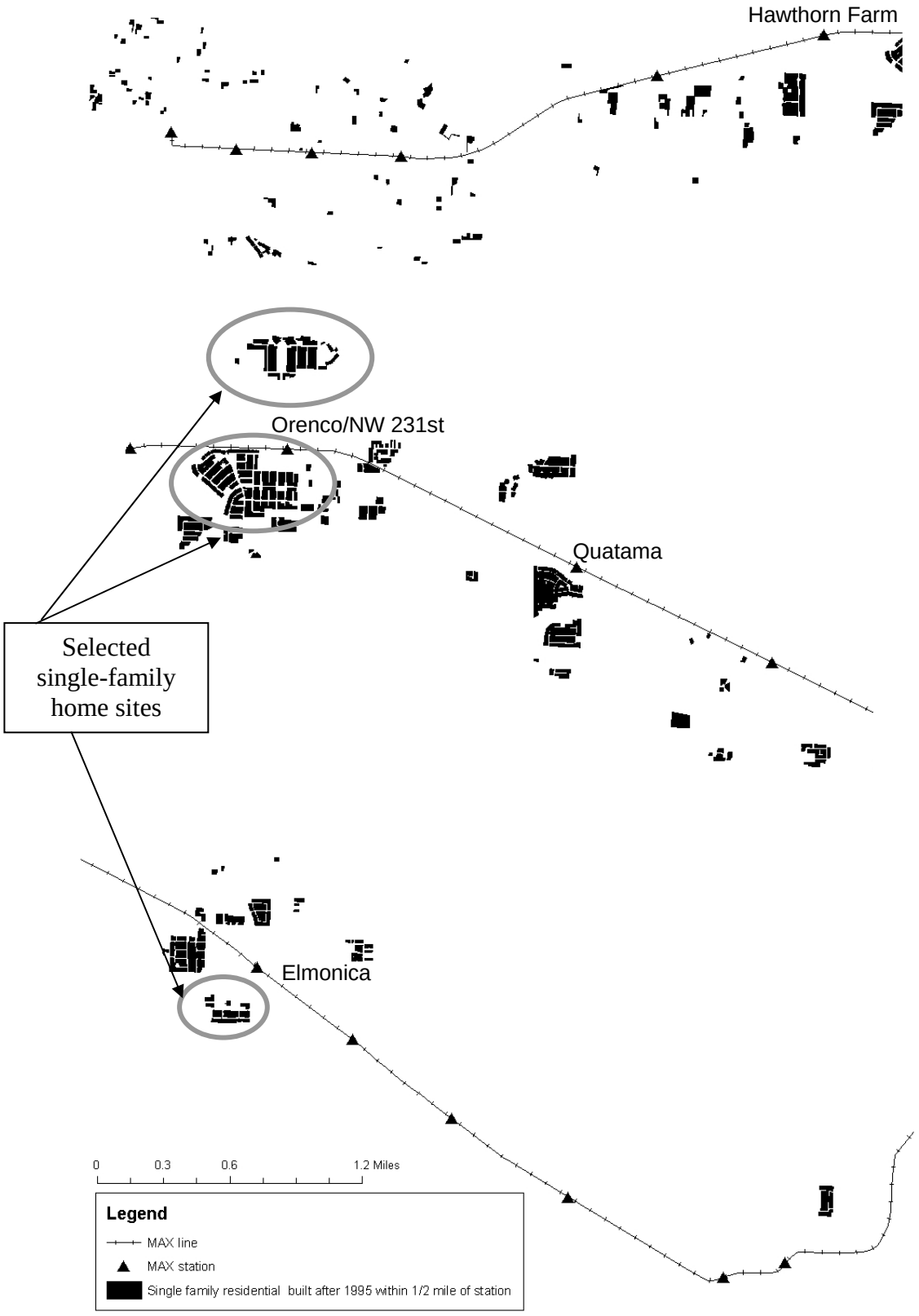
- Density;
- Land use mix;
- Pedestrian friendliness; and
- Closeness to transit.

To control for regional accessibility, particularly to downtown Portland, this project focuses on development in Washington County along the Westside MAX line, which extends west from downtown Portland to Hillsboro, OR. Along this corridor, there are two developments that have gained regional and national attention as examples of TODs: Orenco Station and The Round at Beaverton. These are two of the older TODs in the region. They were chosen first for this research because of their notoriety and because they exhibit most or all of the four TOD features. Both are higher density than the surrounding area, include a mix of residential and commercial land uses, and are pedestrian-friendly (within the development). The Round is right at a MAX station, while the closest border of the Orenco Station development is one-quarter mile away from a MAX station. The housing at The Round, built in 2003, consists of condominiums. Housing at Orenco Station includes condominiums, row houses, and detached single-family homes. All units were built after 1996.

We attempted to identify appropriate control neighborhoods using GIS maps and databases and site visits. The objective was to find developments with comparable housing in terms of type, age and price range, but without one or more of the four features of a TOD. The intent was to control somewhat for demographics, including income and housing style preferences, by identifying comparable housing. We first looked for developments within walking distance (one-quarter mile) of shopping and other commercial uses, but not near a MAX station. We could not find any such developments in Hillsboro or Beaverton. There were several comparable new housing developments, but not within a one-quarter mile walking distance of a shopping area with more than just a grocery or gas station. We then searched for developments within one-half mile (straight-line) Washington County MAX stations with comparable housing, but without either the mix of land uses or pedestrian friendliness.

Figure 1 hows the taxlots with single-family homes built after 1995 within one-half mile of a MAX station in Washington County. The maps are in three segments from west (top) to east (bottom). In the easternmost segment, most of the stations only have a few scattered new single-family homes nearby. The developments near the Hawthorn Farm station were not chosen because the street network did not connect them to the station directly. The walking distances to the station are much further than one-half mile. Of the remaining station areas, we chose one large single-family development near Orenco/NW 231st (along with the original Orenco Station development) and a single-family development near Elmonica station. We chose to focus on these stations because there were also condominium developments nearby to survey. Finally, adjacent to Orenco Station was an older development of single-family homes, built between 1980 and 1996. While these homes did not meet the original criteria for selecting sites, we added it because is presented an interesting opportunity. The home values were comparable to those in Orenco Station. Some of the homes were within the same distance of the MAX station as Orenco Station and now, with the addition of Orenco Station, they are within walking distance of shopping and other commercial services.

Figure 1: New Single-family homes within ½ mile of MAX Stations



The final developments selected for surveying included:

- Orenco Station (original development)
- Club 1201 Condominiums
- The Round at Beaverton (condominiums)
- Arbor Gardens at Orenco
- Arbor Station at Elmonica
- Elmonica Station Condominiums

During the time we were identifying sites, Metro (Portland's regional planning agency) approached PSU about surveying residents at a TOD they helped fund, The Merrick. The Merrick is an apartment building with ground-floor retail located near the Convention Center MAX station in the City of Portland, just east of downtown. We added this site to the study as a pre-test site for the survey instrument to be used at the six developments listed above. All of the developments are described in more detail below.

1.2 Survey Sites

The seven developments selected satisfy all four elements of a TOD to varying degrees. The variation allows us to examine questions about the contribution of each element towards one measure of success – mode choice, particularly transit use and walking. All but one of the developments are located near one of three stations on the Westside light rail MAX line: Orenco NW 231st Ave and Elmonica SW 170th Ave in Hillsboro, OR and Beaverton Central in Beaverton, OR (Figure 2). Both cities are suburbs of Portland, though they are also home to large employment sites including Intel and Nike. During the morning peak, MAX trains stop at these stations every six to eight minutes for a 30-40 minute ride to downtown Portland. Off-peak service is at 15-minute headways.

1.2.1 Orenco/NW 231st Station

Around the Orenco/NW 231st MAX station, we included four developments (Figure 3). The first is what this project refers to as the "original" Orenco Station development. This development is the largest master-planned community on the MAX system, has received numerous awards, and is often pointed to as a successful TOD, though that has been contested (TriMet, 2005; Bae, 2002). The development includes a variety of for-sale housing and 60,000 square feet of retail and commercial space (see Table 1). The retail uses include a grocery store, a large home and kitchen store, Starbucks, several restaurants, and some small shops. The development is often used as an example of New Urbanism as well as a TOD. While the "original" Orenco Station development includes a mix of land uses, higher density housing, and a nice pedestrian environment, it is not very close to the MAX station. The southern edge of the development is just over one-quarter mile from the station. Some of the homes are over one-half mile (straight-line distance) from the station. The street linking the development to the station includes sidewalks, benches and attractive lighting, though the land to the west is vacant; new condominiums are under construction to the east.

Further to the east and south of "original" Orenco Station, are the Club 1201 condominiums. Most of these units are within a quarter mile of the station and the retail area in the original development. South of the station is an Arbor Homes development that includes a variety of for-sale housing, but no commercial uses. These homes also employ many New Urbanist design features (e.g. front porches, small lots, and small set backs). The pedestrian environment is very pleasant. All three of these developments (original Orenco, Club 1201 and Arbor Homes) were conceived and/or built after the MAX station opened and transit accessibility was used in marketing. In contrast, our fourth development, Sunset Downs, precedes MAX and was not marketed as a transit-accessible place to live. The homes, however, are as close to MAX as the most of the original Orenco Station and now have retail uses within walking distance.

Figure 4 shows the land uses for tax lots within one-half mile of the Orenco/NW 231st MAX station, according to the Regional Land Information System (RLIS) maintained by Metro. About half of the land area is used for single- and multi-family residences. Of the commercial land uses indicated by RLIS (11% of the land area), only the parcels in the original Orenco Station development are actually land uses that residences might walk to, such as a grocery store or coffee shop. The other commercial parcels are either not being actively used for commercial purposes or are used for businesses that do not typically attract neighboring residents on a regular basis, such as a hotel and medical offices.

The Orenco Station developments also have some large employment sites nearby. Within the ¼ to ½ mile ring from the station are several office buildings. Just north of "original" Orenco Station (OOS) is a very large Intel facility. This site is within ¼ to ½ mile of the homes in OOS. West of the station area is another large Intel facility. This site is one-half to one mile from all four developments. In addition, within OOS, there are small offices (e.g. dentists, real estate, etc.), retail employment, and live-work-type townhomes with office space on the bottom floor.

Examples of the types of homes in each of the four sites are shown in

Figure 5 through Figure 10.

