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The Impact of Light Rail Transportation Announcement and Construction: The Role of Rail Transit in Property Values, Land Use, Demographics, Equity, Accessibility, and Gentrification

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The Impact of Light Rail Transportation Announcement and Construction: The Role of Rail Transit in Property Values, Land Use, Demographics, Equity, Accessibility, and Gentrification

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Abstract

The Impact of Light Rail Transportation Announcement and Construction: The Role of Rail Transit in Property Values, Land Use, Demographics, Equity, Accessibility, and Gentrification

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As American cities continue to expand and their existing transportation infrastructure becomes strained from increased demand, many cities have turned to light rail transit to not only alleviate congestion but also to provide an economic development stimulus to the areas around the stations. This report focuses on determining the economic impact on areas surrounding announced light rail stations in Austin, Texas while also attempting to quantify changes in land use and demographics experienced in a city who has an established light rail line; Dallas, Texas. In addition to examining any changes associated with the announcement and construction of a light rail project this report will qualitatively examine the role of these project in stimulating gentrification in station areas and what effect gentrification will have in preventing low-income households from accessing the improved transit system. The report will also propose actions that could ensure that these households continue to have access to public transportation, which would mitigate the strain of increasing transportation costs.

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BACKGROUND

As of 2006, 33 cities in the United States had developed light rail to supplement their public transportation systems (Clower, Weinstein, & Seman, 2007). Light rail systems are seen as a necessary evolution of public transit. Providing more transportation options for these projects will lead to decreased congestion on major roadways and spur economic development along the transit line. However, as cities consider these types of improvements, they often fail to take into account the effect that construction of a light rail project will have on the residents who already live within the transit corridor.

Economic development near the light rail stations often results in increased property values, which leads to the conversion of land to a "higher use": single family housing becomes multi-family housing, industrial space becomes commercial development, and other land uses are similarly transformed. This conversion of uses "upward" is the purest form of gentrification. While renovation and redevelopment near stations and rail corridors bring in new business activity and new residents, this may force those who benefit most from accessibility to public transportation to move to lower-cost areas. Although the main goal of light rail is to allow residents to reduce their vehicle use and to more conveniently travel throughout the city, the increase in property values associated with rail projects results in those who are most in need of accessibility to move away from the urban core. These residents are then confronted with a host of transit difficulties: they must continue using their cars (or seek another travel mode), their travel time is increased, and in the end they might be forced to seek jobs outside the city core. From the perspective of urban redevelopment, the positive benefits of light rail

often overshadow these negative consequences. Still, the social consequences of light rail development should be more carefully considered, so that cities can take preventive measures to avoid gentrification of low-income neighborhoods.

THE IMPORTANCE OF AFFORDABLE TRANSIT OPTIONS

With the changing economy, access to convenient and efficient transportation is becoming more important, especially for individuals and families dealing with severe budget constraints. In a study by transit advocacy group Reconnecting America, it was determined that the average American household in a transit-accessible neighborhood spends 9% of their budget on transportation. This is compared to the average American household that spends 19% of their budget on transportation and 25% of budget for households in car centric suburban developments (Haas, Makarewicz, Benedict, Sanchez, & Dawkins, 2006). The impact of transportation on household expenses becomes even more significant when accounting for higher housing.

The presence of light rail often has positive economic development effects for a city looking to expand, while at the same time increasing the level of service of the public transportation system. However, for property owners near the transit stations this can often produce a "glass half full" effect. With the increase in economic activity and increased accessibility the property values near the transit stations often skyrocket. While this is a positive effect for the city in general, the nearby residents often carry the burden of increased property taxes, which at some points are high enough to force relocation. These properties are then sold at a higher value to new residents who have the income to pay the higher premiums associated with living in the area. This process is often referred to as gentrification. The problem with this gentrification effect is that transportation and

housing costs comprise such a significant part of the annual budget of low-income families, so much that they are missing out on the opportunity to lower these costs by being located near transit. The proximity to transit – especially rail – provides dependable, convenient, and low-cost means to commute daily to work. If the transportation costs for these low-income families were lowered it would allow them to better allocate their resources towards essentials such as food or education. This unfortunate side effect of a municipality's increased investment in transportation ends up failing to help the individuals who would most benefit from its arrival.

CASE STUDIES: DALLAS AND AUSTIN

There are a number of studies that have evaluated the effect of light rail project and improved access on property values. Most studies have focused on examining the effects of light rail projects on various land uses, and a few have studied the possible change in land value and use resulting from the announcement of light rail construction. Austin was selected for this study to determine the potential consequences in terms of land use and gentrification resulting from the development of a light rail line. Because of the limited amount of historic land value data, the Austin study will focus on the effect of the announcement of a light rail project rather than the actual use of one. Austin is also a desirable location for this study because the area has already experienced rapid property value appreciation and growth independent of the light rail development, so any increase in property value near transit stations will be even more significant in determining the "premium" for accessibility. Although the residents of the city approved the light rail project through voting in November 2004, the vote was close because many opponents of

the system deemed it unnecessary and excessive, partly due to the city's existing strong bus system. Despite the resistance, the existing railroad tracks in the city were renovated to accommodate the light rail trains. The initial phase of the system includes 32 miles of track with nine stations, and is projected to accommodate 2,000 riders per day.

To observe and analyze changes in land use and demographics resulting from a light rail project the City of Dallas was selected as the second study area. This project was specifically chosen because the project was completed between 1990 and 2000 and recent information on land values and use change data was more readily available. The Dallas project was also selected because it is in the same state and thus subject to similar land use polices and because the Dallas system has a commuter rail configuration similar to Austin. The light rail in Dallas began operation on June 14, 1996 and serves 48.6 miles on three different lines within the city and surrounding communities. The system accommodates 69,800 riders each day, which makes it the eighth most ridden light rail system in the entire United States (Dallas Area Rapid Transit). This successful integration of the light rail system into the daily lives of commuters was also a consideration when choosing Dallas as a case study due to the fact that land use and demographic changes can be more easily seen in a project that is highly used and a central element of local transportation. This comparison case makes more sense than comparing Austin to a city where light rail transit is an afterthought rather than a primary option for commuting. The Dallas system currently boasts 39 stations in 13 local communities, and is projected to eventually serve an area of 700 square miles in the

Dallas metro area and surrounding area. The city has launched a plan for an expansion of the system to 90 miles of track, which would nearly double the current system.

The purpose of this study is to analyze existing studies that have been conducted on the topic of the impacts of light rail transit on land use, property values, and demographics in close proximity to station areas. In addition to expanding upon existing studies on these topics, this paper will also relate these impacts to gentrification near light rail stations and discuss how this process affects low-income households near these stations. This paper will also make a case for the inclusion of mixed-income transit oriented developments (TODs) to become a necessary policy for cities that are looking to construct rail-based transit systems.

RESEARCH METHODOLOGY

Questions this study will address include:

- Do new transit lines lead to property value appreciation and land use changes around station areas, and to what level is there a "premium" for being located near rail transit stations?
- Is there a relationship between changes in land use/land value and demographic characteristics of residents in areas proximate to light rail stations?
- If low-income households are unable to be located near public transportation, what effect does commuting by car have on their annual household budgets?

- What public benefits would occur from locating mixed-income transit oriented development near light rail stations?
- What policy actions would be necessary to make mixed-income TODs a profitable choice for public and private developers?

In order to address these questions the following methodology will be used to determine the presence and significance of these relationships. Existing studies and articles will first be reviewed on the following topics: the property value impacts of light rail projects, land use changes near light rail stations, demographic changes near light rail stations, costs associated with housing and transportation and their regressive effect on low-income households, and the process and impacts of gentrification. An extensive review of data is developed on the effect of transportation cost burdens on low-income households and benefits of cost reduction, thus providing a rationale for planners and policymakers to focus on potential displacement effects from transit investments. The third aspect of this study is the use of Geographic Information Systems (GIS) to analyze data from two case studies to determine land value, land use, and demographic changes associated with the construction of a light rail line. Austin, Texas and Dallas, Texas will be used as cases for the analysis. Finally, policies for mitigating gentrification are reviewed and a proposal is made for Austin. Since Austin is just beginning to see the effects of the arrival of light rail transit, these recommendations will be focused on maintaining and creating new affordable housing near transit station areas in order to improve outcomes for low-income families.

In order to address these key issues, this study is organized in the following manner. The second chapter of provides a review of the literature from existing studies and articles, focusing on land value and use impacts from light rail construction in addition to the progression of gentrification. In the third chapter the issue of the high burden of transportation costs on low-income households is addressed by analyzing existing data on these costs from a number of studies. The fourth, fifth, and sixth chapters are comprised of original research using the results of GIS analysis to examine issues regarding proximity to light rail station in Austin and Dallas. The fourth chapter will address property value changes, the fifth will address land use changes, and finally the sixth will address demographic changes associated with the construction of light rail transit stations. The final chapter restates the case for mixed-income transit oriented developments and examines several widely used policies to mitigate over-gentrification in the areas near stations. In addition, several specific policy tools are proposed for Austin to limit negative gentrification effects and make the transit line a more efficient and equitable public good.