Figure 2: MAX Stations near Survey Sites

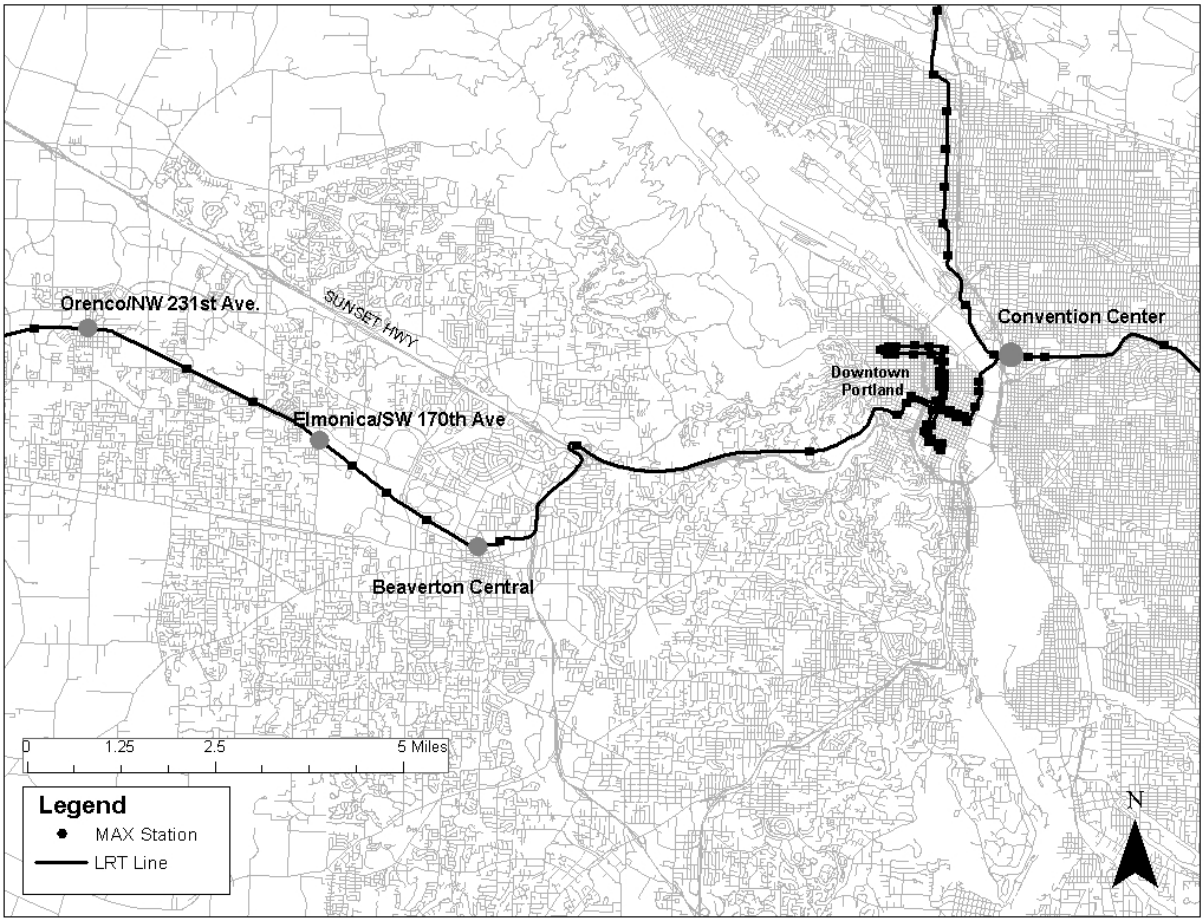


Figure 3: Survey Sites around Orenco/NW 231st Ave. Station

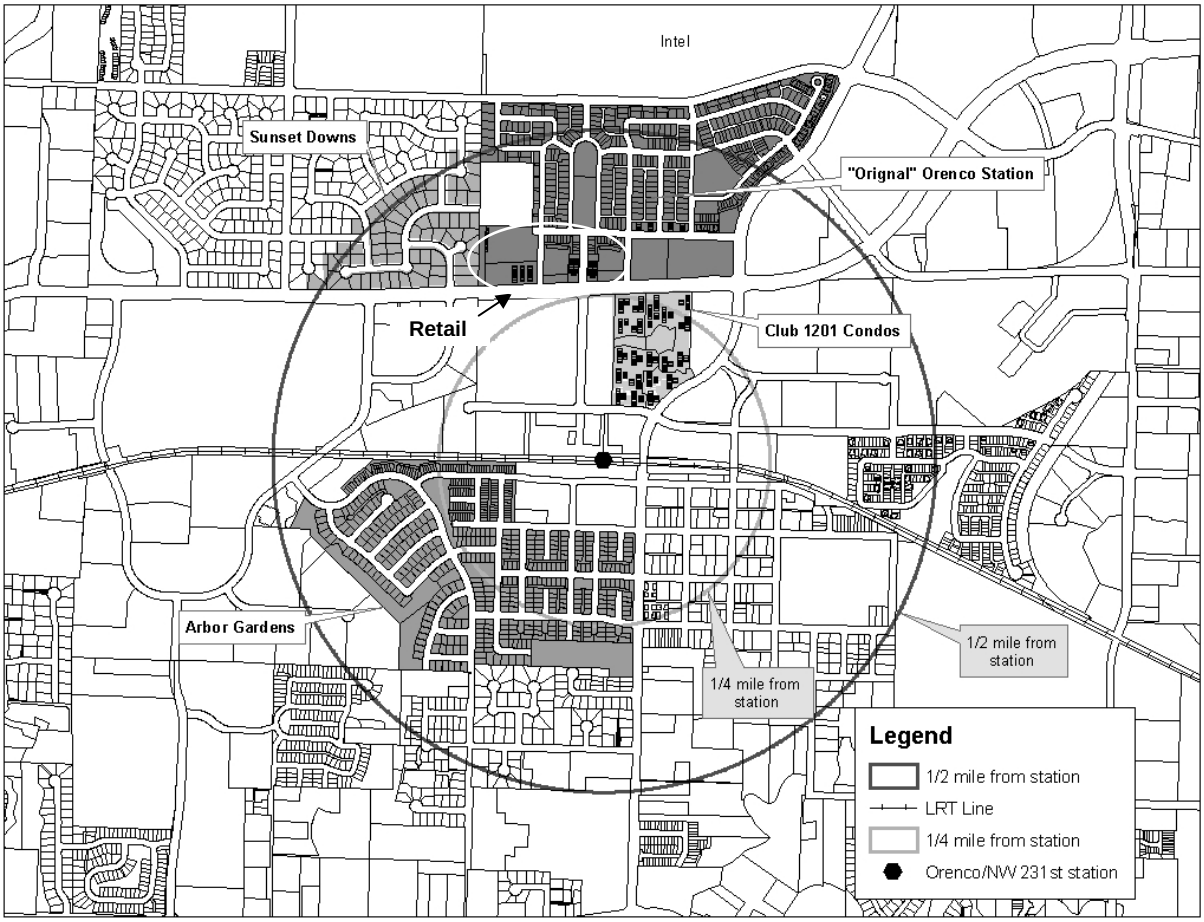


Figure 4: Orenco/NW 231st MAX station Area Land Uses

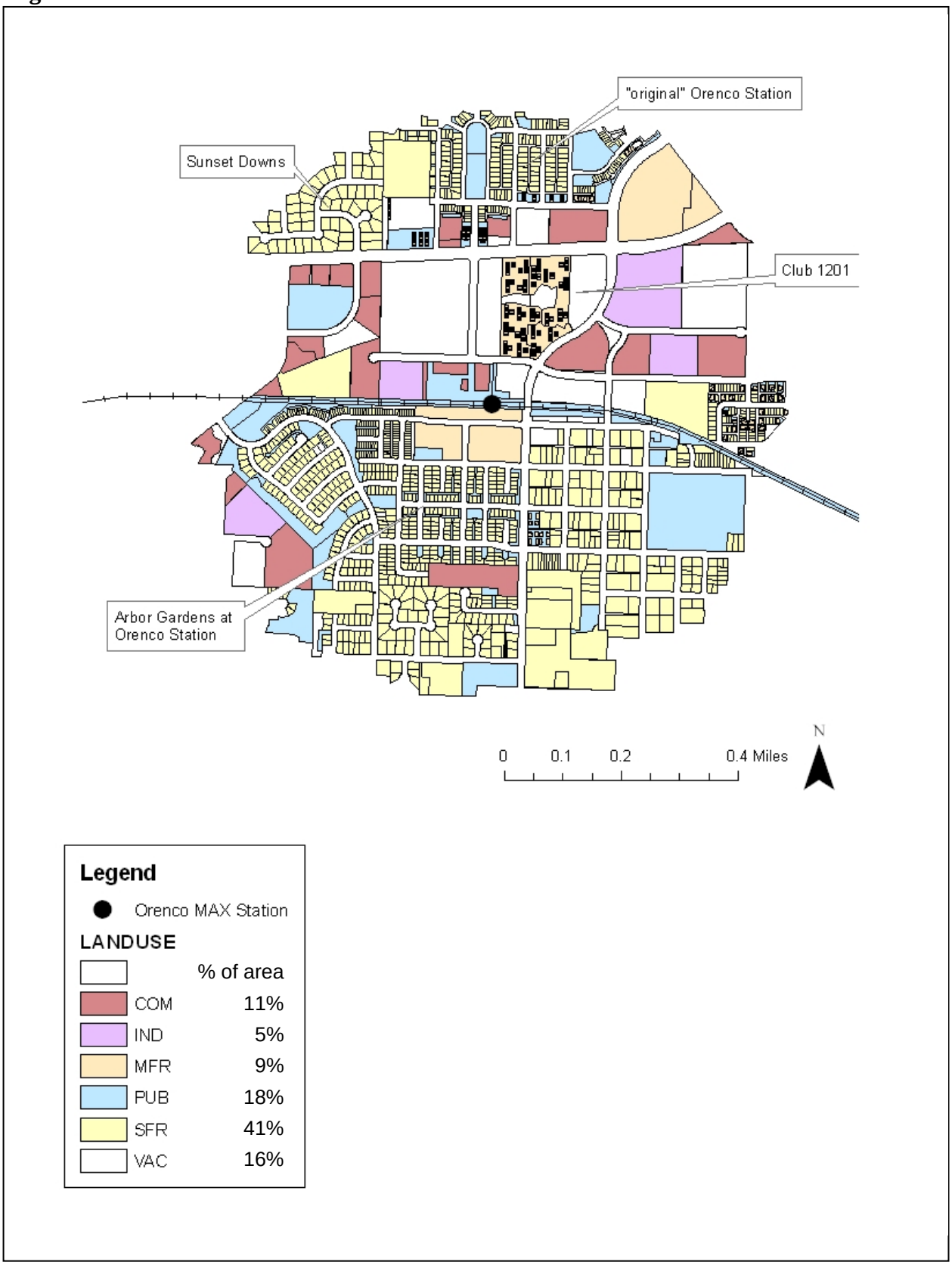


Figure 5: Original Orenco Station – Condominiums over Retail



Figure 6: Original Orenco Station - Single Family Homes



Figure 7: Original Orenco Station - Club 1201 Condominiums



Figure 8: Sunset Downs



Figure 9: Arbor Gardens at Orenco Station Single Family Detached Homes



Figure 10: Arbor Gardens at Orenco Station Single Family Townhomes



1.2.2 Elmonica/SW 170th Ave Station

The two projects at the Elmonica Station (Figure 11) have housing similar to "original" Orenco Station, but the area lacks some of the other key TOD features. The developments have two of the required TOD features – proximity to transit and higher density – but lack a good mix of land uses and good pedestrian environment. At the time of this study, there were very limited retail and commercial land uses nearby – a deli, a restaurant, a barber shop, and Costco, a warehouse-style store. As with the land around the Orenco/NW 231st station, about half of the land around the Elmonica station is devoted to residential uses (Figure 12). A large amount of land (28%) is devoted to public uses, including the MAX parking lot, a storage and maintenance area for MAX trains, a park with baseball fields, and an elementary school. The commercial property directly west of the Elmonica Station Condominiums is not currently active. The Arbor Station development includes attached homes from the same Arbor Homes developer (Figure 13 and Figure 14) as Arbor Gardens at Orenco Station. At the time of the survey, about one-third of the development was complete. These homes are about one-quarter mile from the station. The Elmonica Station Condominiums (Figure 15) are across the MAX parking lot from the station. The pedestrian environment connecting the condominiums to MAX is excellent. The pedestrian connection from Arbor Station is lacking sidewalks on part of the route (Figure 16).

Figure 11: Elmonica Station Sites

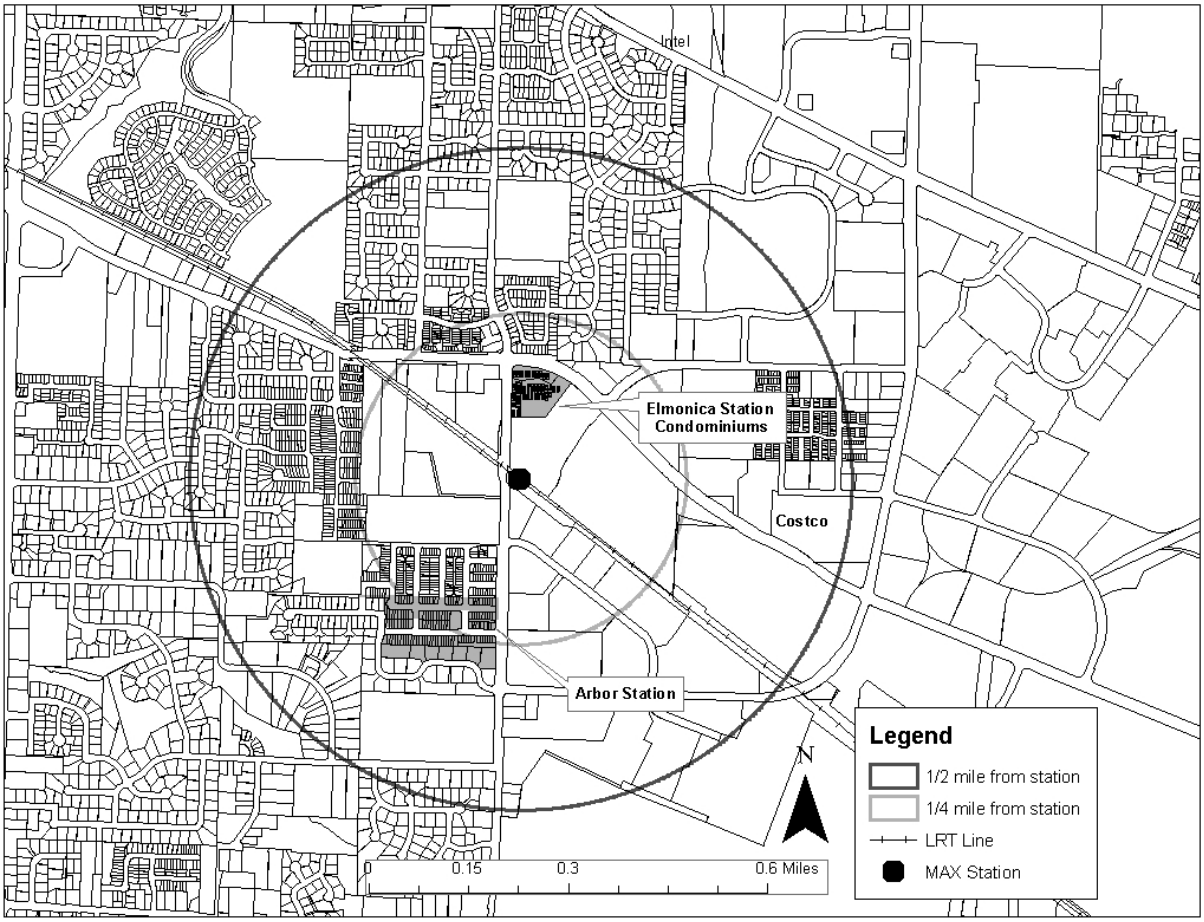


Figure 12: Elmonica Station Area Land Uses

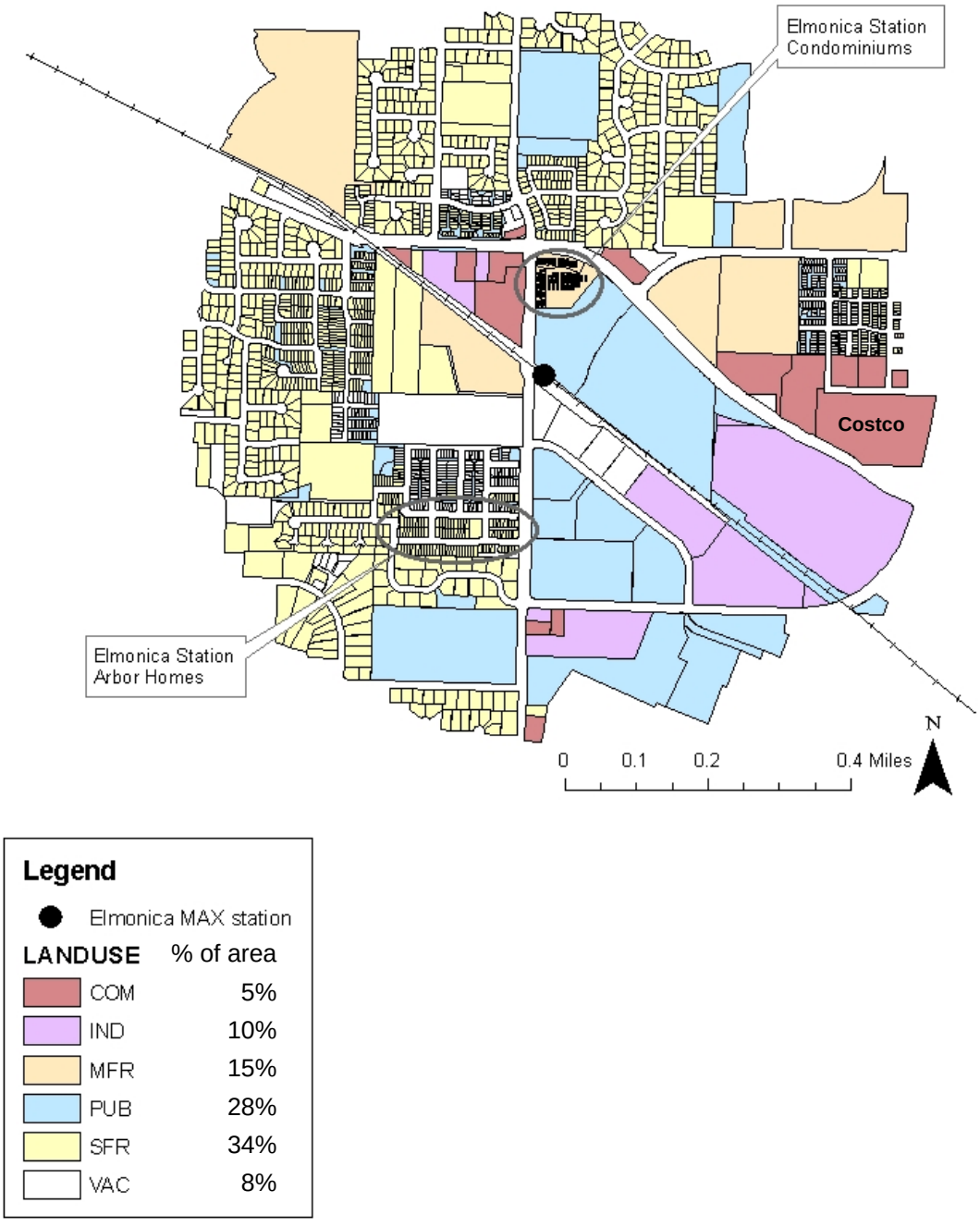


Figure 13: Elmonica Station Arbor Station Attached Single-family Homes



Figure 14: Elmonica Station Arbor Station Townhomes



Figure 15: Elmonica Station Condominiums



Figure 16: End of Sidewalk between Arbor Station and MAX Station



1.2.3 Beaverton Central

The final Westside TOD included in this research is another development that has received a lot of positive and negative attention – the Round at Beaverton Central (aka Beaverton Round). The original plan for the Round included eight buildings surrounding a new MAX station, including residential, office, and retail uses. The project has faced numerous financial and technical difficulties. Three of the buildings are complete and occupied. All are within 100 feet of the MAX station. One includes three floors of condominiums with ground-floor retail (Figure 18).

The second are offices for a real estate company. The third includes a fitness club and office space. The pedestrian environment within the development is excellent; however, connections and the environment beyond the development are poor. Retail uses within the development are currently limited to a few restaurants and the fitness center. The density and style of the development is in sharp contrast to the surrounding area, which is typical of many auto-oriented suburbs. The is, however, a significant amount of commercial land use within a half-mile of the station (Figure 20). Most of these properties are retail businesses, but their design is auto-oriented, with large parking lots, making the area not very pedestrian-friendly.

Figure 17: Survey Site at Beaverton Central MAX Station

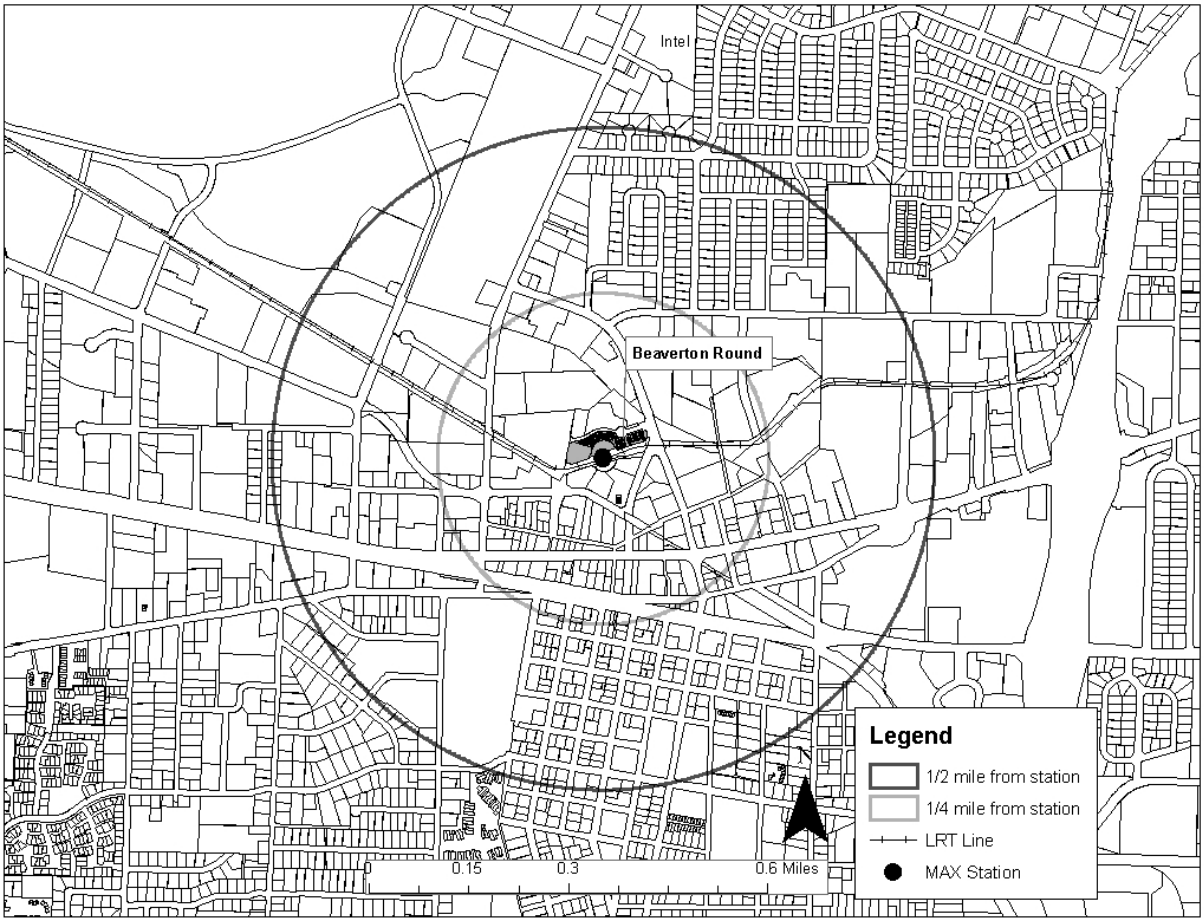


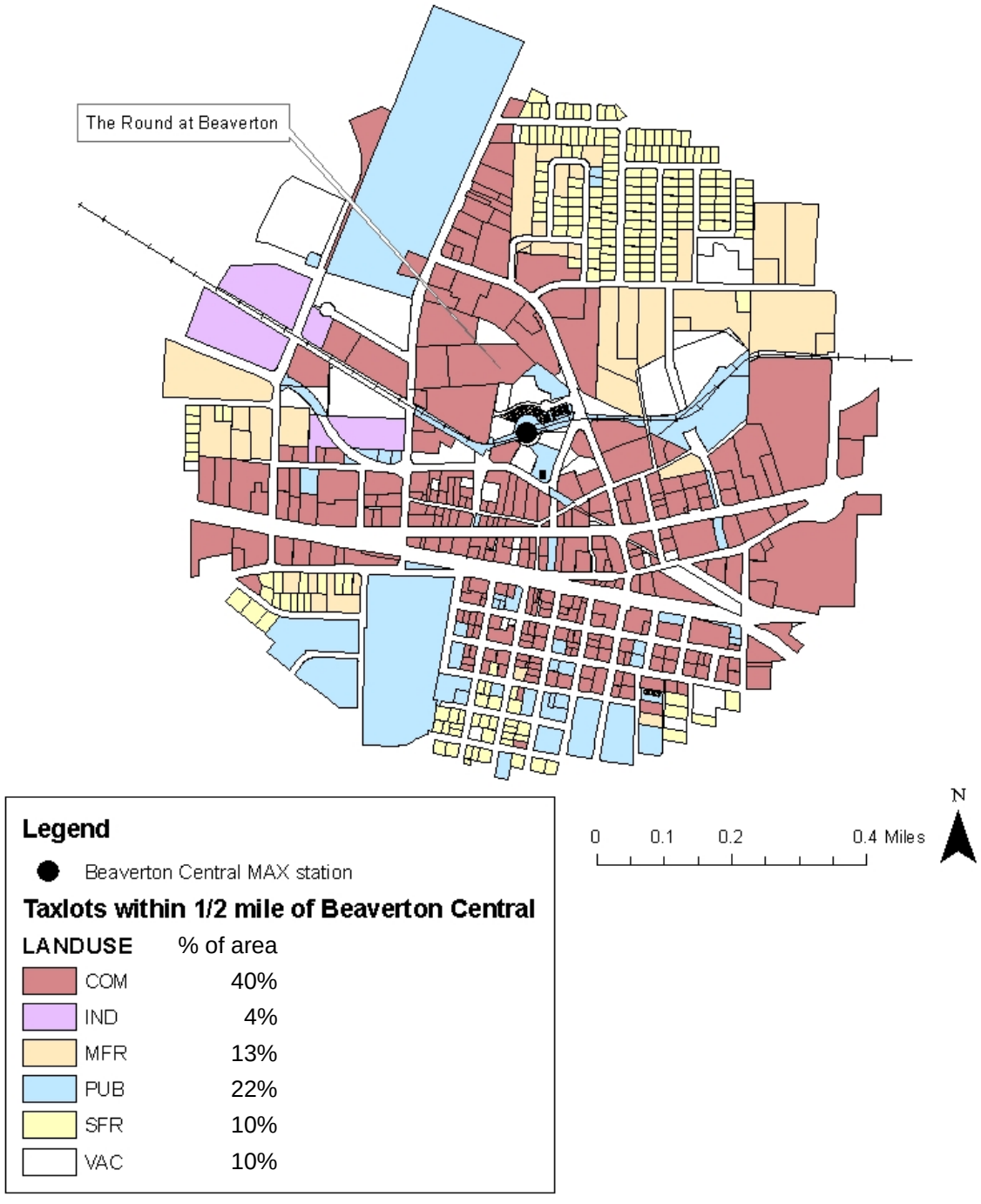
Figure 18: Beaverton Round Condominiums



Figure 19: Beaverton Round Office Building



Figure 20: Beaverton Central Station Area Land Uses



1.2.4 The Merrick (Convention Center MAX)

Finally, one eastside development was included – The Merrick. The Merrick received funding from Metro's TOD program and was completed in late 2004. The Merrick was not in the original research plan for this project. However, Metro was interested in surveying residents there and including it provided an opportunity to expand our project and pre-test the survey instrument. The Merrick is a five story building with retail space on the ground floor, 185 rental apartments above, and parking below (Figure 21). The apartments are marketed as luxury apartments with amenities such as a fitness center. The Merrick is about 600 feet from a MAX station in the Lloyd Center/Rose Quarter area (Figure 22). The station is only a few stops from downtown Portland. The surrounding neighborhood is auto-oriented, with several parking lots and drive-through restaurants. However, there are sidewalks throughout the area, and the grid street pattern makes destinations accessible. In the larger area there are many employment sites, including 6-12 story office buildings, the Convention Center, the Rose Garden arena, and the Memorial Coliseum. Just over one-quarter mile away is a large, indoor regional mall (the Lloyd Center).

Figure 21: The Merrick Apartments



Source: http://www.themerrickapts.com/

1.2.5 Summary of Sites

Table 1 provide a summary of the characteristics of the developments, based upon data from RLIS and the discussion above.

Figure 22: Merrick Site Location

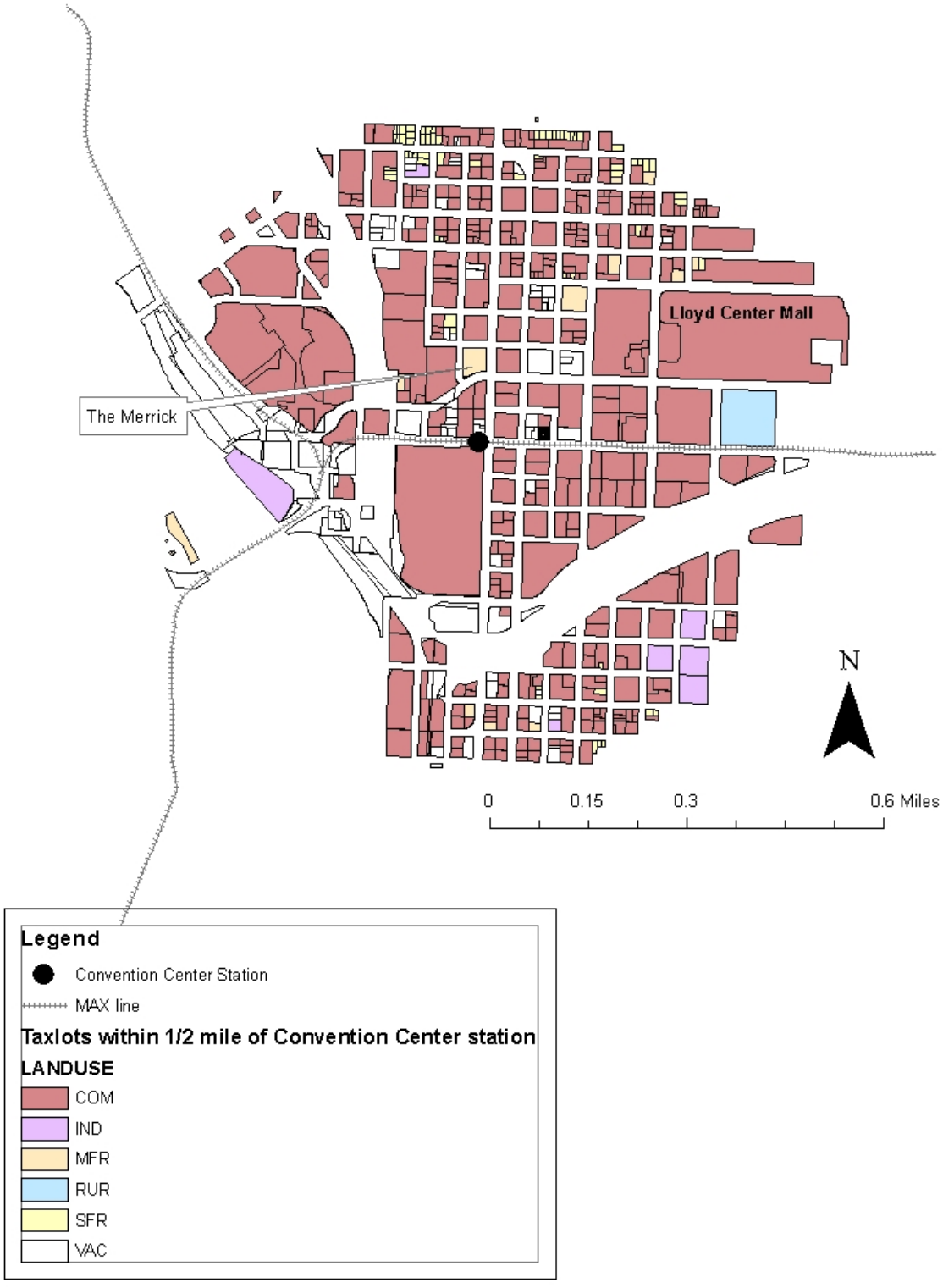


Table 1: Summary of Characteristics of the Developments

	Housing Types	Dates built	Average home size (range)	Recent sales price range	Distance to MAX	Commercial uses (selection and distance)	Walking environment
Orenco Station: Arbor Homes	Detached Townhomes	2002-2004	1,830 sq. ft. (1,511-2,544)	$163,900-347,620	<¼ to ½ mile	Good	Excellent
Orenco Station: Original development	Detached Townhomes 2-, 3-, 4-plexes Condos	1997-2003	1,560 sq. ft. (664-2,525)	$121,200-800,000	>¼ to >½ mile	Excellent	Excellent
Orenco Station: Club 1201	Condos	2000	1,160 sq. ft. (696-1,646)	$89,900-198,000	~¼ mile	Excellent	Excellent
Sunset Downs	Detached	1980-1996	1,670 sq. ft. (1,246-2,334)	$149,900-280,000	>¼ to ½ mile	Excellent	Excellent
Arbor Station at Elmonica Stn.	Attached and Townhomes	2004	1,520 sq. ft. (1,147-2,887)	$149,000-265,000	~¼ mile	Poor	Fair-Good
Elmonica Station Condominiums	Condos	2004-2005	Not available*	Not available*	< ¼ mile	Poor	Fair-Good
Beaverton Round	Condos	2003	1,100 sq. ft. (722-1,968)	$165,000-304,000	Adjacent	Excellent	Fair-Good
The Merrick	Apartments	2004	(509-930)	$800-1500 per month rents	~ 600 feet	Excellent	Fair-Good

Source for size and price information: RLIS.
**RLIS data for the Elmonica Station Condominiums was incomplete as of February 2006.*

1.3 Survey Development and Distribution

The surveys were conducted in two phases. The first phase included The Merrick and served, in part, as a pre-test for the instrument and methodology. That phase was completed in March 2005. The second phase includes the Westside developments and was completed in October 2005.