This study analyzes the impacts of light rail projects on residents through a careful study of two cases. Austin is used to evaluate if increased property values result from the announcement of light rail construction. The Dallas study provides a longer-term analysis of changes in demographics and land use through the early life of a completed system. Through this study the magnitude of the effects of transit station areas will be seen on the surrounding areas, and recommendations will be made to prevent gentrification to the point where transit cannot serve the individuals who benefit most

from transit access. To put the effect of this displacement in perspective, an in-depth analysis of the burden of housing and transportation costs is performed. The purpose of this study is not only to analyze the quantitative changes, but also to qualitatively evaluate the impact of rail transit investments.

Chapter 2: Literature Review

Many different approaches have been used to quantify the effect of public infrastructure improvements on local property values. This research has only recently been extended to include the social implications of such transit projects, including gentrification in areas surrounding new transit developments. In particular, many authors have begun to examine the effect of increasing property values on demographics surrounding the project.

Single Family Homes		
City	**Year of Construction**	**Premium Effect**
San Francisco	1979	17%
San Diego	1992	2%
Portland	1993	10.60%
Sacramento	1995	6.20%
Santa Clara	1995	10.80%
Chicago	1997	20%
St. Louis	2004	32%

Condominiums		
City	**Year of Construction**	**Premium Effect**
San Diego	2001	18%

Apartment Rental Rate		
City	**Year of Construction**	**Premium Effect**
San Francisco	1991	5%
San Diego	2001	4%
Santa Clara	2002	4.50%

Office		
City	**Year of Construction**	**Premium Effect**
Washington D.C.	1981	14%
Atlanta	1993	15.10%
San Francisco	1995	0%
Dallas	1999	10%
Santa Clara	2002	15%

Retail		
City	**Year of Construction**	**Premium Effect**
San Francisco	1981	1%
San Diego	1992	16.70%
Dallas	1999	30%

Table 1. Effects of Transit Investments on Property (Fogarty, Eaton, Belzer, & Ohland, 2008)

This table is included to illustrate the variety of effects on property values seen near rail transit projects in cities of varying size and composition. As this table illustrates, the effect of transit greatly depends on the use of the land near the transit stations, on the integration of the transit investment to the rest of the city's transit systems, and the area

served by the rail transit. Though these effects vary from the very moderate (1%) to the very significant (32%), the premium effect on property is a discrete variable that depicts a clear positive effect on property values in most studies.

As previously noted, researchers typically focused on the impact on property values in close proximity to stations. One such article examined the effect of the announcement of the locations of stations for an upcoming light rail project on home sale values within a half-mile and one mile (Knapp, Hopkins, & Ding, 1999). The authors developed a model local governments could use to inform their constituents about the impact of the construction of a light rail project and influence the city's approach to planning around the stations (proposed high-density mixed-use development) and how that would in turn change the value of their property depending on proximity to the station. The authors used real estate transaction data over nearly a five-year period to model the effect of the announcement of the light rail project, while controlling for variables such as distance to major roads, distance to the floodplain, and distance to sewer lines. The authors determined there was a minor but statistically significant increase in the value of a sale if it was conducted after the announcement of the light rail station locations. They also determined there was a greater increase in value in parcels located within one mile or a half-mile of the proposed stations, compared to other properties in the study area. The increase in value was particularly significant in transactions that were located within a half-mile of an announced station location.

Increases in property values in proximity to light rail station construction were also noted in Chicago (McDonald & Osuji, 1995). The authors examined an 11-mile stretch of light rail constructed in the early 1990's between downtown Chicago and the Midway Airport, a stretch of rail known as the Midway Line. This research is unique due to the fact that an independent organization named Chicago Area Transportation/Land Use Analysis System (CATLAS) produced a calculated value of each piece of property in the Chicago area every 10 years; this estimate is based on actual sales, appraisals, and asking prices in the area over the 10-year period. This data from CATLAS is also valuable because it accounts for changes in racial composition, median income, and population density, attempting to determine if these variables have an effect on property values on their own. Using a regression model, the authors assessed the effect of the construction of the light rail line on land values between the census years of 1980 and 1990. They found a significant increase in land values within a half-mile of the Midway Line stations. They estimated that the increase in parcels with this half-mile buffer over the 10-year period was 17.4% (McDonald & Osuji, 1995, 274). The other variables were less significant. They determined that population density had stayed relatively constant, and median income did not experience a significant change in explaining the property value change. One variable that did show significant change was the racial indicator of percentage of population that was Black within a half-mile of the parcel; the impact of this variable on property values decreased from 1980 to 1990 (McDonald & Osuji, 1995, 272).

LONG-TERM PROPERTY VALUE EFFECTS

An announced or newly constructed amenity such as a light rail project tends to create an immediate impact on the property values of surrounding businesses and neighborhoods, but the longer-term effects are usually not addressed. Looking specifically at single-family homes in Buffalo, New York, Daniel Hess and Tangerine Almeida were able to use a hedonic model (which is a method of using revealed preferences to derive value or demand) to quantify the marginal increase in property value associated with proximity to the 20-year-old rail line in upstate New York (Hess & Almeida, 2007). By examining residential properties within a half-mile of one of the 14 stations, the authors determined that each foot closer to the station resulted in an average increase in property value of $2.31. This value is a very statistically significant effect on home value; the authors determined that it resulted in an average "premium" of $1,300 to $3,000 for homes that were located within the half-mile buffer of the station. They also determined that these effects were not uniform or consistent across the 14 stations: in high-income neighborhoods the change in value due to the presence of a station was positive, but in a lower income neighborhood, the change was actually negative (Hess & Almeida, 2007, 1059).

Immergluck examined the effect of the announcement of the Atlanta Beltline, a large public infrastructure project consisting of parks created from open space leftover from historic rail corridors, on land values within a half-mile of the project (Immergluck, 2009). This Beltline study is unique in comparison to the one proposed for this paper's case study in Austin, TX because rather than looking at assessed values it examines

transactions within the half-mile buffer, and does not examine land use or demographic shifts. This article found that property values within a quarter-mile and a half-mile area of the project see a significant increase when the project is announced to the public. Though Immergluck does not directly address the demographic shifts, he does note that the construction will have adverse impact on low-income families within the half-mile buffer zone due to property value appreciation effects. He states that these families will have a difficult time continuing to pay their property taxes and will eventually be forced out of the area and into a more affordable region of the city ((Immergluck, 2009), 1730). The link between the construction of light rail infrastructure and the increase in surrounding property value is a highly researched topic that has produced a number of academic papers. Lawless looked at both property value and land use changes in a 1999 paper on the areas surrounding newly constructed metro stops in Sheffield, England (Lawless, 1999). As seen in previous studies, Lawless noted a small yet significant increase in property values in proximity to SuperTram routes. Within his study area between the years of 1992 and 1996 Lawless noted some significant changes in land use, particularly in vacant land and buildings. He observed a 13% decrease in vacant land (about 130,000 sq. meters) and an 8% decrease in vacant buildings (about 24,000 sq. meters). Most of the other land uses stayed relatively stagnant over the time period with the exception of Business and Office space, which saw an increase of 20% in four years.

When city governments ponder a light rail project they often examine the positive and negative externalities associated with the construction of the project, and attempt to quantify how their city would be impacted. The city of Phoenix took an innovative

approach to this problem by allowing a group of authors to use an UrbanSim model to predict the effects of the project on the area adjacent to the stations (Joshi, Guhathakurta, Konjevod, Crittenden, & Li, 2006). City officials were particularly interested in determining how their proposed route would fare in terms of ridership, not wanting to build an expensive project that was irrelevant to a majority of residents. The authors attempted to correlate the effect of density and mixed uses near the stations on transit use, and also to investigate the causal relationship with gentrification associated with light rail projects. To build the UrbanSim model, the authors used data from the county assessor's office, employment data, census data, land use data, and a chronological list of development events. The study divided the area served by the light rail into three zones that had a similar makeup in the base year and determined that racial diversity would increase in areas that are less desirable. In contrast those that are viewed as developable will become "whiter" and more affluent as the project is constructed.