We developed the first survey instrument for the Merrick by borrowing (with permission) from two other sets of researchers and previous work by the author. The first survey that we borrowed from was used by Professors Hollie Lund, Richard Willson, and Robert Cervero in their research on TODs in California, "Travel Characteristics of Transit-Oriented Development in California." That survey focused on collecting commute information and data about three recent trips. The second survey that we borrowed from was developed by Professors Susan Handy and Patricia Mokhtarian at the University of California, Davis. The survey was used in a study of several neighborhoods in California, focusing on people who had recently moved. That survey collected broader information about travel, particularly non-work travel, along with information about travel and housing preferences and decisions. In addition, the Merrick survey asked respondents to recall for the past week (defined by dates on the form) the number of trips they made from The Merrick by various modes (private vehicle, walk, bicycle, bus, and MAX) for 13 purposes. This was done to estimate a "trip generation" rate for the development. In the second phase of the research, this portion of the form was replaced with a separate one-day travel diary. Both eight-page survey forms included the following sections:

- Information on your Household. This included questions on household size and number of vehicles.
- Information on your Place of Work/School and Commuting.
- Information on Commuting from your Prior Residence
- Your daily travel. This section focused on non-work travel during different times of the year.
- Information on your Current Place of Residence. This section focused on the importance of various items in selecting their home. Most of the questions came from the Handy and Mokhtarian instrument. In the second phase, a series of questions on sense of community were included.
- Information on your Travel Preferences. This section attempts to gauge people's preferences for various modes and was developed by Handy and Mokhtarian.
- Your household vehicles. This section includes a question from Handy and Mokhtarian about changes in vehicle ownership resulting from characteristics of their current neighborhood.
- Information about you. This section includes standard demographic questions and some questions about mobility impairments.

The Merrick survey packets included two identical forms, one for each adult. Given the size and price of the apartments, we anticipated that this would cover almost every adult resident in the building. The Westside survey packets only included one form (included in Appendix). The cover letter explained that any adult who shares in the decision making for the household and who participated in selecting their current residence could complete the survey. All survey packets included a gift card to Starbucks with three dollars as an up-front incentive. With management cooperation, The Merrick survey packets were placed under the door of each occupied apartment. There was a box in the office to return the surveys. The Westside surveys were mailed and included business-reply envelopes for returning the surveys. Both phases included a reminder postcard and second mailing to non-respondents.

Sample sizes and response rates are in Table 2. In the smaller developments one survey was sent to every household in the development (a 100% sample). In the larger developments half of the households were selected randomly. The table indicates whether 50% or 100% of all households in the developments (at the time of the survey) were sent a survey. The sampling frame for the survey for most of the sites was the Regional Land Information System (RLIS) database maintained by Metro. For the Beaverton Round, Elmonica Station Condominiums, and Merrick apartments, we obtained the addresses and unit numbers from either the developer/manager or city planning departments. For those housing units selected from RLIS, there is information on the lot size, building square footage, land value, and building value. We compared these data (when available) for respondents and non-respondents for each neighborhood and found no statistically significant differences.

The response rates are calculated as follows:

$$\text{Response rate} = \frac{\text{\# responses}}{(\text{\# sent}) - (\text{\# returned as vacant or undeliverable})}$$

The overall response rate for the sites on the Westside was 29%. Response rates for individual neighborhoods on the Westside ranged from 24% to 33%. For The Merrick, we received completed surveys back from 65 apartments (of 150), for a 43% response rate. There were 76 total completed surveys, since some apartments had two adults. The higher response rate is likely due, in part, to the cooperation of the Merrick management, which included a letter in the original packet. Graduate students at PSU did all of the data entry. The data was checked for potential errors. Overall, it appears that the survey respondents completed the questionnaires with little difficulty. There were very few skipped questions. Anecdotally, the staff at the Merrick mentioned that some residents said that the survey was fun or interesting.

Table 2: Sampling and Response Rates

	Sample size (housing units)	**Responses (rate)**
Orenco Station: Arbor Homes	217 (50% of all residences) *4 returned as vacant*	68 (32%)
Orenco Station: Original development	166 to attached and detached single family homes (50% of all) 114 to condominiums (100%) *13 returned as vacant*	52 of SFH (32%) 28 of MFH (26%)
Orenco Station: Original Club 1201	105 (50% of all units) *9 returned as vacant*	23 (24%)
Sunset Downs	68 (100%) *2 returned as vacant*	21 (32%)
Elmonica: Arbor Station	65 (100%) *7 returned as vacant*	16 (28%)
Elmonica: Condominiums	120 (100%) *10 returned as vacant*	26 (24%)
Beaverton Round	63 (100%) *12 returned as vacant*	13 (25%)
All Westside locations	918 *57 returned as vacant*	247 (29%)
The Merrick	150 (100%) *none returned as vacant*	65 units (43%)

Findings

The length and depth of the survey instrument provided a very large amount of data. For this report, only data from the main survey instrument is analyzed, not the one-week trip recall (The Merrick) or the one-day travel diary (Westside projects). The analysis will focus on comparing travel behavior at the different developments.

1.4 Demographics

1.4.1 Respondents

The demographics of the respondents varies somewhat between the developments (Table 3). The respondents from the Arbor Homes at Orenco Station and Sunset Downs have the largest households and include more children. With the exception of the condominiums at Elmonica Station, the condominium and apartment-style developments had smaller households, usually without children under 16. As would be expected, households at The Merrick are the smallest, with only one household having a child and most households being single adults. With a couple exceptions, the respondents were predominantly female. This likely indicates that women were more likely to complete the survey in households with both a male and female adult.

Table 3: Household Demographics

	Average # people per household	% of homes with people under 16	% of respondents over 64	% female	N
Orenco Station: Arbor Homes Orenco Gardens	2.4	36%	6%	68%	68
Orenco Station: Original single family	2.0	10%	20%	61%	52
Orenco Station: Original multi-family	1.7	4%	19%	63%	28
Orenco Station: Original Club 1201	1.5	4%	17%	70%	23
Sunset Downs	2.6	33%	14%	81%	21
Elmonica Station: Arbor Station	2.1	19%	7%	56%	68
Elmonica Station Condominiums	2.0	23%	0%	77%	26
Beaverton Round	1.6	8%	0%	39%	13
The Merrick	1.3	1%	7%	50%	66
Statistically significant difference between sites?	Yes	Yes	Yes	Yes	

The “original” Orenco Station (OOS) and Club 1201 condos had a high share of respondents aged 65 or older. It is likely that these developments are attracting a high share of older adults because of the style of development and accessibility to retail. In contrast, the Beaverton Round is a more modern, urban-style development with limited nearby destinations.

Income levels at all developments are relatively high (Table 4). This is not unexpected. None of the developments include affordable housing components and all are marketed and priced for the higher end of the housing market. The residents of these developments are not transit-dependent; on average, there is almost one or more than one vehicle per person of driving age. Vehicle availability is also high, averaging about one or 0.9 vehicles per person of driving age. This indicates that the population is generally not transit-dependent.

Table 4: Household Income and Vehicle Availability

	Median Income (category)	Vehicles per person 16 or older	N
Orenco Station: Arbor Homes Orenco Gardens	$75,000-99,999	0.9	68
Orenco Station: Original single family	$75,000-99,999	0.9	52
Orenco Station: Original multi-family	$75,000-99,999	1.0	28
Orenco Station: Original Club 1201	$35,000-49,999	0.9	23
Sunset Downs	$50,000-74,999	1.0	21
Elmonica Station: Arbor Station	$50,000-74,999	0.9	68
Elmonica Station Condominiums	$35,000-49,999	1.0	26
Beaverton Round	$75,000-99,999	1.1	13
The Merrick	$35,000-49,999	0.9	66
All Sites	$50,000-74,999	0.9	323
Statistically significant difference between sites?	Yes (betweens means, using midpoints of ranges)	No	

1.4.2 Survey respondents compared to population

Because most of the homes surveyed were built after the 2000 Census, it is difficult to compare the respondents to the population, based upon the Census, to see how well the respondents represent the population. Over 85% of our respondents moved to their home after 2000. All of the Sunset Downs homes were built before 2000. The only other site with homes built before 2000 is the original Orenco Station. Just under half of the single-family homes surveyed there were built before 2000. Some of the homes completed in 2000 (one-third of the single-family and half of the multi-family homes) may have been included in the Census. Club 1201 was completed in 2000. The Census blocks covering these neighborhoods were selected for comparison to the survey respondents. The results are shown in Table 5. There are some differences. However, for the Orenco Station and Club 1201 sites, it is unclear whether the differences are because of changes in the population as the development was completed or true differences between the respondents and the population. For example, there are over 200 units in Club 1201, but only 42 were included in the 2000 Census. The first residents may be different from the population now. This might explain why there are a higher share of respondents 65 year

or older (17%), compared to the Census (9%). Older residents may For Sunset Downs, it appears that the more single-person households responded compared to two-person households. The share of respondents aged 65 or older is very similar to the Census for Sunset Downs.

Table 5: Comparison of Household Size and Age to Census 2000

	1 person	2 persons	3 or more persons	n	% over 64 years	n
Orenco Station Original SF & MF						
Respondents	29%	59%	12%	80	19%	78
Census 2000	36%	48%	16%	147	11%	253
Club 1201						
Respondents	57%	39%	4%	23	17%	23
Census 2000	67%	33%	0%	42	9%	54
Sunset Downs						
Respondents	24%	38%	38%	21	14%	21
Census 2000	14%	48%	35%	132	13%	258

1.5 Travel

1.5.1 Commuting

1.5.1.1 Commute Mode

Overall, three-quarters of the respondents worked or went to school outside of the home. For the analysis of the commuting survey data that follows, all of the single- and multi-family homes from the original Orenco Station sites and Club 1201 are combined because of their proximity and similar relationship to the MAX station. The two developments at the Elmonica Station are also combined.

The respondents who commute to work or school are using transit at higher rates than found in the 2000 Census in the cities of Hillsboro (6.7%), Beaverton (7.9%) and Portland (14.9%). Rates of commuting on transit were highest at the Elmonica Station sites and the Beaverton Round (Table 6). In all cases, over 20% of the respondents commuting primarily by transit. The high level of walking for Merrick residents reflects the proximity of the building to a major center – the Lloyd Center. The high rate of walking for Sunset Downs respondents may be a result of the small sample size. Residents of Sunset Downs are within one mile of a large Intel facility. These high rates of transit use may reflect some self-selection in responses; people using transit may have been more likely to respond to the survey. The 2000 Census data for the block group that includes the original Orenco Station development indicates that 13% of the workers regularly commuted to work using transit and 6% usually walked. The block group does include residential development further from the MAX station than the sites surveyed, including two large apartment complexes that were completed before the 2000 Census that are more and one-half mile from the station.

Table 6: Commute Modes

	Commutes by MAX once a week or more*	Primary commute mode is transit	Primary commute mode is drive alone or carpool	Walks to work once a week or more*	n
Orenco Station: Arbor Homes Orenco Gardens	32.0%	25.0%	64.6%	6.0%	50
Orenco Station: Original development and Club 1201	37.5%	23.4%	57.8%	8.1%	64
Sunset Downs	30.8%	23.1%	61.5%	23.1%	13
Elmonica Station: Condos and Arbor Station	43.2%	29.7%	59.5%	2.7%	37
Beaverton Round	41.7%	33.3%	58.3%	0.0%	12
The Merrick	29.0%	27.9%	50.8%	23.0%	62
Significant difference?	No	No	No	Yes	

Table only includes respondents who work or go to school outside of the home.

The longer distance to the MAX station for Original Orenco residents compared to the Arbor Homes development at Orenco does not appear to effect rates of commuting by MAX. However, the distance does appear to effect how respondents get to the MAX station (Table 7). Many of the Original Orenco MAX commuters drive or get a ride to the station (30.8%).

Table 7: Mode to MAX Station for Commuters

	Walk	Drive or ride	N
Orenco Station: Arbor Homes Orenco Gardens	90.0%	10.0%	20
Orenco Station: Original development & Club 1201	69.2%	30.8%	26
Sunset Downs	Too few respondents		
Elmonica Station	76.5%	11.8%	17
Beaverton Round	100.0%	0%	5
The Merrick	100.0%	0%	25

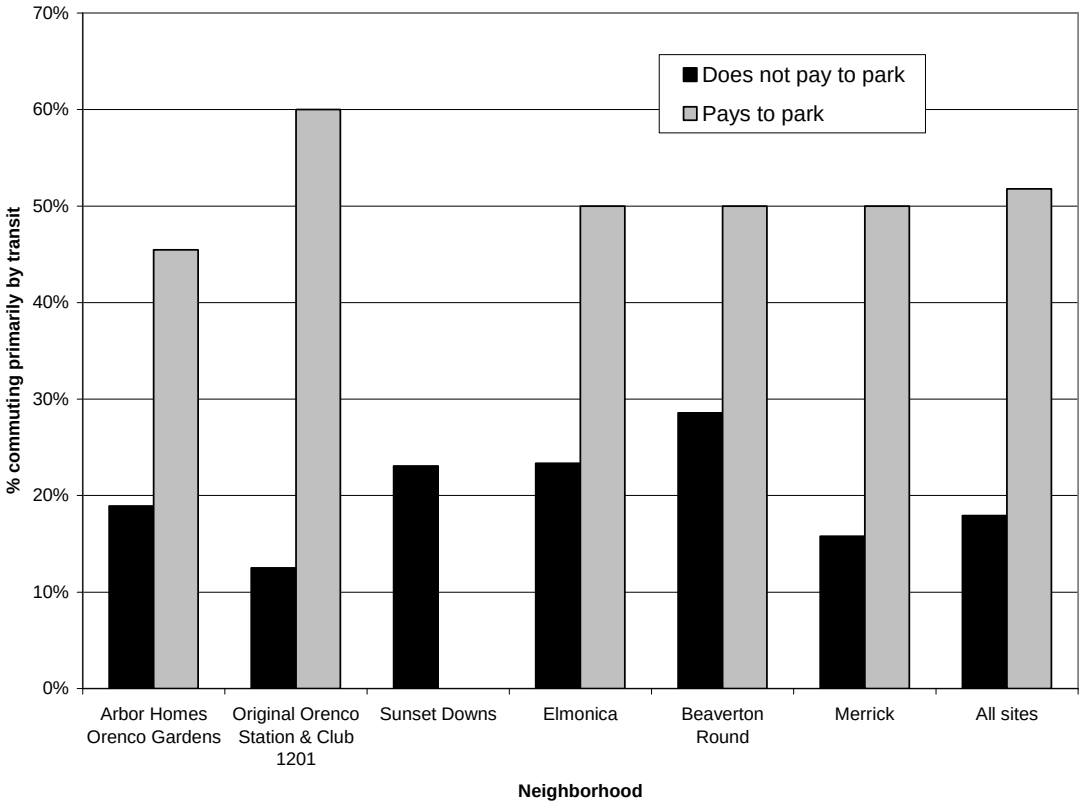
Differences are statistically significant at p<0.05.

1.5.1.2 Differences between Transit Commuters and non-Transit Commuters

Residents at all of the sites surveyed have similar levels of light rail transit service[1] and most live within one-half mile of a station. Given the similar levels of transit access and service, what might explain why some people regularly commute by transit and others do not?

Parking pricing at the work or school site appears to have a significant effect on commute mode. Only about one-quarter of the respondents overall do or would have to pay to park at work or school. Of these, 52% regularly commute by transit, compared to 18% of the respondents who do not have to pay to park. The difference is consistent across the neighborhoods (Figure 23).

Figure 23: Commute mode and free parking



Transit commuters are far less likely to make stops on the way to or from work or school. However, the direction of the cause-effect relationship is not known. People who need to stop more (e.g. to drop children at school or go grocery shopping) may decide to drive. Alternatively, people who use transit may not make those stops on the way to/from work and make them at other times. Regular transit commuters stopped an average of 0.26 days per week on the way to work and 0.94 days per week on the way home. This compares to 1.03 and 1.96 days per week, respectively, for non-transit commuters. The pattern of stopping more often on the way home is consistent between the two groups. The differences are statistically significant. On the other

[1] The Merrick has more bus service nearby, compared to the other sites.

hand, there is no significant difference in the number of children under 16 in the households of transit commuters (0.13) versus non-transit commuters (0.19).

To commute regularly by transit, a worker/students needs to access transit on both ends of their trip. The survey design controlled for access to the station at the home end, though there is a range (Table 8).

Table 8: Estimated time (minutes) to walk from home to MAX station

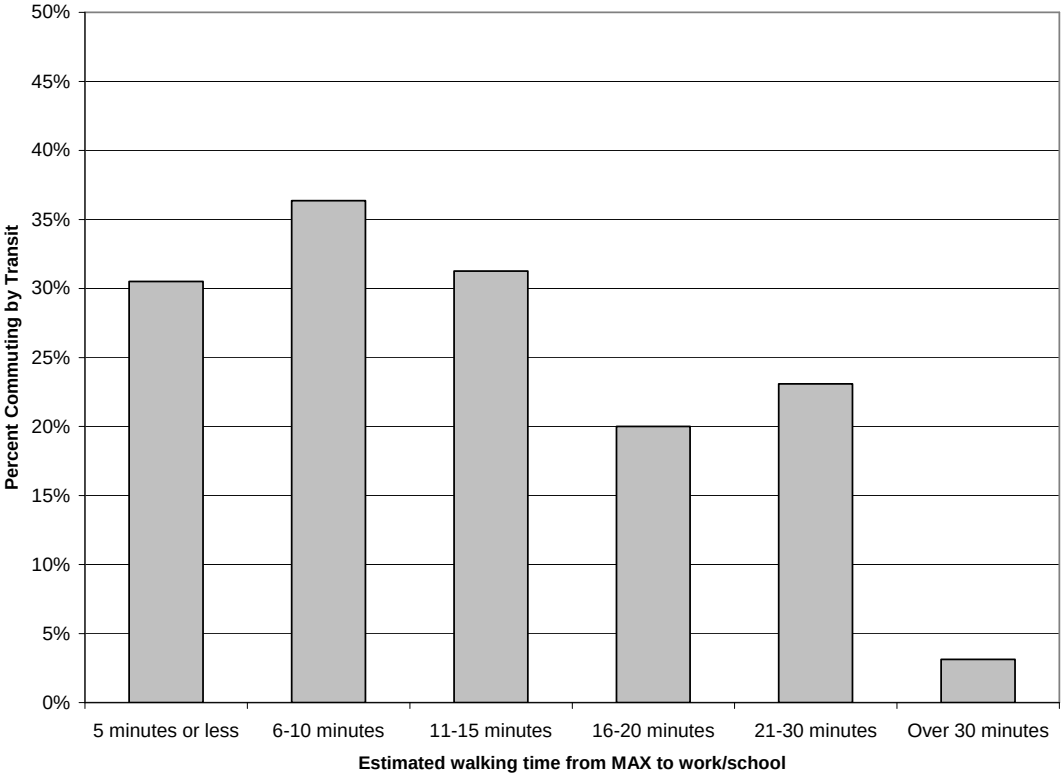
	Mean	Std. Deviation	Median	Minimum	Maximum	n
Orenco Station: Arbor Homes	5.5	2.7	5.0	1.0	15.0	65
Orenco Station: SFH & MFH	10.3	3.9	10.0	2.0	20.0	76
Orenco Station Original: Club 1201	6.7	4.8	5.0	3.0	25.0	21
Sunset Downs	12.0	3.8	10.0	5.0	20.0	17
Elmonica Station	4.4	3.9	3.0	1.0	21.0	38
Beaverton Round	1.7	1.4	1.0	0.0	5.0	10

Notes: Question not included on Merrick survey. ***Only*** *respondents without a condition limiting their ability to walk outside the home included.*

There is no significant difference between transit and non-transit commuters' estimate of the length of time it takes them to walk from home to the MAX station – 6.6 minutes for both.[2] There is a significant difference in the estimated walking time on the other end of the trip. Transit commuters estimated that it takes 9.6 minutes to walk from MAX to work or school, while non-transit commuters estimated that it takes 15.5 minutes. A drop off in transit commuting appears to happen when the work or school location is over 15 minutes from the MAX station (Figure 24). Almost no one commuted by transit if the walking time was 30 minutes or more. Overall, 70% of the commuters using MAX walked from the station to work/school and 15% used a bus.

[2] This question was not on the Merrick survey. Therefore, results are for the Westside only.

Figure 24: Transit Commuting and Walking Distance from MAX to Work/School



1.5.1.3 Changes in Commute Mode

One objective of public policies to promote TODs is to increase transit ridership by encouraging people to switch from driving to transit. Many of the survey respondents appear to have made this switch. Of those that commuted before and after they moved to their current home, nearly 20% indicated that they used to travel primarily by non-transit modes[3] and now commute primarily by transit (Table 9). Nearly four percent made the switch in the other direction, from transit to non-transit, for a net change of about 16%. The Original Orenco Station residents exhibited the lowest rate of switching from non-transit to transit, though the differences between the neighborhoods is not statistically significant. Overall, of the 44 regular MAX commuters responding, 59% had primarily commuted by car, alone or in a carpool, 25% had used transit, 11% had used multiple modes (including at least one non-transit mode) and 4.5% walked. Of the 15 commuters who currently walk to work or school regularly, 47% had traveled by car before they moved, 20% walked, 20% used multiple modes, and 13% biked.

[3] Non-transit modes include driving alone, carpool, walk, bike, and a mix of modes.

Table 9: Changes in Commute Mode between Transit and non-Transit

	Switched from non-transit to transit	Continued commuting by transit	Continued commuting by non-transit modes	Switched from transit to non-transit	n
All Neighborhoods	19.7%	6.1%	70.4%	3.8%	213
Orenco Station: Arbor Homes Orenco Gardens	17.4%	6.5%	69.6%	6.5%	46
Orenco Station: Original development and Club 1201	11.9%	11.9%	69.5%	6.8%	59
Sunset Downs	18.2%	9.1%	72.7%	0.0%	11
Elmonica Station: Condos and Arbor Station	25.8%	3.2%	71.0%	0.0%	31
Beaverton Round	25.0%	8.3%	58.3%	8.3%	12
The Merrick	25.9%	0.0%	74.1%	0.0%	54

Differences between neighborhoods not significant.

1.5.2 Non-Commute Travel

Commuting typically represents far less than one half of all trips, though it has historically been a focus of transportation and transit planning because of its predictability and consistency. One question is whether TODs might influence mode choice for non-commute trips. The survey included a series of questions asking how often the respondent walked or rode a bike or used transit to various non-work or school destinations "in a typical month with good weather" and "during wetter, colder weather." In addition, the respondent was asked "How many times in the last 30 days did you take a walk, jog, or stroll around your neighborhood – for example to get exercise or walk the dog?" and "How many times in the last 30 days did you take a walk from your home to a business or store in the neighborhood?"

Some of these results for walking and bicycling are shown in Table 10. Proximity to destinations clearly influences responses. The lowest rates of walking/cycling to stores are seen at the Beaverton Round and Elmonica Station, where little retail exists within walking distance, and the highest rates are at OOS, where a large amount of retail is part of the development. The Beaverton Round residents do appear to be walking to the restaurants on the ground floor, however. In addition, half of them reported walking to a gym. The Sunset Downs residents to do not appear to be accessing the nearby retail at the same rate that OOS residents do, even though the distance is not that much greater.

Table 10: Walking and Biking for Non-commute Purposes

	Walks/bikes to store once a week or more in good weather	Walks/bikes to restaurant/bar/ café once a week or more in good weather	Walks/bikes with no destination once a week or more in good weather	Mean # walk, jog, or strolling trips in neighborhood in last 30 days	Mean # walking trips from home to business or store in last 30 days	n
Orenco Station: Arbor Homes Orenco Gardens	31%	31%	59%	18.0	4.6	68
Orenco Station: Original MF & SF & Club 1201	69%	46%	61%	19.8	12.8	103
Sunset Downs	19%	19%	49%	11.6	4.0	21
Elmonica Station	14%	14%	33%	8.6	1.5	42
Beaverton Round	15%	38%	25%	2.8	2.4	13
The Merrick	53%	64%	43%	5.1	6.7	68
Significant difference between neighborhoods? ($p<0.05$)	Yes	Yes	Yes	Yes	Yes	

The respondents are not using transit as frequently as they are walking or bicycling for non-commute destinations. With the exception of the Merrick residents, less than ten percent of the respondents indicate that they use transit at least once a week in good weather to get to various destinations (Figure 25). In contrast, 35% of the residents took MAX to work or school once a week or more. Rates of transit use to non-commute destinations were higher on a monthly basis (Figure 26)

Figure 25: Percent of Residents Taking Transit to Non-commute Destinations Once a Week or more in Good Weather

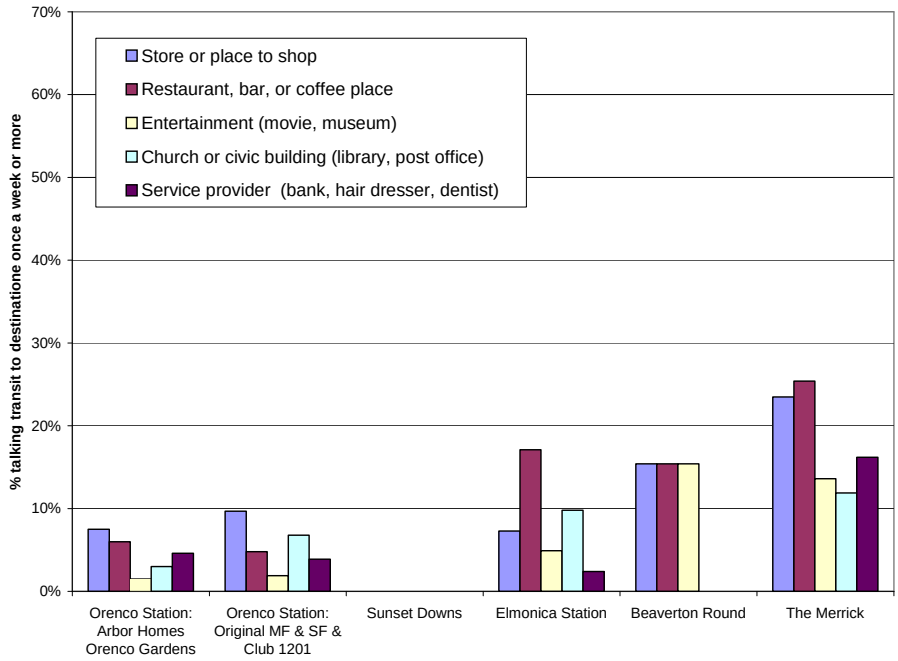
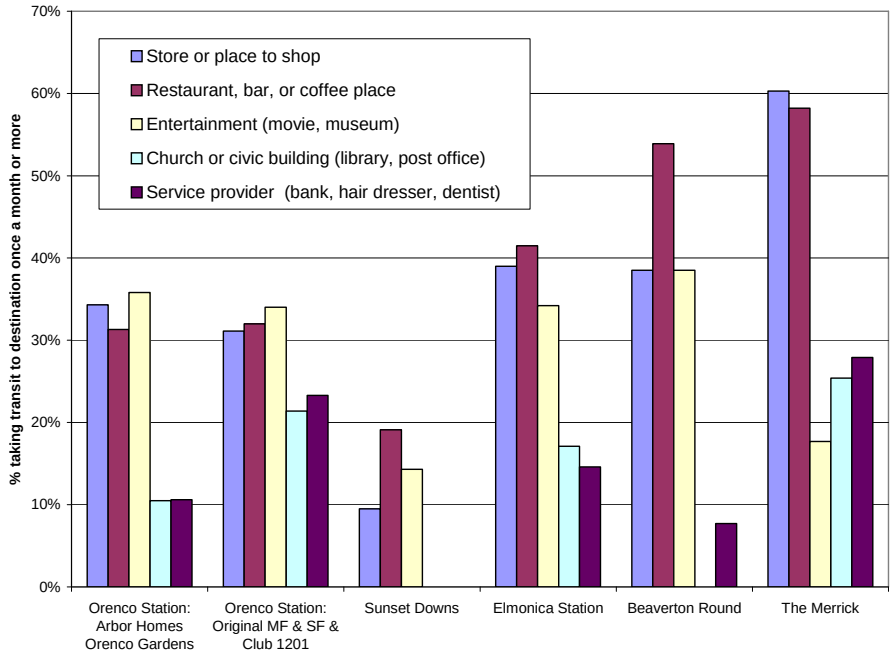


Figure 26: Percent of Residents Taking Transit to Non-commute Destinations Once a Month or more in Good Weather



1.5.3 Overall Changes in Travel

Respondents were asked to "think about your current daily travel and your daily travel when you lived at your previous residence not long before you moved. We would like to know about how your travel has changed, for whatever reason. Please answer for your own travel only." These results are shown in Table 11. A majority of respondents at all of the sites claim to use transit more and large shares also claim to walk more and drive less. Respondents were also asked "Approximately how many mile do ***you*** drive in a typical week (including weekends)?" The averages are also shown in Table 11.

Table 11: Changes on Travel Modes Compared to Previous Residence and Weekly Miles Driven

	Uses transit more now	Walks more now	Drives less now	Avg. Weekly Miles Driven	n
Orenco Station: Arbor Homes Orenco Gardens	58%	64%	47%	106	66
Orenco Station: Original MF & SF & Club 1201	66%	58%	63%	122	103
Sunset Downs	40%	60%	62%	144	21
Elmonica Station	61%	29%	61%	133	41
Beaverton Round	77%	15%	77%	125	13
The Merrick	71%	47%	68%	85	74
All neighborhoods	63%	51%	61%	113	318
Significant difference between neighborhoods? (p<0.05)	No	Yes	No	No	

Respondents were also asked if the number of vehicles in their household changed "***as a result of the characteristics of your current neighborhood?"*** Overall, 76% said that "moving to this place has had no impact on the number of vehicles available in my household" and 13% said that "I/we got rid of a vehicle because of the characteristics of the neighborhood." However, 2% claimed to have added a vehicle because of the neighborhood. There were no significant differences between the neighborhoods.

1.6 Factors in Selecting Home

One issue that is often raised when looking at the relationships between land use and travel is "self-selection". The argument is that people who want to use non-auto modes choose to live in neighborhoods where this is possible, such as in a TOD; the TOD didn't "cause" the travel behavior, personal preferences did. This argument is often used to dismiss or downplay the benefits of TODs and similar land use policies. On the other hand, Levine (1999) and others have argued that even if self selection does occur, it is important for communities to provide the options for people to exercise these choices. He hypothesizes that a share of the population is not able to live in the type of neighborhood they desire that allows them to reduce auto use because cities and developers have not provided those neighborhoods.