Property Value Decrease Effect

Despite the seemingly overwhelming and extensive research indicating that light rail has a positive effect on adjacent property value, several cities have been studied where this was not the case, specifically San Jose, Sacramento, and Miami. This absence of economic impact is often attributed to the quality of the rail system or a lack of ridership, resulting in the inability to make the surrounding land more attractive to consumers. Gatzlaff and Smith examined the light rail project in Miami and presented one of these dissenting studies (Gatzlaff & Smith, 1993). The Miami Metrorail struggled most because Miami is a decentralized city, and the stations were constructed to

redevelop areas of the city suffering from low economic activity. The study spanned a significant time period, and observed property value changes when the light rail was announced as well as when it was constructed and made operational. With a policy of using the stations as a redevelopment vehicle in areas that had little chance of becoming frequently visited, the stations had little effect in creating a solid ridership base and enticing economic development. As a result, the ridership suffered immensely, achieving only 15% of the original ridership projection of 50,000 daily trips used to pitch the project to the constituents. The authors used a hedonic model (a method of using revealed preferences to derive value or demand) that utilized data from repeat sales of homes, rather than new homes whose prices would be adjusted for increased property values. They determined that the properties adjacent to the stations noticed a moderate increase in price resulting from the announcement of the light rail project, but there was little to no long-term effect on property values. They did note that these changes varied greatly depending on the neighborhood: those with higher property values saw increased property values and economic development with the arrival of the project, while those with lower property values at the beginning of the study had little to no economic development and minimal land value appreciation. Looking at land use and property sales, the authors noted there was no significant neighborhood revitalization resulting from the project as was experienced in many other North American cities.

Perhaps the most relevant literature for this project was an article analyzing light rail transit in Dallas (Clower, Weinstein, & Seman, 2007). In order to assess the impact of the Dallas Area Rapid Transit Light Rail Train (DART LRT on taxable property

valuations in Dallas, the researchers examined all parcels within a quarter-mile of the 23 stations in the Dallas area, as well as a series of control groups that were located within a quarter-mile of a major intersection outside of the rail transit area. The authors decided to use appraised values for the parcels rather than property sales within the areas, which is a common method of measuring an increase in value. The authors note the common concern with using assessor values, but indicate that any fluctuations will be controlled for due to the large number of properties examined.

Using these values, the authors present the changes in property values between 1997 and 2001, classified in five land use categories. Office properties increased in median property value by 24.7% in the DART area compared to 11.5% in the control areas. Residential properties increased in value by 32.1% in the DART zones compared to 19.5% in control areas. In residential properties that were vacant, the median value increased by 11.1% in DART areas compared to no change in control areas. Retail and Industrial were the only land uses that actually experienced a higher change in the control area at 30.4% compared to 28.3% in the DART areas for retail and 21.5% increase in control for industrial versus 13% in the DART zones. This study is not only important to this project for developing a baseline for property value projections, but it is also relevant for cities who are concerned about the level of reimbursement in terms of fare revenues and economic development benefits they can expect from the construction of the project.

Gentrification Transforms Neighborhoods

Gentrification is a general term used to describe a specific process of changing residences and other characteristics in a neighborhood. The Princeton dictionary defines gentrification as the restoration of run-down urban areas by the middle class (resulting in the displacement of low income residents), renovating so as to make it conform to middle class expectations, resulting in a neighborhood transition from low to high property values. This definition takes into account the difference between the classes of people moving in and out of the neighborhood and the affect on property values, while others see gentrification as a means of economic development and making a neighborhood desirable once again. Whether intentionally or not, the process of gentrification results in a rapid neighborhood transition, as people with higher incomes take advantage of location, historic architecture or other undervalued amenities and see the opportunity for a quick turnaround on property value with a moderate investment. Lower income residents not only lack the ability to renovate their current property, they tend to avoid upgrades to escape higher property values. But this approach to battling gentrification often goes unrewarded because the assessed value of the property increases without improvements due to the activity around the property and potential for future development. The construction of public transportation or other public infrastructure is often enough to serve as a catalyst for change, making the area desirable again for a more diverse set of income brackets, whether this change was intentional or not.

A classic example of gentrification in America is in one of its oldest cities: New York City. Constrained by space and home to the core of American business, in New

York often the only option is redevelopment, and once a trend of redevelopment is started in an area it spreads quickly. This phenomenon was recently examined by Newman and Wyly and used a combination of interviews and the American Housing Survey from 2003 to measure the impact of gentrification in specific neighborhoods across the city (Newman & Wyly, 2005). Gentrification has been occurring in New York for nearly 40 years, though the revitalization of Brooklyn, Harlem, and Manhattan came as a surprise to many. These neighborhoods had served as the center of various cultures and ethnicities for a century, since the initial waves of immigration from Europe in the mid-1800s. This push towards redevelopment resulted in the displacement of a large number of low-income renters in the neighborhoods that were studied. Most of the change occurred when access to funds for higher-income families became available through low-rate mortgages during the housing boom of the 1990s and 2000s.

Using data from the American Housing Survey, the researchers determined that 225,000 renters were displaced in the United States in 2002, with most reporting that increasing cost pressures were the primary cause of their move. Of these individuals, 96,000 were directly displaced by private landlords or government actions. The researchers then looked retrospectively at New York during the housing boom from 1989 to 2002 and found that 176,900 renters were displaced during that period from increasing rents, which accounted for nearly 10% of total annual moves during that time period. This displacement caused the renters to move out from the city core and into distant sections of New York City's Burroughs, including Queens, the Bronx, and the outskirts of Brooklyn. When looking at the reasons behind this displacement, the researchers

discovered that Harlem neighborhoods that once were home to single room occupancy hotels and efficiencies now had average rents of more than $1,700, and the brownstones in the area had almost entirely converted to higher rent homes or were only available by purchase. This significant shift of housing options for low-income households is only one example of a trend that continues to happen across the nation. As people with more disposable income attempt to capitalize on accessibility, low-income individuals can no longer afford the same level of access.

An evaluation of the literature on transit project announcement and construction effects on property values and land uses makes it clear that pressures may emerge which trigger some displacement of existing low income residents near rail stations and corridors. Those studies that have directly studied gentrification processes suggest that these displacement processes can in some cases become rapid and cumulative, causing a basic transition in urban residential patterns. In the case of displacement effects from light rail, the residents being pressured out are likely the ones that would support high transit ridership and benefit from the improved access to jobs and services provided by transit oriented development. It is, therefore, important to contrast in a general sense the household and public benefits that might flow from policies that mitigate displacement and allow mixed income communities to emerge in TOD areas.

In the article “Mixed-Income Housing Near Transit”, published by Reconnecting America, the authors delineate the benefits of TODs and Mixed-Income housing separately, then list a series of benefits resulting from the two developments taking place

concurrently (Center for Transit-Oriented Development, 2009). The article lists the benefits of TODs as: more housing and mobility choices, environmental improvement, infrastructure cost savings, healthy resident lifestyles, strong transit systems, lasting value, and decreased emissions. It lists the benefits of mixed-income housing as: deconcentration of poverty, integration of low-income individuals into society, and workforce stability. Finally it lists the benefits of mixed-income TODs as: truly affordable housing, stabilized ridership, increased access, and reduced gentrification pressures. These benefits of mutual development illustrate the role that affordable housing in TOD areas can have on the budget constraints of low-income households through capitalizing on a public good that serves the city as a whole. By locating affordable housing near transit it ensures that the transit system will have strong ridership while providing access throughout the city, which leads to more job options for low-income workers. This type of development integration manages to address both budget issues for low-income households (housing and transportation) while improving a public good through strong ridership and neighborhood diversity.

The impact of light rail transit announcement and construction on land values and land uses varies greatly across the 33 cities that have added a rail element to their existing transit systems. Though most researchers have found a positive relationship between announcement and construction and property values, there are some instances where this effect was not seen. The majority of studies have also concluded there is a positive relationship between the arrival of a transit system and a change in land use to commercial uses and housing in station areas that previously had a large component of

vacant land and industrial uses. The role that these positive relationships have had in spurning gentrification in areas adjacent to transit stations has also been a well researched topic, and most have concluded that the arrival of rail transit results in rapid gentrification. This process has the long-term effect of displacing a large portion of the existing population who cannot afford to maintain their households with increasing property values and development pressures.

Chapter 3: Household Transportation Costs

The vast reduction in transportation costs during the midpoint of the 20th century in America resulted in a movement of families from the city to suburbia. It now became feasible for higher and middle-income households to move out of what many perceived as a dirty, noisy, and cramped city into a suburb and commute into the city for work. As the workers moved out of the city, companies followed, moving to greenfield sites close to highway transit. Decreased transportation costs allowed the companies around the nation to move goods across interstate highway systems at relatively low costs, while capitalizing on inexpensive land in the surrounding areas. While this movement from city to suburb was cost-effective for the past 60 years, the sting of rising fuel costs and increasing congestion has induced a reconsideration of the suburban model; indeed there is some evidence that a growing number of families and companies are beginning to favor more centralized locations in core cities of metro areas (Fogarty, Eaton, Belzer, & Ohland, 2008), stimulating the use of public transportation. In cities with a strong public transportation system this comes as a welcome change for low-income employees who spend a large percentage of their annual income on transportation, a ratio that is increasing rapidly.