This survey included questions to try to at least examine the amount and level of self-selection. Respondents were asked to indicate the level of importance on a scale of one to four (not at all important to extremely important) for over 20 factors when looking for their current residence. The results from all factors are shown in Table 12. There are significant differences between the neighborhoods for all but three of the factors (marked with *). The high and low mean scores are in bold for each factor. In many cases, the extremes are for residents of the Merrick and Sunset Downs, which are probably the most different of the surveyed neighborhoods. Having good transit service ranked eighth overall, with Beaverton Round residents placing the most importance on that factor. High quality schools ranked very low overall, averaging just 1.67 on a scale of 1-4. This reflects the relative low number of children in the responding households.

Table 12: Importance of Factors when Selecting Current Home

	Mean scores, 1-4 scale, Ranked by All Neighborhoods High and Low means in **bold**						
	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
High quality living unit*	3.67	3.55	3.47	3.48	**3.85**	**3.46**	3.55
Attractive appearance of neighborhood	**3.63**	**3.63**	3.58	3.33	3.08	**2.68**	3.34
Affordable living unit	3.42	3.36	**3.79**	3.71	**2.77**	2.97	3.33
Safe neighborhood for walking	3.57	3.62	**3.79**	3.07	3.31	**2.67**	3.31
High level of upkeep in neighborhood	3.52	3.51	**3.58**	3.19	3.25	**2.74**	3.28
Low crime rate within neighborhood	3.62	3.49	**3.68**	3.36	3.08	**2.55**	3.27
Relatively new living unit*	**3.38**	3.19	**2.84**	3.36	2.92	3.05	3.19
Good public transit service (bus or rail)	3.17	3.21	**2.58**	2.86	**3.46**	3.28	3.14
Sidewalks throughout the neighborhood	3.34	**3.40**	3.79	2.63	2.77	**2.47**	3.06
Parks and open spaces nearby	**3.45**	3.28	2.79	2.69	3.08	**2.26**	2.96
Good street lighting	3.17	3.11	**3.53**	2.95	2.92	**2.35**	2.94
Easy access to downtown	2.55	2.81	**2.26**	2.76	**3.46**	3.43	2.89
Shopping areas within walking distance	2.69	**3.29**	2.53	**2.29**	2.69	2.76	2.83
Quiet neighborhood	3.29	3.17	**3.68**	2.64	2.77	**1.81**	2.82
Easy access to the freeway	2.69	2.81	**3.16**	**2.39**	3.15	2.65	2.73
Close to where I worked	2.85	**2.35**	2.94	2.71	**3.23**	2.93	2.71
Good investment potential	3.29	3.11	**3.32**	3.19	2.92	**1.15**	2.70
Lots of off-street parking (garages or driveways)	2.58	2.78	**3.42**	2.37	**2.31**	2.62	2.67
Variety in housing styles	2.80	2.83	**3.42**	2.10	2.08	**1.84**	2.50

	Mean scores, 1-4 scale, Ranked by All Neighborhoods High and Low means in **bold**						
	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
Low level of car traffic on neighborhood streets	2.91	2.79	**3.37**	2.38	2.38	**1.59**	2.49
Lots of people out and about within the neighborhood	2.45	**2.72**	2.63	**2.05**	2.62	2.14	2.42
Economic level of neighbors similar to my level	2.59	2.36	**2.74**	2.33	2.85	**2.12**	2.39
Easy access to a regional shopping mall	**2.08**	**2.57**	2.32	2.19	2.46	2.47	2.38
Diverse neighbors in terms of ethnicity, race, and age*	2.51	2.48	2.26	2.19	**2.77**	**2.11**	2.36
Safe neighborhood for kids to play outdoors	2.88	2.39	**3.26**	2.43	2.00	**1.45**	2.31
Lots of interaction among neighbors	2.34	2.55	**2.63**	2.12	2.15	**1.77**	2.25
Good bicycle routes beyond the neighborhood	2.35	2.53	**2.84**	2.02	1.85	**1.76**	2.23
Other amenities such as a pool or a community center available nearby	1.74	**2.75**	**1.74**	2.29	2.00	2.00	2.21
Close to friends or family	2.11	2.11	2.11	**2.50**	2.31	**1.96**	2.13
Big street trees	2.08	2.21	**2.74**	1.71	1.85	**1.46**	1.96
High quality K-12 schools	**2.40**	1.53	2.26	1.74	1.31	**1.07**	1.67
Living unit on cul-de-sac rather than through street	1.88	1.55	**2.58**	1.39	1.62	**1.18**	1.58
Large back yard	1.65	1.26	**3.53**	1.38	1.15	**1.14**	1.46
Large front yard	1.45	1.21	**2.63**	1.29	1.15	**1.11**	1.33
N	65	101	19	42	13	73	313

Note: Differences between neighborhoods significant (P<0.05) ***except*** *those marked with *.*

Four of the transportation-related factors are highlighted in Table 13 and indicate that most respondents did value access to transit. The responses are reflective of the neighborhoods. For example, OOS residents valued shopping areas within walking distance the most. This may

reflect true values when they did choose their current home and may also reflect an adaptation of values to the neighborhood. For example, Elmonica Station area respondents didn't value having shopping nearby as highly. They may be adapting to the fact that they don't have much shopping nearby and reducing their expectations. On the other hand, Beaverton Round respondents value nearby shopping at about the same rate as residents of The Merrick and the Arbor Homes at Orenco. The Merrick residents have far more shopping opportunities nearby. The high rate from the Round residents may reflect their desire to live in a fully-developed TOD (which The Round aspires to be) or more urban environment (which The Round's architecture emulates). Further analysis of the data, including looking at the move in date, may help understand this better.

Table 13: Importance of Transportation Factors in Looking for Current Residence

	% indicating that this factor was important *(3 or 4 out of 1-4 scale)*				**N**
	Good public transit service	**Shopping areas within walking distance**	**Easy access to freeway**	**Sidewalks throughout the neighborhood**	
Orenco Station: Arbor Homes Orenco Gardens	77%	57%	62%	85%	65
Orenco Station: Original MF & SF & Club 1201	78%	84%	68%	89%	101
Sunset Downs	53%	47%	68%	100%	19
Elmonica Station	62%	40%	46%	59%	41
Beaverton Round	100%	62%	77%	69%	13
The Merrick	81%	59%	63%	53%	75
All neighborhoods	76%	64%	63%	75%	314
Significant difference between neighborhoods? ($p<0.05$)	Yes	Yes	No	Yes	

For all but three of the factors, there was no significant difference between regular transit commuters and non-transit commuters. The three factors with a significant difference are shown in Table 14. As would be expected, having good public transit service was more important for transit commuters, as was easy access to downtown.

Table 14: Significant Differences Between Transit and non-Transit Commuters in Choosing Home

	Transit Commuters	Non-Transit Commuters
Good public transit service (bus or rail)	3.69	2.91
Easy access to downtown	3.21	2.77
Easy access to the freeway	2.51	2.81
N	61	169

1.7 Travel Preferences

Respondents were also asked about their travel preferences for all modes, again with a series of over 20 questions. The list was preceded with this explanation: "We'd like to ask about your preferences with respect to daily travel Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions." The statements included such things as "walking can sometimes be easier for me than driving," "traveling by car is safer overall than riding a bicycle," and "getting to work without a car is a hassle." These questions were developed by Handy and Mokhtarian. The responses are shown in Table 15 (grouped by topic) and Table 16 (sorted by level of agreement). While these responses confirm that self-selection is likely occurring, it is important to note that respondents are not all anti-driving. They generally agree that they need their cars and they like driving. Many also agree that the region should build more highways and few could manage with one less vehicle.

Table 15: Travel Preferences

Grouped by topic	Mean score Scale 1-5, 1=Strongly disagree, 5=Strongly agree						
	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
n	65	100	19	42	13	74	313
Walking							
Walking can sometimes be easier for me than driving	3.03	3.52	3.26	2.81	2.92	3.55	3.29
I prefer to walk rather than drive whenever possible.	3.18	3.55	3.42	2.55	2.77	3.43	3.27
I like walking	4.20	4.45	4.16	3.64	4.08	4.07	4.17
Driving							
I need a car to do many of the things I like to do	3.85	3.96	3.89	4.07	4.33	3.91	3.95
I like driving	3.32	3.24	3.42	3.45	3.08	3.59	3.37
Getting to work without a car is a hassle	3.10	3.22	2.88	3.45	2.85	3.16	3.18
Traveling by car is safer overall than walking	2.66	2.50	2.84	2.79	2.92	2.68	2.65
Traveling by car is safer overall than riding a bicycle	3.71	3.71	3.79	3.67	4.23	3.70	3.73
Traveling by car is safer overall than taking transit	2.58	2.44	2.58	2.38	2.31	2.51	2.48
Vehicle Ownership							
I would like to own at least one more car	1.95	1.82	1.53	1.95	2.00	1.95	1.89
We could manage pretty well with one fewer car than we have (or with no car)	2.54	2.42	2.32	2.14	2.31	2.23	2.35
My household spends too much money on owning and driving our cars	2.50	2.59	2.21	2.67	2.54	2.69	2.58

Grouped by topic	Mean score Scale 1-5, 1=Strongly disagree, 5=Strongly agree						
	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
Transit							
I like taking transit	3.38	3.76	3.00	3.10	3.85	3.51	3.49
I prefer to take transit rather than drive whenever possible	3.03	3.31	2.32	2.62	3.23	3.22	3.07
Public transit can sometimes be easier for me than driving	3.57	3.79	2.95	3.48	3.77	3.66	3.62
Bicycling							
I like riding a bike	3.20	3.27	3.11	3.00	2.69	2.80	3.08
I prefer to bike rather than drive whenever possible	2.34	2.45	2.58	2.14	2.00	2.27	2.34
Biking can sometimes be easier for me than driving	2.37	2.66	2.47	2.19	2.00	2.38	2.43
General Travel							
Travel time is generally wasted time	3.05	2.85	3.21	2.95	3.31	2.88	2.95
I use my trip to/from work productively	3.16	3.39	3.19	3.21	3.54	2.80	3.17
The prices of gasoline affects the choices I make about my daily travel	3.34	3.48	3.47	3.76	2.69	2.53	3.23
The only good thing about traveling is arriving at your destination	2.49	2.59	2.53	2.79	3.08	2.74	2.65
I prefer to organize my errands so that I make as few trips as possible	4.20	4.34	4.53	4.17	3.54	4.23	4.24
When I need to buy something, I usually prefer to get it at the closest store possible	3.74	3.54	3.89	3.60	3.54	3.54	3.61
The trip to/from work is a useful transition between home and work	3.39	3.42	3.29	3.37	3.15	3.25	3.35
I often use the telephone or the Internet to avoid having to travel somewhere	3.89	3.84	3.63	3.62	3.31	3.66	3.74

Grouped by topic	Mean score Scale 1-5, 1=Strongly disagree, 5=Strongly agree						
	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
Environment							
Air quality is a major problem in this region	2.63	2.58	2.53	2.71	2.92	2.85	2.68
I try to limit my driving to help improve air quality	3.28	3.30	3.21	2.79	3.00	2.97	3.13
Fuel efficiency is an important factor for me in choosing a vehicle	4.05	4.19	4.32	3.86	3.54	3.63	3.97
Vehicles should be taxed on the basis of the amount of pollution they produce	3.39	3.40	3.05	3.19	3.15	3.30	3.32
Transportation policy							
I am willing to pay a toll or tax to pay for new highways	2.54	2.94	2.63	2.62	2.92	2.44	2.68
The region needs to build more highways to reduce traffic congestion	3.22	3.29	3.47	3.14	2.62	2.84	3.13
Exercise							
It is important to me get some physical exercise every day	4.27	4.47	4.47	4.26	4.46	Not on survey	4.38

Statistically significant differences in bold.

Table 16: Travel Preferences (sorted by level of agreement)

	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
I prefer to organize my errands so that I make as few trips as possible	4.20	4.34	4.53	4.17	3.54	4.23	4.24
I like walking	4.20	4.45	4.16	3.64	4.08	4.07	4.17
Fuel efficiency is an important factor for me in choosing a vehicle	4.05	4.19	4.32	3.86	3.54	3.63	3.97
I need a car to do many of the things I like to do	3.85	3.96	3.89	4.07	4.33	3.91	3.95
I often use the telephone or the Internet to avoid having to travel somewhere	3.89	3.84	3.63	3.62	3.31	3.66	3.74
Traveling by car is safer overall than riding a bicycle	3.71	3.71	3.79	3.67	4.23	3.70	3.73
Public transit can sometimes be easier for me than driving	3.57	3.79	2.95	3.48	3.77	3.66	3.62
When I need to buy something, I usually prefer to get it at the closest store possible	3.74	3.54	3.89	3.60	3.54	3.54	3.61
I like taking transit	3.38	3.76	3.00	3.10	3.85	3.51	3.49
I like driving	3.32	3.24	3.42	3.45	3.08	3.59	3.37
The trip to/from work is a useful transition between home and work	3.39	3.42	3.29	3.37	3.15	3.25	3.35
Vehicles should be taxed on the basis of the amount of pollution they produce	3.39	3.40	3.05	3.19	3.15	3.30	3.32
Walking can sometimes be easier for me than driving	3.03	3.52	3.26	2.81	2.92	3.55	3.29
I prefer to walk rather than drive whenever possible.	3.18	3.55	3.42	2.55	2.77	3.43	3.27

	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
The prices of gasoline affects the choices I make about my daily travel	3.34	3.48	3.47	3.76	2.69	2.53	3.23
Getting to work without a car is a hassle	3.10	3.22	2.88	3.45	2.85	3.16	3.18
I use my trip to/from work productively	3.16	3.39	3.19	3.21	3.54	2.80	3.17
I try to limit my driving to help improve air quality	3.28	3.30	3.21	2.79	3.00	2.97	3.13
The region needs to build more highways to reduce traffic congestion	3.22	3.29	3.47	3.14	2.62	2.84	3.13
I like riding a bike	3.20	3.27	3.11	3.00	2.69	2.80	3.08
I prefer to take transit rather than drive whenever possible	3.03	3.31	2.32	2.62	3.23	3.22	3.07
Travel time is generally wasted time	3.05	2.85	3.21	2.95	3.31	2.88	2.95
Air quality is a major problem in this region	2.63	2.58	2.53	2.71	2.92	2.85	2.68
I am willing to pay a toll or tax to pay for new highways	2.54	2.94	2.63	2.62	2.92	2.44	2.68
Traveling by car is safer overall than walking	2.66	2.50	2.84	2.79	2.92	2.68	2.65
The only good thing about traveling is arriving at your destination	2.49	2.59	2.53	2.79	3.08	2.74	2.65
My household spends too much money on owning and driving our cars	2.50	2.59	2.21	2.67	2.54	2.69	2.58
Traveling by car is safer overall than taking transit	2.58	2.44	2.58	2.38	2.31	2.51	2.48
Biking can sometimes be easier for me than driving	2.37	2.66	2.47	2.19	2.00	2.38	2.43
We could manage pretty well with one fewer car than we have (or with no car)	2.54	2.42	2.32	2.14	2.31	2.23	2.35

	Orenco Station: Arbor Homes Orenco Gardens	Orenco Station: Original MF & SF & Club 1201	Sunset Downs	Elmonica Station	Beaverton Round	The Merrick	All neighborhoods
I prefer to bike rather than drive whenever possible	2.34	2.45	2.58	2.14	2.00	2.27	2.34
I would like to own at least one more car	1.95	1.82	1.53	1.95	2.00	1.95	1.89

People's travel preferences are likely having an impact on their mode choices. Table 17 shows the preferences where there are significant differences between transit and non-transit commuters. As expected, transit commuters prefer transit and find it easier than driving. They also place higher importance on fuel efficiency and limiting driving to improve air quality, indicating that environmental values may be influencing mode choice. Transit commuters are also more likely to find that their trip to/from work is productive and that travel time is not wasted. In contrast, non-transit commuters believe that traveling by car is safer than transit and walking.

Table 17: Travel Preferences - Significant Differences between Transit and Non-Transit Commuters

	Transit commuter	Non-transit commuter
Public transit can sometimes be easier for me than driving	4.44	3.28
I prefer to take transit rather than drive whenever possible	4.21	2.61
I like taking transit	4.20	3.16
Fuel efficiency is an important factor for me in choosing a vehicle	4.11	3.81
Walking can sometimes be easier for me than driving	3.67	3.05
I need a car to do many of the things I like to do	3.65	4.07
I use my trip to/from work productively	3.62	3.09
I prefer to walk rather than drive whenever possible.	3.53	3.12
I try to limit my driving to help improve air quality	3.47	2.89
Travel time is generally wasted time	2.69	3.05
We could manage pretty well with one fewer car than we have (or with no car)	2.58	2.22
Traveling by car is safer overall than walking	2.37	2.81
Traveling by car is safer overall than taking transit	2.16	2.59
Getting to work without a car is a hassle	1.89	3.58

Conclusions and Future Research

1.8 Major Findings

The survey collected a large amount of data from over 300 residents near four different light rail stations in the Portland region. The neighborhoods were selected to represent a range of types of TODs, while controlling somewhat for income (through housing styles and prices) and regional and transit accessibility (except for The Merrick). None of the neighborhoods completely satisfies generally agreed upon standards for good TODs: higher density, good land use mix, pedestrian friendly, and close to transit. The original Orenco Station development come closest, but is farther from the MAX station than many TOD advocates recommend. The Elmonica Station developments are much closer to MAX, but lack the land use mix and pedestrian amenities. Beaverton Round is an mixed-use urban oasis in the middle of auto-oriented suburbia. In addition, all of the neighborhoods are works in progress. There are still vacant parcels in the Orenco area that are expected to develop with more housing and commercial uses. Many homes at the Arbor Station at Elmonica are still under construction, with vacant commercially-zoned parcels nearby. The master plan for the Beaverton Round includes more commercial and residential buildings. Much of the ground floor retail space at the Merrick is still vacant.

The overall response rate for the Westside neighborhoods was 29%, which is good for a mail-out survey. The response rates for the surveys from which we borrowed elements for our instrument were 13% and 24%. The Starbucks card incentive likely helped get the higher response, helping to counter the length of the survey. However, there is still a likelihood of response bias. People who are "pro-transit" or active walkers may have been more likely to respond. People with very busy and complicated schedules, which may also include fewer transit riders, may be less likely to respond. These types of biases are inherent in most survey research and must be acknowledged when interpreting results. However, if any response bias is consistent across the neighborhoods, comparisons between neighborhoods should not be significantly affected.

Several findings stand out.

- **Responding households in the neighborhoods tend to be smaller, without children.** In most neighborhoods, the surveyed households averaged 2.0 or fewer persons. The two Arbor Homes developments (2.4 and 2.1 persons per household) and the older Sunset Downs (2.6 persons per household) were exceptions. According to the 2000 Census, the average household size in Hillsboro was 2.76, 2.44 in Beaverton, and 2.30 in Portland. Response bias may account for some of this difference. In addition, except for Sunset Downs, all of the single-family housing units have small yards, which may not attract families with children.

- **Some of the TODs appear to be attracting older adults.** Over 15% of the respondents in the Original Orenco Station development (including Club 1201) were 65 or older, while only nine percent of the Hillsboro population is 65 or older, according to the 2000 Census. The amenities and walkability of the development may be attracting older adults.

- **The residents of the surveyed TODs are not transit dependent.** This finding was not a surprise. The developments are at the higher end of the housing market for the region and we expected to find higher income residents. The point of interest is whether the features

of a TOD can encourage higher income adults who can travel by private car to take transit, walk, or bicycle.

- **Respondents take transit to work or school at a higher rate than residents citywide.** About 30% or more of the respondents in each neighborhood commuted by MAX at least once a week and 23-33% used transit as their primary commute mode. This compares to less than 10% of workers in Hillsboro and Beaverton and 15% of Portland workers.

- **The varying features of the TODs does not appear to affect transit commuting.** There was no significant difference between the neighborhoods in the share of people regularly commuting by transit.

- **The varying features of the TODs does appear to affect commuting on foot.** Nearly one-quarter of the Merrick residents walked to work once a week or more. This reflects, in part, the high density of employment nearby.

- **Parking pricing at work or school is an important factor in commute mode choice.** Workers and students who would have to pay to park at work were far more likely to use transit.

- **Distance from home to the MAX station may not affect the level of transit commuting, but does affect the mode used to get to the station.** Residents of the Original Orenco Station development, who live further from the station than the other neighborhoods (except Sunset Downs), were more likely to drive or be dropped off at the station, rather than walk.

- **Distance from a MAX station to work/school affects the level of transit commuting.** Fewer of the responding workers and students that estimated the walking time from MAX to work/school was over 15 minutes used transit regularly. If people walk an average of three miles per hour, a 15 minute walk is three-quarters of a mile. This is longer than the often-cited quarter-mile rule for locating near transit stations.

- **A significant share of respondents now commute by transit who did not before.** Overall, nearly 20% of the commuters switched from non-transit to transit modes and 4% did the opposite, for a net of about 16%. Response bias may affect this finding.

- **The features of the TODs appear to 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. Residents a the Original Orenco Station developments and the Merrick walked most often to destinations such as shops and restaurants. This reflects the larger number of such destinations within walking distance of these sites.

- **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. Again, the except was the Merrick, which is within a short transit ride of downtown Portland. Parking pricing and availability is likely to be a factor here.

- **A majority of respondents in all the neighborhoods claim to be using transit and walking more and driving less now compared to where they used to live.** While the overall levels of change may be exaggerated, the differences between the neighborhoods may be more useful to examine. There were no significant differences between the neighborhoods in the share of residents using transit more or driving less. There were significant differences in the shares claiming to walk more, with fewer residents of Elmonica Station and Beaverton Round claiming to walk more. The differences reflect the features of the neighborhoods, with fewer destinations and a less pleasant walking environment.

- **The higher use of transit and walking and the changes in modes are likely due, in part, to "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.

1.9 Recommendations for Future Research

- Further analysis of the data, including multivariate analysis, will help sort out the relationships between urban form and travel behavior, including the relative importance of demographics and travel preferences. Further GIS analysis will also allow us to develop additional urban form indicators for each respondent, such as the network distance from their home to the MAX station and other destinations.

- Given the unfinished aspects of the neighborhoods surveyed, it would be useful to survey residents in a few years, after more development. With more destinations and higher density nearby, travel behavior may change in some of the TODs. In addition, it will be interesting to see if the demographics of the residents changes. For example, if younger couples start having children, will they stay in the TODs or move to neighborhoods with larger yards?

- As part of a related project, we are conducting pedestrian and land use activity audits of the neighborhoods surveyed. These audits collect detailed information about the walking environment on every block in the area. These data can be used to more objectively compare the neighborhoods and perhaps explain differences in travel behavior.

- Surveys at other "control" neighborhoods could be useful. We were unable to find a neighborhood in Washington County with housing and retail opportunities in close proximity of each other that were comparable to those at Original Orenco Station, but without the MAX station. We had hoped to find such a neighborhood to use as a control – a neighborhood with the mixed use and pedestrian-friendly features, but not the transit. Surveying a residential-only neighborhood without a MAX station may have some use. Comparisons of mode choice may not be too enlightening; residents can't ride transit if it is not provided. However, it may be useful to compare travel preferences and changes in mode over time or compared to their previous residence.

References

Bae, C-H C (2002) Orenco Station, Portland, Oregon: A Successful Transit Oriented Development Experiment? *Transportation Quarterly, 56*(3), 9-15

Cervero, R, Arrington, G B, Smith-Heimer, J, & Dunphy, R (2004) *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects* (TCRP Report No 102) Washington, DC: Transportation Research Board

Dow, A (2001) *Metro Transit-Oriented Development Program: Improving Accountability Through Enhanced Measures of Service Efforts and Accomplishments* Portland, OR: Metro

Dittmar, H, & Ohland, G (Eds) (2004) *The New Transit Town* Washington, DC: Island Press

Levine, J (1999) Access to Choice *Access*(14), 16-19

Lund, H, Cervero, R, & Willson, R (2004) *Travel Characteristics of Transit-Oriented Development in California*

Podobnik, B (2002a) New Urbanism and the Generation of Social Capital: Evidence from Orenco Station *National Civic Review, 91*(3), 245-255

TriMet (2005) *Community Building Sourcebook* Portland, OR: TriMet

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Several students assisted in this research, including Matt Lasky, Sumi Malik, Lesley Barewin, and Warren Greaser.

Appendix

Neighborhood and Travel Choice Study

This survey is part of an effort to improve neighborhoods and transportation options in the Portland region. Please help us by filling out this questionnaire. Your individual responses will be confidential. **Please mail your completed survey using the enclosed, postage-paid envelope by October 24, 2005.** For questions, contact Dr. Jennifer Dill, Portland State University, jdill@pdx.edu or 503-725-5173.

A. Information on your Household

	1	2	3	4	5	If more (specify #)
1. Including yourself, how many people live in your household?	☐	☐	☐	☐	☐	_____
2. Of these, how many are 16 yrs *or older*?	☐	☐	☐	☐	☐	_____
3. How many motorized vehicles are available for use by members of your household (do not include Flexcar)?	☐	☐	☐	☐	☐	_____
4. How many working bicycles are available to you and members of your household?	☐	☐	☐	☐	☐	_____
5. Are you a member of Flexcar?	☐ Yes		☐ No			
6. Does your household have a pet that needs regular walks?	☐ Yes		☐ No			

B. Information on your Place of Work/School and Commuting

If you work and attend school, please provide information on your full-time activity. If both are part-time, please provide information on your place of work. **Remember that your responses are confidential.**

1a. Do you work or go to school outside your place of residence?
- 1☐ Yes, I work outside of home
- 2☐ Yes, I attend school outside of home

→ 1b. If yes, where do you work or attend school?
Address or cross streets: _____
City: _____ Zip code: _____

- 3☐ No, I work/take courses at home
- 4☐ No, I am not employed or in school

→ *Please skip to Section C.*

2. Does your employer/school: *(check all that apply)*
- 1☐ allow you to work flexible hours
- 2☐ allow you to work from home
- 3☐ provide a car for use during the day
- 4☐ provide free parking
- 5☐ help pay for transit
- 6☐ help pay for tolls, fuel or other commuting costs

3. If you do drive or if you were to drive to work/school, would you have to pay to park?
1☐ No 2☐ Yes

4. About how long would it take you to walk from work/school to the closest MAX light rail station? ____ minutes or ☐ Don't know

5. On average, how many days per week do you commute to work/school? ____ days per week

6. How often do you stop somewhere on the way to work/school? ____ days per week

7. How often do you stop somewhere on the way home from work/school? ____ days per week

8. How often do you work at home *instead* of making the trip to work? ____ days per month

9. At this time of year, how often do you use each of the following as your **primary** means of transportation to work/school? By "primary" we mean the means of transportation you use for the longest portion of your trip.

	4-5 days per week	2-3 days per week	once a week	1-3 days a month	less than once a month	never
a. Drive alone (including motorcycle)	☐1	☐2	☐3	☐4	☐5	☐6
b. Carpool	☐1	☐2	☐3	☐4	☐5	☐6
c. MAX light rail	☐1	☐2	☐3	☐4	☐5	☐6
d. Streetcar	☐1	☐2	☐3	☐4	☐5	☐6
e. TriMet bus	☐1	☐2	☐3	☐4	☐5	☐6
f. Walk	☐1	☐2	☐3	☐4	☐5	☐6
g. Bicycle	☐1	☐2	☐3	☐4	☐5	☐6
h. Other: _____	☐1	☐2	☐3	☐4	☐5	☐6

10. **If you currently commute by MAX light rail or streetcar** at least once a month, how do you normally get

from home to the station? *(check one)*		from station to your workplace/school? *(check one)*	
1☐ walk	4☐ ride bus	1☐ walk	4☐ ride bus
2☐ drive vehicle	5☐ bicycle	2☐ drive vehicle	5☐ bicycle
3☐ ride as passenger	6☐ other (_____)	3☐ ride as passenger	6☐ other (_____)
7☐ I do not commute by MAX or streetcar		7☐ I do not commute by MAX or streetcar	

C. Information on Commuting from your Prior Residence

1. Where did you live prior to this location?

   Street and nearest cross street: _____

   City:_____ State: _____ Zip code:_____

2. For your prior residence, did you work (or go to school) at the same place as you do now?
   - 1☐ Yes
   - 2☐ No
   - 3☐ I did not work or go to school. (Please skip to Section D on the next page.)

3. At your prior residence, how often did you usually use the following modes to commute to work/school?

	4-5 days per week	2-3 days per week	once a week	1-3 days a month	less than once a month	never
a. Drive alone (including motorcycle)	☐1	☐2	☐3	☐4	☐5	☐6
b. Carpool	☐1	☐2	☐3	☐4	☐5	☐6
c. Rail transit (ex: subway or light rail)	☐1	☐2	☐3	☐4	☐5	☐6
d. Bus	☐1	☐2	☐3	☐4	☐5	☐6
e. Walk	☐1	☐2	☐3	☐4	☐5	☐6
f. Bicycle	☐1	☐2	☐3	☐4	☐5	☐6
g. Other: _____	☐1	☐2	☐3	☐4	☐5	☐6

4. If you previously commuted by rail transit (ex: subway, light rail, street car) once a month from your prior residence, how did you normally get

from home to the station? *(check one)*		from station to your workplace/school? *(check one)*	
1☐ walk	4☐ ride bus	1☐ walk	4☐ ride bus
2☐ drive vehicle	5☐ bicycle	2☐ drive vehicle	5☐ bicycle
3☐ ride as passenger	6☐ other (_____)	3☐ ride as passenger	6☐ other (_____)
7☐ I did not commute by rail transit		7☐ I did not commute by rail transit	

D. Your daily travel

1. **In a typical month with good weather**, how often do you **walk or bike** from your home to each of the following places for purposes other than work or school?

	Never	Less than once per month	Once or twice a month	About once every 2 weeks	About once per week	Two or more times per week
A church or civic building (examples: library, post office)	☐1	☐2	☐3	☐4	☐5	☐6
A service provider (examples bank, post-office, hair dresser, dentist)	☐1	☐2	☐3	☐4	☐5	☐6
A restaurant, bar, or coffee place	☐1	☐2	☐3	☐4	☐5	☐6
A store or place to shop	☐1	☐2	☐3	☐4	☐5	☐6
A gym or indoor recreation (ex: bowling alley)	☐1	☐2	☐3	☐4	☐5	☐6
A park or natural open space	☐1	☐2	☐3	☐4	☐5	☐6
Out of the house with no particular destination	☐1	☐2	☐3	☐4	☐5	☐6
Visit friends or family at their home	☐1	☐2	☐3	☐4	☐5	☐6
Entertainment (examples: movie, museum)	☐1	☐2	☐3	☐4	☐5	☐6
Taking someone else to school or daycare	☐1	☐2	☐3	☐4	☐5	☐6
Other places besides work/school: (please specify) _____	☐1	☐2	☐3	☐4	☐5	☐6

2. **During wetter, colder weather**, how often do you **walk or bike** from your home to each of the following places for purposes other than work or school?