The percentage of income spent on housing and transportation has always been a large percentage of expenditures for households in the US and across the world. A study of average expenditure on transportation in 28 American metro areas (Haas, Makarewicz, Benedict, Sanchez, & Dawkins, 2006) determined that the average household owns 1.9

cars and spends 19% of their annual income on fuel and loan or lease payments, a percentage that does not include other costs associated with owning a vehicle and commuting such as parking, maintenance, license, fees, etc. This percentage varied between 14% and 21% in the study, depending on how extensive the public transportation system was in each city. For example, the city of Washington D.C., which has 169 rail stations and 13% of workers who use non-personal auto transportation to commute to work, had average expenditures of $7,853, or 15.4% of their total annual income. In Kansas City meanwhile, where there are no rail transit stations and only 3% of commuters use non-personal auto transportation, residents spent an average of 20.2% of their income on transportation or $8,794 annually (Haas, Makarewicz, Benedict, Sanchez, & Dawkins, 2006). The same study found that in the Dallas metro area the average expenditure on transportation was $9,815 – 19.7% of income. The average household in Dallas owned two cars and 4% of workers used non-auto transportation to work. As previously noted these costs vary greatly amongst the 28 metro areas but range between 14% and 21%, which is a significant portion of income dedicated to one cost.

The cost of transportation associated with commuting to work is observed to be quite high, but transportation costs are only half of the burden faced by the average household – when housing costs are factored in the impact on households is amplified. In the 28 metros observed in “Driven to Spend” (Bernstein, Makarewicz, & McCarty, 2005) the average household spent 32.9% of income on housing. When combined with the average transportation costs of 19.1%, 52% of disposable income was consumed on housing and transportation alone. In Washington D.C. the average housing costs were

37%, when combined with the transportation costs this resulted in a total housing transport share of 52.4% of annual budget. In Kansas City the housing costs were 32.3%, resulting in a 52.5% combined share. In Dallas the average expenditure on housing was 31.5%, resulting in total expenditures on housing and transportation of 51.2%. The fact that the average American household spends over half of their income on these two costs is quite significant; the variance amongst the cities depends on the price of housing and the extent of the transportation system. This indicates that these two areas should be addressed together when promoting efficient and equitable land use transportation policies in metro areas.

In the paper “Heavy Load” (Lipman, 2006) the authors found that households in the suburbs carried most of the burden of high housing costs (41% of income) while those living in the central city had significantly lower costs (29% of income). If those households living in the suburbs are commuting into the city for work, their combined costs are going to be extremely high, while those who live in the city and have access to public transportation could have significantly lower combined costs. Without the expansion of transit or a change in policies these burdens will continue to grow in the suburbs, potentially forcing a change in household decisions about residential locations in urban areas.

Based on this research finding, it appears that higher-income suburban households might be pushed toward searching for housing in urban neighborhoods. More central or transit-lined locations appear to be an attractive choice for these households to use public

transportation rather than commuting via auto to thus save over 19% of their annual income. However once time is factored into the analysis it is easier to see why so many households continue to favor auto transit. In the study conducted by the Center for Neighborhood Technology (Haas, Makarewicz, Benedict, Sanchez, & Dawkins, 2006), the researchers found that in the 28 metro areas, the average commute time by personal auto was 26.1 minutes, which covered 9.5 miles, and found that this transportation choice was used by 91% of workers. Looking at the 9% of workers who relied on public transportation, the average commute time was 45.9 minutes and covered 7.7 miles. This difference explains why households would allocate so much of their income to transportation; by using their personal auto to get to work they are effectively saving nearly 20 minutes each day to travel a greater distance. In the other cities studied, the average commute time by car in Washington D.C. was 31.7 minutes, versus 46.6 by public transportation. In Kansas City the average commute by car was 22.8 minutes, while the average commute by public transportation was 40.6 minutes. In the city of Dallas the average commute by car took 27.3 minutes, versus 50.3 by public transportation. In cities where use of public transportation is a widely available viable alternative, there is a small gap between auto and public transportation commute times, and the inverse is true in cities with limited public transportation. Until these gaps are closed, or it becomes much less efficient to commute by car, the use of public transportation will continue to face major hurdles.

REGRESSIVE GASOLINE COSTS AND RATIONAL CONSUMERS

A major variable in the rise and fall of transportation costs is the everyday operating cost of using the personal vehicle: gasoline. The rise and fall of gasoline prices affect every American household, but with significant variations in income the impact on household budgets varies greatly. Commuters are generally rational consumers – they may decide the value of their time is worth more than the value of fuel cost savings from use of public transit. Since gas costs the same for every person purchasing it, regardless of income, an increase in gasoline prices is seen as regressive, i.e. it consumes a greater proportion of the income of lower-income individuals than higher-income individuals. Steve Hargreaves of CNN Money estimates that lower-income households spend eight times the amount of their disposable income on fuel in comparison with high-income households (Hargreaves, 2007). Hargreaves used two American cities to make his initial comparison: Wilcox, Alabama and Hunterdon, New Jersey. In Wilcox the average household spent 12.72% of their annual income on gas alone, while in Hunterdon the average household spent 1.52% of their income on fuel. The national average expenditure on fuel is 3.8%, which had increased over a 5-year period from 1.9%. This figure becomes more significant when the income per household is added to the equation. The average household in Hunterdon earns $87,701 per year, and in Wilcox the average household brings in $19,682 annually. While both areas spend a similar total dollar amount per year on their gasoline, the impact on the lower income households is much greater.

The transportation impact on households is attributable to variables associated with transportation and car ownership in these two cities and two income brackets. In Hunterdon the city relies on an extensive public transportation system, which in most cases can get the residents to and from work on time and at low cost. In Wilcox there is a very limited public transportation system and since incomes are low the households locate wherever they can find affordable housing which is often far from employment centers and results in a significant commute. A second contributing factor to a gap in expenditures on transportation between different income level households is the impacts associated with car ownership. Those households operating with low incomes rely on older model vehicles, which often have poor gas mileage and higher maintenance costs, and this adds to total transportation costs. These combined factors make any change in gas prices a significant burden on lower-income households while only moderately impacting higher-income households. If the cost of gasoline continues to increase as it has over the last decade (see Figure 1), this impact will put a major burden on low-income households. Significant investment in public transportation for lower-income areas of the country is one major way to limit these burdens.

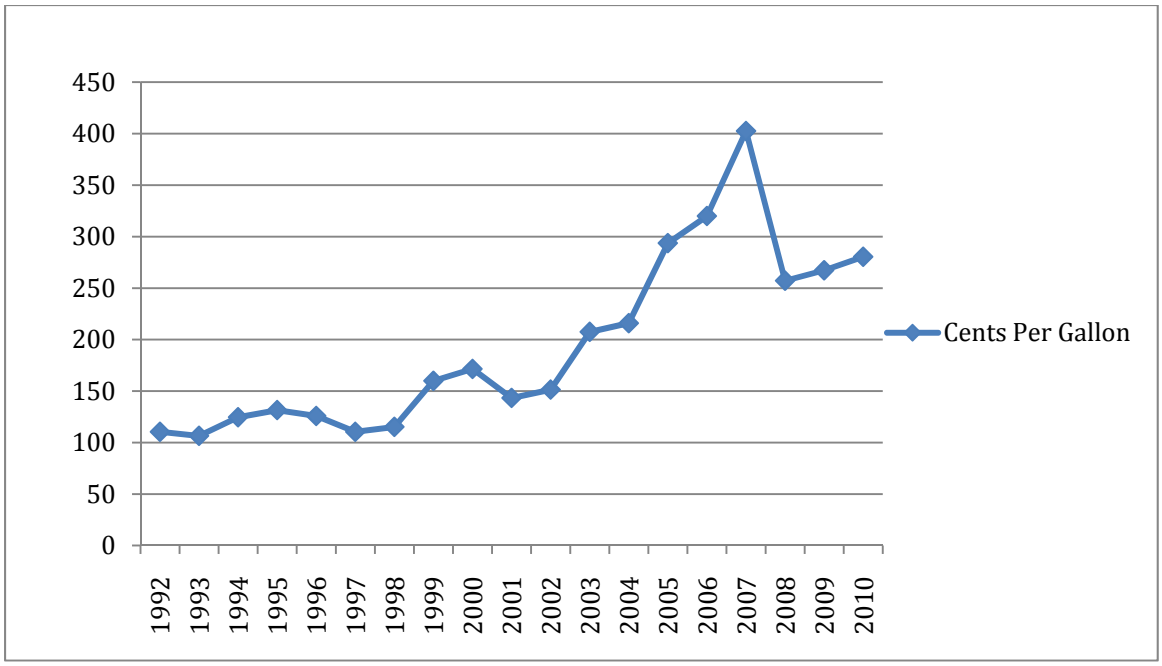

Figure 1. American Gasoline Prices in the first week of June with the exception of 2010 (Energy Information Administration)

An additional factor contributing to the regressive effect of gasoline prices is the fuel tax (see Figure 2). This tax has grown significantly over the years since the construction of the interstate system, and in recent years has been used to fund new projects and complete repairs on existing roads. This (combined federal and state) tax is an average of 45.6 cents per gallon (Energy API, 2009) and is seen as a "user-fee" tax for driving on publicly maintained roads. Since this tax applies equally to everyone who purchases gas it is also regressive, and has a greater impact on low-income household budgets than on higher-income households'. Compounding this regressive effect is how the tax is spent, with tax revenues going mostly to maintain existing roads and build new roads. If a greater portion was spent on improving public transportation for low-income residents, it would significantly lower transportation costs in the long-term and reduce

dependence on auto transportation, possibly lowering maintenance costs on roads due to reduced usage.

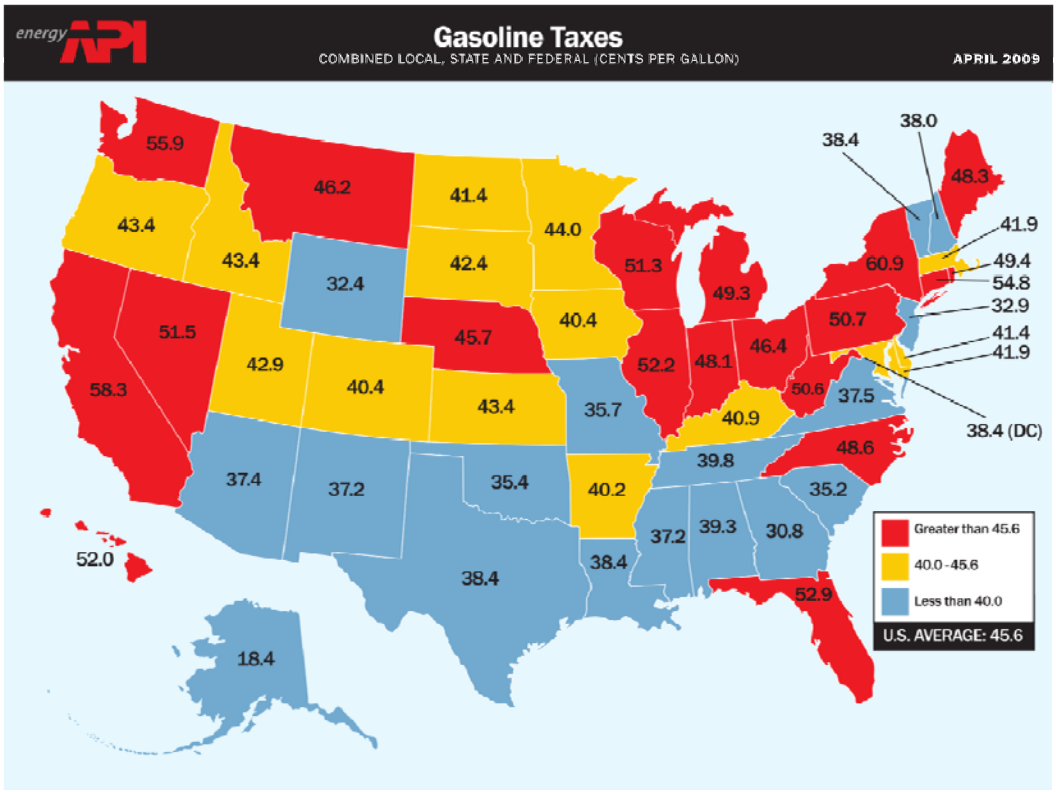

Figure 2. Combined State and Federal Gas Taxes (Energy API, 2009)

The American dependence on auto transportation is generating increasing costs especially for lower and middle-income households. The high costs of transportation by auto are especially burdensome to low-income households who are impacted more significantly by high fuel costs and maintenance on aging vehicles. Lower-income households tend to keep cars longer that require costly repairs due to the fact they are unable to purchase a new vehicle. The costs associated with auto transportation will only continue to increase; rising fuel prices will have the greatest negative impact on low-

income households. Due to the high cost of gasoline, these households often rely on older cars that have higher maintenance fees to keep them in working order. In response to higher fuel costs, car manufacturers have been bringing more fuel-efficient models to market; unfortunately these vehicles are expensive and low-income households cannot afford to purchase them in order to reduce their fuel costs. The difference in impact of fuel costs between low- and higher income households will continue to widen as low-income households dedicate a higher portion of their income to higher fuel costs and maintenance on aging vehicles, while higher income households are able to purchase new fuel-efficient vehicles to lower their fuel costs. However, there may eventually be a "trickle-down" effect as these fuel-efficient vehicles are purchased secondhand by those who cannot afford to purchase them new.

A means of mitigating these effects while making low-income households better off is a significant increase in investment towards public transportation and ensuring that low-income households have access to transit alternatives. While light rail is only one form of public transportation, it provides a dependable, quick, and low-cost option to commute to and from work. An extensive network of linkages would allow a low-income individual to access more options for employment and greater access to services to prevent them from spending such a high portion of their income on transportation. Areas without sufficient public transportation cause problems for households in meeting critical work and non-work transit needs. The problem then becomes ensuring that affordable housing near transit is still available to allow this transition from a car-dependent society to one with a diversity of transportation choices.

Chapter 4: Transit-Land Value Analysis of Two Cases: Austin and Dallas

This study analyzes the change in property values from 2005 to 2008 in Austin within a quarter-mile of the new proposed transit stations, and also within a half-mile of these stations. The control locations were set using the same method used by researchers at the University of North Texas who did a similar study on Dallas (Clower, Weinstein, & Seman, 2007). The researchers used controls that were located at major intersections and placed in such a way that their quarter- and half-mile buffers did not intersect with any of the transit station's buffers. The location of the research points and buffer levels are shown in an attached map located in the appendix (Figure 4), the control points and their buffers are also shown in the map. The data for this analysis was obtained from Capital Area Council of Governments (CAPCOG) (Capital Area Council of Governments) and the Travis Central Appraisal District (Travis Central Appraisal District). The station and control locations were manually entered using the All Systems Go system map available from Capital Metro (Capital Metro). To capture the increased property values associated with transit improvements, a long period of value data would have to be available to analyze an established transit system. This study therefore tracks the changes in property values since the announcement of a rail line.

After the station and control areas were mapped for Austin, a quarter-mile buffer was applied to each location, followed by a half-mile buffer. Once these buffers were established at each level, the parcel data for 2005 and 2008, which was obtained from

CAPCOG was added to the map. The parcels that intersected the quarter-mile buffers for each year were isolated and used to create a new layer of information that designated the market value of each parcel and whether or not it was vacant in 2005 and 2008. This information was exported and manipulated in Microsoft Excel to determine the number of parcels, the total value of parcels in each year, the total square footage, and the number of vacant parcels. Once this data was prepared the total value of parcels was divided by the total square footage which gave the effective square footage. This process was then repeated for the parcels that fell within a half-mile of the stations. The results of this analysis for both 2005 and 2008 at the quarter-mile and half-mile are presented below.

Austin Station Property Value Buffers

	# Parcels	Total Value	Total Sq. Ft.	Average Value Per Sq. Ft.	# Vacant Parcels
2005					
Quarter Mile	1,381	$1,085,994,090	52,980,738	$36.35	8
Half Mile	5,940	$3,089,398,658	162,852,401	$28.72	14
2008					
Quarter Mile	1,388	$1,568,151,781	52,243,651	$53.62	7
Half Mile	5,901	$4,923,312,435	157,657,506	$43.08	11

Table 2. Austin Station Property Values (Source: TCAD)

The results for the station areas are presented in Table 1 which outlines the two study years (2005 and 2008) and the changes in number of parcels, total value of the parcels, total square feet of the parcels included, average value per square foot, and the number of vacant parcels, which is presented at both the quarter-mile buffer level and the half-mile buffer level. The results of this analysis show a significant increase in value,

and a decrease in the number of vacant parcels, both confirming the hypothesis of this study. The increase in property values per square foot in parcels located within a quarter-mile of the proposed stations was 47.5%, which is an extremely significant change over such a short period. Looking at the total value of the parcels, it increased from $1.085 billion to $1.568 billion, or 44.4%. The number of vacant parcels decreased only slightly from eight parcels to seven. This change in value over a three-year period is extremely high and must be adjusted for the change seen throughout the city in order to put it into perspective.

The change seen in the half-mile parcels was equally impressive over the short period used in this analysis; property value per square foot increased from $28.72 to $43.08, or 49.98%. The total value of the parcels increased from $3.089 billion to $4.923 billion, which was an increase of 59.36% over the three-year period. There was a more significant change in vacant parcels at the half-mile level over the period, from 14 vacant in 2005 to 11 vacant in 2008. As noted with the quarter-mile parcels, this increase in value is extremely high and must be compared to the control parcels for the area to determine the true effect of the announcement of the new transit stations.