	Never	Less than once per month	Once or twice a month	About once every 2 weeks	About once per week	Two or more times per week
A church or civic building (examples: library, post office)	☐1	☐2	☐3	☐4	☐5	☐6
A service provider (examples bank, post-office, hair dresser, dentist)	☐1	☐2	☐3	☐4	☐5	☐6
A restaurant, bar, or coffee place	☐1	☐2	☐3	☐4	☐5	☐6
A store or place to shop	☐1	☐2	☐3	☐4	☐5	☐6
A gym or indoor recreation (ex: bowling alley)	☐1	☐2	☐3	☐4	☐5	☐6
A park or natural open space	☐1	☐2	☐3	☐4	☐5	☐6
Out of the house with no particular destination	☐1	☐2	☐3	☐4	☐5	☐6
Visit friends or family at their home	☐1	☐2	☐3	☐4	☐5	☐6
Entertainment (examples: movie, museum)	☐1	☐2	☐3	☐4	☐5	☐6
Taking someone else to school or daycare	☐1	☐2	☐3	☐4	☐5	☐6
Other places besides work/school: (please specify) _____	☐1	☐2	☐3	☐4	☐5	☐6

3. **In a typical month with good weather**, how often do you **take transit** (bus, MAX, or Streetcar) from your home to each of the following places for purposes other than work or school?

	Never	Less than once per month	Once or twice a month	About once every 2 weeks	About once per week	Two or more times per week
A church or civic building (examples: library, post office)	☐1	☐2	☐3	☐4	☐5	☐6
A service provider (examples bank, post-office, hair dresser, dentist)	☐1	☐2	☐3	☐4	☐5	☐6
A restaurant, bar, or coffee place	☐1	☐2	☐3	☐4	☐5	☐6
A store or place to shop	☐1	☐2	☐3	☐4	☐5	☐6
A gym or indoor recreation (ex: bowling alley)	☐1	☐2	☐3	☐4	☐5	☐6
A park or natural open space	☐1	☐2	☐3	☐4	☐5	☐6
Visit friends or family at their home	☐1	☐2	☐3	☐4	☐5	☐6
Entertainment (examples: movie, museum)	☐1	☐2	☐3	☐4	☐5	☐6
Taking someone else to school or daycare	☐1	☐2	☐3	☐4	☐5	☐6
Other places besides work/school: (please specify) _____	☐1	☐2	☐3	☐4	☐5	☐6

4. **During wetter, colder weather**, how often do you **take transit** (bus, MAX, or Streetcar) from your home to each of the following places for purposes other than work or school?

	Never	Less than once per month	Once or twice a month	About once every 2 weeks	About once per week	Two or more times per week
A church or civic building (examples: library, post office)	☐1	☐2	☐3	☐4	☐5	☐6
A service provider (examples bank, post-office, hair dresser, dentist)	☐1	☐2	☐3	☐4	☐5	☐6
A restaurant, bar, or coffee place	☐1	☐2	☐3	☐4	☐5	☐6
A store or place to shop	☐1	☐2	☐3	☐4	☐5	☐6
A gym or indoor recreation (ex: bowling alley)	☐1	☐2	☐3	☐4	☐5	☐6
A park or natural open space	☐1	☐2	☐3	☐4	☐5	☐6
Visit friends or family at their home	☐1	☐2	☐3	☐4	☐5	☐6
Entertainment (examples: movie, museum)	☐1	☐2	☐3	☐4	☐5	☐6
Taking someone else to school or daycare	☐1	☐2	☐3	☐4	☐5	☐6
Other places besides work/school: (please specify) _____	☐1	☐2	☐3	☐4	☐5	☐6

5. How many times in the last 30 days did you take a walk, jog, or stroll around your neighborhood – for example to get exercise or walk the dog? ____ times in the last 30 days

6. How many times in the last 30 days did you take a walk from your home to a business or store in the neighborhood? ____ times in the last 30 days

7. For this question, please think about your current daily travel and your daily travel when you lived at your previous residence not long before you moved. We would like to know about how your travel has changed, for whatever reason. Please answer for your own travel only.

	A lot less now	*A little less now*	*About the same*	*A little more now*	*A lot more now*
a. How much do you ***drive*** now, compared to when you lived at your previous residence?	☐1	☐2	☐3	☐4	☐5
b. How much do you use public transit (bus or rail) now, compared to when you lived at your previous residence?	☐1	☐2	☐3	☐4	☐5
c. How much do you walk in your neighborhood now, compared to when you lived at your previous residence?	☐1	☐2	☐3	☐4	☐5
d. How much do you ride your bike now, compared to when you lived at your previous residence?	☐1	☐2	☐3	☐4	☐5

E. Information on your Current Place of Residence

1. When did you move to your current residence? _____month _____ year (ex: 2004)
2. Do you rent or own your residence? *Current residence* ☐1 Rent ☐2 Own *Previous residence* ☐1 Rent ☐2 Own
3. About how long would it take you to walk from home to the closest MAX light rail station? ____ minutes or ☐ Don't know
4. How well do you think your residence and its location meet the **current needs** of your household?

	Very poorly	*Poorly*	*About right*	*Well*	*Very well*
Location of your neighborhood in the region	☐1	☐2	☐3	☐4	☐5
Characteristics of the neighborhood itself	☐1	☐2	☐3	☐4	☐5
Location of your residence within your neighborhood	☐1	☐2	☐3	☐4	☐5
Characteristics of the residence itself	☐1	☐2	☐3	☐4	☐5

5. Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions.

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
I think my neighborhood is a good place for me to live	☐1	☐2	☐3	☐4	☐5
People in this neighborhood do not share the same values	☐1	☐2	☐3	☐4	☐5
My neighbors and I want the same thing from this neighborhood	☐1	☐2	☐3	☐4	☐5
I feel at home in this neighborhood	☐1	☐2	☐3	☐4	☐5
Very few of my neighbors know me	☐1	☐2	☐3	☐4	☐5
I care about what my neighbors think about my actions	☐1	☐2	☐3	☐4	☐5
I have almost no influence over what this neighborhood is like	☐1	☐2	☐3	☐4	☐5
If there is a problem in this neighborhood people who live here can get it solved	☐1	☐2	☐3	☐4	☐5
It is important to me to live in this particular neighborhood	☐1	☐2	☐3	☐4	☐5
The people who live in this neighborhood get along well	☐1	☐2	☐3	☐4	☐5
I can recognize most of the people who live on my block	☐1	☐2	☐3	☐4	☐5

6. In this question, we'd like to know ***what was important to you*** when you were looking for your current residence. Please indicate ***how important*** each of the factors was ***when you were looking for your current residence*** on a scale from "not at all important" to "extremely important."

	Not at all important			*Extremely important*
Affordable living unit	☐1	☐2	☐3	☐4
High quality living unit	☐1	☐2	☐3	☐4
Relatively new living unit	☐1	☐2	☐3	☐4
Good investment potential	☐1	☐2	☐3	☐4
High quality K-12 schools	☐1	☐2	☐3	☐4
Attractive appearance of neighborhood	☐1	☐2	☐3	☐4
Variety in housing styles	☐1	☐2	☐3	☐4
High level of upkeep in neighborhood	☐1	☐2	☐3	☐4
Large front yard	☐1	☐2	☐3	☐4
Large back yard	☐1	☐2	☐3	☐4
Big street trees	☐1	☐2	☐3	☐4
Lots of off-street parking (garages or driveways)	☐1	☐2	☐3	☐4
Sidewalks throughout the neighborhood	☐1	☐2	☐3	☐4
Good bicycle routes beyond the neighborhood	☐1	☐2	☐3	☐4
Easy access to the freeway	☐1	☐2	☐3	☐4
Living unit on cul-de-sac rather than through street	☐1	☐2	☐3	☐4
Good public transit service (bus or rail)	☐1	☐2	☐3	☐4
Parks and open spaces nearby	☐1	☐2	☐3	☐4
Shopping areas within walking distance	☐1	☐2	☐3	☐4
Other amenities such as a pool or a community center available nearby	☐1	☐2	☐3	☐4
Easy access to a regional shopping mall	☐1	☐2	☐3	☐4
Easy access to downtown	☐1	☐2	☐3	☐4
Close to where I worked	☐1	☐2	☐3	☐4
Close to friends or family	☐1	☐2	☐3	☐4
Low level of car traffic on neighborhood streets	☐1	☐2	☐3	☐4
Quiet neighborhood	☐1	☐2	☐3	☐4
Good street lighting	☐1	☐2	☐3	☐4
Safe neighborhood for walking	☐1	☐2	☐3	☐4
Safe neighborhood for kids to play outdoors	☐1	☐2	☐3	☐4
Low crime rate within neighborhood	☐1	☐2	☐3	☐4
Lots of interaction among neighbors	☐1	☐2	☐3	☐4
Lots of people out and about within the neighborhood	☐1	☐2	☐3	☐4
Diverse neighbors in terms of ethnicity, race, and age	☐1	☐2	☐3	☐4
Economic level of neighbors similar to my level	☐1	☐2	☐3	☐4
Other (please specify): _____	☐1	☐2	☐3	☐4

F. Information on your Travel Preferences

We'd like to ask about your preferences with respect to **daily travel**. Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions.

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
Walking can sometimes be easier for me than driving	☐1	☐2	☐3	☐4	☐5
I would like to own at least one more car	☐1	☐2	☐3	☐4	☐5
Travel time is generally wasted time	☐1	☐2	☐3	☐4	☐5
I prefer to take transit rather than drive whenever possible	☐1	☐2	☐3	☐4	☐5
I like riding a bike	☐1	☐2	☐3	☐4	☐5
I use my trip to/from work productively	☐1	☐2	☐3	☐4	☐5
I like taking transit	☐1	☐2	☐3	☐4	☐5
Traveling by car is safer overall than walking	☐1	☐2	☐3	☐4	☐5
Air quality is a major problem in this region	☐1	☐2	☐3	☐4	☐5
I need a car to do many of the things I like to do	☐1	☐2	☐3	☐4	☐5
I prefer to walk rather than drive whenever possible	☐1	☐2	☐3	☐4	☐5
I am willing to pay a toll or tax to pay for new highways	☐1	☐2	☐3	☐4	☐5
I like driving	☐1	☐2	☐3	☐4	☐5
I prefer to bike rather than drive whenever possible	☐1	☐2	☐3	☐4	☐5
Traveling by car is safer overall than riding a bicycle	☐1	☐2	☐3	☐4	☐5
Public transit can sometimes be easier for me than driving	☐1	☐2	☐3	☐4	☐5
I try to limit my driving to help improve air quality	☐1	☐2	☐3	☐4	☐5
Traveling by car is safer overall than taking transit	☐1	☐2	☐3	☐4	☐5
Getting to work without a car is a hassle	☐1	☐2	☐3	☐4	☐5
I like walking	☐1	☐2	☐3	☐4	☐5
Biking can sometimes be easier for me than driving	☐1	☐2	☐3	☐4	☐5
The only good thing about traveling is arriving at your destination	☐1	☐2	☐3	☐4	☐5
I prefer to organize my errands so that I make as few trips as possible	☐1	☐2	☐3	☐4	☐5
The prices of gasoline affects the choices I make about my daily travel	☐1	☐2	☐3	☐4	☐5
The trip to/from work is a useful transition between home and work	☐1	☐2	☐3	☐4	☐5
Fuel efficiency is an important factor for me in choosing a vehicle	☐1	☐2	☐3	☐4	☐5
I often use the telephone or the Internet to avoid having to travel somewhere	☐1	☐2	☐3	☐4	☐5
We could manage pretty well with one fewer car than we have (or with no car)	☐1	☐2	☐3	☐4	☐5
Vehicles should be taxed on the basis of the amount of pollution they produce	☐1	☐2	☐3	☐4	☐5
When I need to buy something, I usually prefer to get it at the closest store possible	☐1	☐2	☐3	☐4	☐5
The region needs to build more highways to reduce traffic congestion	☐1	☐2	☐3	☐4	☐5
My household spends too much money on owning and driving our cars	☐1	☐2	☐3	☐4	☐5
It is important to me get some physical exercise every day	☐1	☐2	☐3	☐4	☐5

G. Your household vehicles

1. Approximately how many miles do ***you*** drive in a typical week (including weekends)? ___ miles

2. Please think about the vehicles you had at your previous residence just before you moved.
   a. How many vehicles were available to you and members of your household for daily travel just before you moved? ___ vehicles

   b. Did the number of vehicles available for daily travel by your household change ***as a result of the characteristics of your current neighborhood?***
   - ☐1 No, but I/we are considering getting rid of a vehicle because of the characteristics of the neighborhood.
   - ☐2 No, but I/we are considering getting another vehicle because of the characteristics of the neighborhood.
   - ☐3 No, moving to this place has had no impact on the number of vehicles available to my household.
   - ☐4 Yes, I/we got rid of a vehicle because of the characteristics of the neighborhood.
   - ☐5 Yes, I/we got an additional vehicle because of the characteristics of the neighborhood.

H. Information about you

The questions in this section ask a few things about you. These characteristics are important for analyzing your choices about where to live and your choices about daily travel. We will keep this information confidential and assure you that we will use this information only for analysis purposes.

1. What is your gender? 1☐ Female 2☐ Male

2. What is your age? _____ years

3. Ethnicity or race: (check all that apply)
   - 1☐ African American
   - 2☐ Native American
   - 3☐ Pacific Islander
   - 4☐ Hispanic
   - 5☐ White
   - 6☐ Asian
   - 7☐ other: _____

4. Do you currently have a drivers license? 1☐ Yes 2☐ No

5. Current employment: (check all that apply)
   - 1☐ employed full-time
   - 2☐ employed part-time
   - 3☐ student
   - 4☐ not currently employed, but looking for work
   - 5☐ not currently employed outside the home
   - 6☐ retired
   - 7☐ other: _____

6. How many years of school have you completed? (circle one answer)

   1 2 3 4 5 6 7 8 — Grade school; 9 10 11 12 — High school; 13 14 15 16 — College; 17+ — Advanced Degree

7. Do you have any physical or anxiety condition that seriously limits or prevents you from doing any of the following?
   - a. Driving a vehicle 1☐ Yes 2☐ No
   - b. Walking outside the home 1☐ Yes 2☐ No
   - c. Riding a bicycle 1☐ Yes 2☐ No
   - d. Using public transit 1☐ Yes 2☐ No

8. Approximate household income before taxes:
   - 1☐ Less than $15,000
   - 2☐ $15,000 - $24,999
   - 3☐ $25,000 - $34,999
   - 4☐ $35,000 - $49,999
   - 5☐ $50,000 - $74,999
   - 6☐ $75,000 - $99,999
   - 7☐ $100,000-$149,999
   - 8☐ $150,000 and over

Is there anything you would like to add or explain?