Austin Control Property Value Buffers					
	# Parcels	Total Value	Total Sq. Ft.	Average Value Per Sq. Ft.	# Vacant Parcels
2005					
Quarter Mile	1,863	$722,629,024	49,507,311	$24.77	4
Half Mile	7,185	$2,416,551,672	163,026,080	$24.87	26
2008					
Quarter Mile	2,016	$1,044,952,553	54,984,694	$33.48	4
Half Mile	7,694	$3,315,245,553	174,315,664	$33.42	19

Table 3. Austin Control Property Values (Source: TCAD)

The data analysis for the control buffers is presented above in Figure 2, but shows a much less significant increase in value over the same period of time observed in the station area parcels. In examining the quarter-mile parcels there is an increase in property values per square foot from $24.77 in 2005 to $33.48 in 2008, which is an increase of 35.15%. The total value of the parcels (it should be noted that the number of parcels increased by roughly 150 due to subdividing) increased from $722 million in 2005 to $1.044 billion in 2008, which is an increase of 44.60%. These numbers also portray a significant increase in property values over the time period, which is to be expected as they are situated in areas near major intersections that are experiencing major redevelopment over the period. However the change in value per square foot is significantly less than the change seen in the quarter-mile parcels near the stations. Over the period there was no change in the number of vacant parcels within a quarter-mile - it remained at four parcels from 2005 to 2008.

At the half-mile buffer level the change in property value is nearly identical to the change seen at the quarter-mile level. Value per square foot increased by 34.36% from 2005 to 2008. Total parcel value increased from $2.416 billion to $3.315 billion, which is an increase of 37.19%. However as seen with the quarter-mile parcels, there was a significant increase in the number of parcels within this time period, over 500 parcels were added through subdivision which shows a much higher level of activity than observed in the station areas as far as development. During this period there was a significant change in the number of vacant parcels in the half-mile control area, decreasing from 26 vacant parcels in 2005 to 19 vacant parcels in 2008. This change in property value is significant over a short period of time though when controlling for the size of the parcels it is less impressive than the change seen in the area adjacent to the stations.

The rapid change in property values in the Austin can be somewhat expected as the city became a hotspot of development over the last ten years, producing not only expansion but also downtown redevelopment. However the premium for parcels near the announced light rail stations is a significant increase. At the quarter-mile level this premium over the control increase in property value is 12.35%, a large jump in property value over a period of just three years. This premium is even higher at the half-mile level at 15.62%; this additional increase is surprising but understandable. The parcels closest to the transit stations will have some added inconvenience, increased noise from the tracks and station activity as well as traffic congestion from when the train is blocking the

roadways. Since the overall value in the control parcels is skewed by the increasing number of parcels it is difficult to use it as a measurement of change and it is best to use the normalized data points. The lack of change in vacant parcels is also somewhat surprising however it is understandable if property owners are holding this property until a critical point when they can get a higher return on their investment by selling it to a developer once the transit stations are established and fully functioning.

The limitations of this analysis are a result of the type of data that is used to derive the increase in property value. For this study the assessed value of parcels were used rather than actual sales transactions, each approach has been used in studies contained in the literature review. However with a limited number of transactions and the fact that most of these transactions would be comprised of single-family home sales, the assessed value was used to include all land uses as well as examine the number of vacant properties.

This analysis is also encouraging due to the fact that it is consistent with the previous findings by Weinstein and Clower at the University of North Texas (Clower, Weinstein, & Seman, 2007). The researchers found a premium effect in parcels located near the transit stations of 13.2% over a four-year period from 1997 to 2001. In studies of other cities the premium ranged from 1% to 16.7% depending on the land use and the city. The fact that the results for Austin support previous findings and put it on the high end of these premium effects is encouraging evidence of the link between transit announcements and the effect on property values. Further study of the Austin area could

be used to determine the long-term effect of the construction of the transit line and whether the effect of a functioning transit line is similar or greater than the effect of the announcement of the line. Either way it indicates a change in property value and potential for development, low-income landowners will likely struggle under the burden of increased property taxes and seek to sell their property to move to a lower cost area. This will further serve as a catalyst to development as higher income individuals enter the market and redevelop the existing improvements, which will only serve to increase the market values further.

Chapter 5: Transit Land Use Analysis
Combining Austin and Dallas Cases

The addition of a new transit line is often a catalyst for a major change within a city; the first changes are often seen in close proximity to the stations. When a station is built it automatically becomes a center of activity, and typically, new highest and best uses are established for the properties near the transit stations. These new uses often consist of increased density in residential housing, in the form of multi-family complexes and mixed-use buildings. Retail outlets emerge to serve the patrons of the transit stop, while industrial buildings may become too expensive to maintain due to increased land prices. Any vacant land in the area is usually purchased and redeveloped relatively quickly, and if the area is subject to a transit oriented development plan, new parks may appear.

The methodology used in this section of the study is similar to the preceding section that analyzed land value increases in Austin. Using the quarter-mile buffers around stations and control locations, the land use classification parcels were selected and clipped to leave only areas that fell within the buffer. This information was then exported to Excel and each land use code was labeled with its appropriate classification. The acreage for each use was then totaled and the percentage of the total acreage for each use is presented in the tables below. This process was repeated at the half-mile level to show any land use changes as distance from the station increased.

Although these are some of the changes often seen in transit accessible areas, the rate at which the conversion occurs is often dependent on its initial proximity to services and its location within the city. This study of land use changes in the Dallas station areas will illustrate possible land use conversions for the Austin corridor to anticipate what kind of changes might be expected with the arrival of the commuter rail.

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	958.4	20.96%
112	Multifamily	154.4	3.38%
121	Office	453.0	9.91%
122	Retail	624.0	13.65%
123	Institutional	314.5	6.88%
124	Hotel/Motel	31.0	0.68%
131	Industrial	787.1	17.21%
141	Transportation	88.9	1.94%
142	Roadway	327.5	7.16%
113	Mobile Home	0.0	0.00%
114	Group Quarters	0.0	0.00%
144	Airport	0.0	0.00%
306	Parking	0.0	0.00%
172	Landfill	0.0	0.00%
143	Utilities	67.7	1.48%
171	Parks	216.1	4.73%
173	Under Construction	30.3	0.66%
181	Flood Control	8.0	0.18%
300	Vacant	508.3	11.12%
	Total	**4572**	

Table 4. Dallas 1990 Quarter-Mile Land Use near stations (Source: NCTCOG)

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	4590.2	28.44%
112	Multifamily	1006.3	6.23%
121	Office	897.6	5.56%
122	Retail	1826.1	11.31%
123	Institutional	897.5	5.56%
124	Hotel/Motel	65.5	0.41%
131	Industrial	2528.0	15.66%
141	Transportation	200.8	1.24%
142	Roadway	992.4	6.15%
113	Mobile Home	0.0	0.00%
114	Group Quarters	20.1	0.12%
144	Airport	0.0	0.00%
306	Parking	0.0	0.00%
172	Landfill	0.0	0.00%
143	Utilities	125.7	0.78%
171	Parks	1024.4	6.35%
173	Under Construction	137.9	0.85%
181	Flood Control	56.9	0.35%
300	Vacant	1749.0	10.84%
	Total	**16142**	

Table 5. Dallas 1990 Half-Mile Land Use near stations (Source: NCTCOG)

Table 4 presents the land use within a quarter-mile of the stations in 1990, before the construction of the DART line. In this quarter-mile radius there is a strong presence of industrial uses, a significant amount of retail and mostly single-family housing rather than multi-family housing. There is also a significant amount of park space, and over 500 acres of vacant properties. At the half-mile level shown in Table 5 there is still significant percentage dedicated to single-family housing with more multi-family acreage than was seen at the quarter-mile level. The industrial and vacant acreage remains

relatively around the same level as the quarter-mile level, the remainder of the major other land uses also maintain nearly the same level as at the quarter-mile level.

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	699.2	15.29%
112	Multifamily	155.6	3.40%
121	Office	319.0	6.98%
122	Retail	500.0	10.94%
123	Institutional	294.1	6.43%
124	Hotel/Motel	20.9	0.46%
131	Industrial	498.9	10.91%
141	Transportation	50.4	1.10%
142	Roadway	1140.2	24.94%
113	Mobile Home	0.0	0.00%
114	Group Quarters	4.5	0.10%
144	Airport	0.0	0.00%
306	Parking	93.1	2.04%
172	Landfill	0.0	0.00%
143	Utilities	35.0	0.77%
171	Parks	241.6	5.28%
173	Under Construction	5.5	0.12%
181	Flood Control	5.2	0.11%
300	Vacant	378.6	8.28%
	Total	**4572**	

Table 6. Dallas 2000 Quarter-Mile Land Use near stations (Source: NCTCOG)

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Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	3351.1	20.76%
112	Multifamily	935.7	5.80%
121	Office	963.5	5.97%
122	Retail	1409.2	8.73%
123	Institutional	877.0	5.43%
124	Hotel/Motel	50.1	0.31%
131	Industrial	1646.5	10.20%
141	Transportation	166.0	1.03%
142	Roadway	3882.5	24.05%
113	Mobile Home	0.0	0.00%
114	Group Quarters	16.0	0.10%
144	Airport	0.0	0.00%
306	Parking	159.2	0.99%
172	Landfill	0.0	0.00%
143	Utilities	94.4	0.59%
171	Parks	992.0	6.15%
173	Under Construction	11.5	0.07%
181	Flood Control	39.2	0.24%
300	Vacant	1254.0	7.77%
	Total	**16142**	

Table 7. Dallas 2000 Half-Mile Land Use near stations (Source: NCTCOG)

By comparing the land use in 1990 to 2000 near the stations in Dallas, many of the trends that are often associated with a shift to transit oriented development start to become noticeable. The first noticeable change at the quarter-mile distance is a loss of 250 acres of single-family housing land use. However it is surprising to see that this loss is not rectified with the construction of multi-family housing, which only increased by just over an acre in the 10-year period. There is also significant decreases in both office and retail acreage over the time period. These losses along with the reduction in single-family may be explained through the drastic increase in transportation land use. It appears that this may be a result of an institutional change regarding how the roadways were

classified; previously they might have been included in the use they were adjacent to with the exception of major roads, and this methodology changed in 2000. As expected there is a significant decrease in the amount of land dedicated to industrial acreage, but it is hard to determine how much of this loss could be attributed to the changed methodology. The final noticeable changes at the quarter-mile distance are the inclusion of a new 30-acre park, and a reduction in the amount of vacant land, which decreased by roughly 130 acres.

The half-mile distance mostly shows the same changes that were observed at the quarter-mile distance. However at this level the industrial acreage dropped at a greater rate than all other land uses, which is a good indicator that there has actually been a significant reduction in land dedicated to this use. An additional interesting change is the addition of parking acreage, a land use which the area did not contain any acreage for in 1990. This can likely be attributed to the presence of park and ride facilities for commuters seeking to use transit to finish their trip into work. As seen in the quarter-mile distance there is a significant decrease in the acreage that is currently vacant, indicating increased development in the area.

The changes at both the quarter-mile and half-mile distance indicate a reduction of industrial acreage; redevelopment of vacant parcels, and arrival of parking. These changes were noticed in previous studies and it confirms the hypothesis of this research. However it is difficult to gauge the changes with the changed methodology when

interpreting transportation land use. If this had remained constant it would be easier to determine if there was any change in residential land uses, as well as increases in commercial space. Despite this problem it can be hypothesized that there were no significant increases in any particular use over the time period. It does appear that the up conversion uses (multi-family, commercial, open space) are growing slightly with the redevelopment of vacant parcels and industrial companies leaving the area. To determine if these effects were seen throughout the city between 1990 and 2000 the control locations were also included for analysis.

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	660.6	47.80%
112	Multifamily	171.0	12.38%
121	Office	17.9	1.29%
122	Retail	156.4	11.32%
123	Institutional	63.7	4.61%
124	Hotel/Motel	3.2	0.23%
131	Industrial	86.1	6.23%
141	Transportation	7.4	0.53%
142	Roadway	66.1	4.78%
113	Mobile Home	0.0	0.00%
114	Group Quarters	0.0	0.00%
144	Airport	0.0	0.00%
306	Parking	0.0	0.00%
172	Landfill	0.0	0.00%
143	Utilities	16.7	1.21%
171	Parks	18.6	1.35%
173	Under Construction	15.3	1.11%
181	Flood Control	0.0	0.00%
300	Vacant	98.8	7.15%
	Total	**1382**	

Table 8. Dallas 1990 Quarter-Mile Land Use Control (Source: NCTCOG)

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	2938.95	53.16%
112	Multifamily	547.52	9.90%
121	Office	178.17	3.22%
122	Retail	416.50	7.53%
123	Institutional	208.62	3.77%
124	Hotel/Motel	7.141	0.13%
131	Industrial	412.84	7.47%
141	Transportation	21.81	0.39%
142	Roadway	179.58	3.25%
143	Utilities	42.68	0.77%
171	Parks	117.84	2.13%
173	Under Construction	26.88	0.49%
181	Flood Control	17.10	0.31%
300	Vacant	412.58	7.46%
	Total	**5528.29**	

Table 9. Dallas 1990 Half-Mile Land Use Control (Source: NCTCOG)

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	494.27	35.77%
112	Multifamily	120.77	8.74%
121	Office	32.39	2.34%
122	Retail	141.81	10.26%
123	Institutional	68.02	4.92%
124	Hotel/Motel	4.44	0.32%
131	Industrial	33.42	2.42%
141	Transportation	6.44	0.47%
142	Roadway	364.49	26.38%
113	Mobile Home	-	0.00%
114	Group Quarters	-	0.00%
144	Airport	-	0.00%
306	Parking	-	0.00%
172	Landfill	-	0.00%
143	Utilities	7.73	0.56%
171	Parks	14.92	1.08%
173	Under Construction	-	0.00%
181	Flood Control	-	0.00%
300	Vacant	77.92	5.64%
	Total	**1,381.85**	

Table 10. Dallas 2000 Quarter-Mile Land Use Control (Source: NCTCOG)

Land Use Code	Land Use	Acreage	Percent of Total
111	Single Family	2223.1	40.21%
112	Multifamily	429.3	7.77%
121	Office	165.9	3.00%
122	Retail	430.5	7.79%
123	Institutional	216.9	3.92%
124	Hotel/Motel	11.0	0.20%
131	Industrial	192.7	3.49%
141	Transportation	11.1	0.20%
142	Roadway	1323.5	23.94%
113	Mobile Home	0.0	0.00%
114	Group Quarters	0.0	0.00%
144	Airport	0.0	0.00%
306	Parking	0.0	0.00%
172	Landfill	0.0	0.00%
143	Utilities	27.6	0.50%
171	Parks	84.7	1.53%
173	Under Construction	0.0	0.00%
181	Flood Control	16.1	0.29%
300	Vacant	355.9	6.44%
	Total	**5528**	

Table 11. Dallas 2000 Half-Mile Land Use Control (Source: NCTCOG)

As seen in the station area analysis, the change in how transportation uses were classified in each period results in some difficulty when analyzing the changes in the control sections, however some interesting results appear regardless of the problem. In the control section the same drop in single and multi-family is observed at relatively the same level as was seen in the station areas. However at the quarter-mile distance there is actually an increase in acreage dedicated to office use, which indicates that it grew above the transportation drop. Also the industrial use decreases at a much faster rate than the other uses, which indicates that this was possibly a trend throughout the city, which is

very feasible and may be a result of cheaper land in the suburbs and fewer restrictions and complaints on use. There is also no increase in parkland or parking, which solidifies results seen in other studies where these have both increased in TOD areas. Finally there is a much less significant drop in vacant parcels (though the acreage in these areas was relatively limited to begin with), which may indicate slower redevelopment compared with the TOD areas.

The half-mile distance shows the same drop in acreage observed in the other areas within the residential land uses, but at the half-mile distance there is actually a decrease in office acreage and an increase in retail acreage. Industrial acreage also sees a dramatic decrease, which again may have been an overall trend during this period of time and not solely associated with the light rail development. At this level the difference between control and station areas in vacant parcels is consistent with the quarter-mile distance buffer; a much less significant drop in acreage indicates that these areas may be seeing less redevelopment than those near the transit stations.

SUPPORT FOR HYPOTHESIZED LIGHT RAIL IMPACTS

The differences between the station areas and the control areas over the 10-year period are able to support some of the hypotheses related to the impact of the arrival of transit in an area; however, in other cases the data does not support the hypothesized correlation. The impact on housing, both single and multi-family, was difficult to determine with the change in methodology associated with transportation land uses. Despite this, the data show a stronger decrease in single-family housing compared to

multi-family housing, which actually increased at the quarter-mile level. The effect on commercial properties was also difficult to determine, but comparing the decrease to other uses indicates that there may have been some moderate growth at both distances. The significant reduction in industrial acreage appears to be a trend that was seen throughout the city in the 10-year period so it is difficult to determine if this effect was any greater in proximity to transit. The arrival of parking is a positive indicator of the effect of transit stations, the creation of park and ride lots shows that the line is being used by commuters and is serving a greater population. The designation and construction of park areas also supports standard TOD theories, since patrons will be walking in the area a large amount of open space is often added to make it a hospitable and enjoyable area. Finally the decrease in vacant land in proximity to stations shows the drive towards redevelopment by way of the easiest means of developing greenfields rather than incurring the expense of a brownfield destruction and remediation.

As noted in the previous chapter on demographics, there was a significant increase in population around transit station areas in Dallas over the examination period. However the land use results presented in this chapter do not show a significant increase in acreage dedicated to residential uses. This discrepancy is a result of the change in methodology for labeling transportation land uses. In the 1990 data roads and sidewalks running through residential areas were labeled as residential land uses, with the exception of major roads. This occurred in all other land uses as well. In 2000 this acreage was relabeled as transportation, which makes the data more accurate but impossible to compare with the previous methodology.

Land Use Code	Land Use	Acres	Percent of Total
100	Single Family/Duplex	124.4	2.98%
113	Mobile Homes	0.5	0.01%
160	Large Lot Single Family	13.0	0.31%
200	Multi-Family	33.0	0.79%
300	Commercial	196.5	4.71%
400	Office	57.1	1.37%
500	Industrial	395.8	9.49%
560	Resource Extraction	0.0	0.00%
600	Civic	74.2	1.78%
700	Open Space	32.4	0.78%
800	Transportation	84.8	2.03%
860	Streets and Roads	2068.5	49.58%
870	Utilities	0.0	0.00%
900	Undeveloped	1091.7	26.17%
940	Water	0.0	0.00%
999	Unknown	0.0	0.00%
	Total	**4172**	

Table 12. Austin 2006 Quarter-Mile Land Use near Stations (Source: City of Austin)

Land Use Code	Land Use	Acres	Percent of Total
100	Single Family/Duplex	774.7	8.23%
113	Mobile Homes	1.9	0.02%
160	Large Lot Single Family	91.1	0.97%
200	Multi-Family	152.0	1.61%
300	Commercial	607.3	6.45%
400	Office	506.3	5.38%
500	Industrial	675.3	7.17%
560	Resource Extraction	44.5	0.47%
600	Civic	432.8	4.60%
700	Open Space	146.9	1.56%
800	Transportation	147.6	1.57%
860	Streets and Roads	3799.8	40.36%
870	Utilities	2.6	0.03%
900	Undeveloped	1910.3	20.29%
940	Water	122.0	1.30%
999	Unknown	0.0	0.00%
	Total	**9415**	

Table 13. Austin 2006 Quarter-Mile Land Use near Stations (Source: City of Austin)

What is most surprising about the data from Austin is the small amount of residential acreage, which constitutes just under 11% of the total acreage in the half-mile distance. The large amount of acreage dedicated to transportation is not surprising as these areas are located relatively close to major roads and the interstate. The large amount of undeveloped land is promising, 26.17% at the quarter-mile and 20.29% at the half-mile. This indicates there is a large potential for growth near the stations without displacing current residents and business owners. One would expect open space to increase with the arrival of pedestrians, and civic uses to increase as the transit line is integrated into the city network. The potential for growth in this area is significant, with proper planning and consideration the areas adjacent to the rail stations could become a

center of activity and commerce, providing an exciting element to the city core and surrounding area.

Chapter 6: Demographics Analysis Based on the Two Cases

Considering the well-established relationship between the arrival of transit and an increase in property values, a logical next step is to determine if this relationship has a short-term effect on who resides near transportation. The relationship between increased property values resulting from the construction of rail transit and the surrounding residents is often referenced but has not been clearly established in literature reviewed for this paper. To make a case for the negative impact of these increased property values the most useful information to examine would be the income of individuals living within a half-mile of the transit stations. The variables chosen to be examined for this research are the total population, percent of the total population that has self-identified as White, percent of the total population that has self-identified as Black, percent of the population listed as another race, percent of households that are owner-occupied, percent of households that are renter-occupied, the median age, the percentage of the total population that is male, and the percentage of the total population that is female. This data was collected from the 1990 and 2000 Census.

In order to isolate areas within a quarter-mile and half-mile of station areas, the buffers were once again used to isolate census blocks which intersected each of the buffer levels. Once it was determined which blocks were located within station and control areas at both distance levels, data obtained from the United States Census Bureau was merged

with the Census Block output to populate data about demographic changes in both Austin in Dallas in 1990 and 2000 at each distance level. The block data at each level was then summarized and is presented in the tables below.

Dallas Station Buffers							
	# Tracts	**Population**	**% White**	**% Black**	**% Other**	**% Owners**	**% Renters**
1990							
Quarter Mile	1,073	46,342	47.97%	38.84%	13.19%	23.83%	76.17%
Half Mile	2,688	134,491	50.35%	35.58%	14.07%	28.10%	71.90%
2000							
Quarter Mile	1,125	53,747	49.00%	27.85%	23.15%	24.54%	75.46%
Half Mile	2,912	167,539	46.93%	28.66%	24.41%	30.73%	69.27%

Table 14. Dallas Demographics near stations in 1990 and 2000 (Source: US Census Bureau)

Dallas Control Buffers							
	# Tracts	**Population**	**% White**	**% Black**	**% Other**	**% Owners**	**% Renters**
1990							
Quarter Mile	268	24,835	56.82%	24.16%	19.03%	33.55%	66.45%
Half Mile	830	68,658	62.71%	19.23%	18.06%	38.24%	61.76%
2000							
Quarter Mile	272	27,141	53.40%	17.87%	28.73%	36.92%	63.08%
Half Mile	847	79,074	53.92%	19.21%	26.87%	39.10%	60.90%

Table 15. Dallas Demographics near control in 1990 and 2000 (Source: US Census Bureau)

The data for the Dallas station area for 1990 is presented in Table 14 and Table 15. During this 10-year period there was a 15.98% increase in population within a quarter-mile of the stations and a 24.57% increase in population within a half-mile of the stations. During the same time period there was a 9.29% change in population within a quarter-mile and a 15.17% change in population within a half-mile in the control areas. This is a relatively significant increase in total population over this time period near the stations. The fact that the half-mile increase is greater than the quarter-mile increase is understandable since the areas closest to the station are often converted to commercial uses and then housing is built surrounding it. This is a typical approach to integrating transit stations in the worlds of transportation and planning. The total increase over this time period at the half-mile level was nearly 33,000 people, which is a significant amount of population increase for this metro area in a 10-year period.

The next variable examined to determine the change in population with the presence of a light rail transit system is race. The results of this section will suffer from the error in data created by the switch in the Census' self-identification procedure. The Census Bureau added two new variables (Native Hawaiian and Other Pacific Islander Alone and Two or more races) in 2000 to offer more detailed and disaggregated data, but this makes comparing race data from 1990 and 2000 difficult. This study selected the two variables that would likely be isolated from this problem, White population and Black population. The remaining races are grouped together in an "other race" category to avoid problems created from the presence of the two new variables. In the station areas the White population within a quarter-mile was 47.97% of the total in 1990 and 49% in 2000.

At the half-mile level the percentage White population in 1990 was 50.35% and 46.93% in 2000. This is compared to the control census blocks which contained 56.82% White population at the quarter-mile distance in 1990 and 53.40% in 2000. At the half-mile distance the White population in 1990 was 62.71% and in 2000 it was 53.92%.

The change in the Black population it is difficult to determine since the population group was the most influenced by the changes made in the census methodology. Within a quarter-mile of stations the Black population was 38.84% in 1990 and 27.85% in 2000. At the half-mile distance the black population percentage was 35.58% and 28.66% in 2000. When comparing this to the control sections there is a similar impact; in 1990 the Black population was 24.16% and 17.87% in 2000 at the quarter-mile buffer distance. Within a half-mile buffer the 1990 Black population percentage was 19.23% and 19.21% in 2000. This smaller change indicates that the change seen near the stations might actually be a reflection of a decrease in Black population in the areas near the stations from 1990 to 2000.

Looking at the final race variable there is a significant change with the shift in Census methodology. In 1990 within a quarter-mile of the rail stations the “Other” percentage of total population is 13.19%, which increase to 23.15% in 2000. At the half-mile distance the population starts at 14.07% of the total in 1990 and increases to 24.41% in 2000. A similar phenomenon is seen in the control areas as well; at a quarter-mile distance to a major intersection the population percentage is 19.03% in 1990, increasing to 28.73% in 2000. At the half-mile distance the population increases from 18.06% in

1990 to 26.87% in 2000. This significant change is likely not a result of a major population shift but dependent on the new self-classification system and affects both of the other race variables.

The next variable used to quantify any change in population is tenure, or whether the household owns their home or rents it. This is an interesting variable to examine for a couple of reasons. First it is generally accepted that near transit there might be a large amount of multi-family housing constructed, which can result in higher rental rates. Secondly the 1990-2000 period saw lower restrictions on home loans and as a result more households were able to purchase homes during this time period. Near the stations in 1990 within a quarter-mile distance 23.83% of the households own their homes, and 76.17% are renters. In 2000 home ownership increased to 24.54%, and renters consisted of 75.46% of households. At the half-mile distance 28.10% of households own their home in 1990, while 71.90% rent. In 2000 this changes to 30.73% owners within a half-mile of transit stations and 69.27% renters. The fact that the percentage of owners increased slightly is most likely due to the presence of condominiums near transit and the increased ability to purchase a home.

In addition to the previously mentioned variables, median age and percentage of the population comprised of each sex were analyzed for this study. However there was no significant changes or relationships at either level in the Dallas rail station areas over the 10-year period.

In order to determine the similarities and differences between the Austin and Dallas transit areas for further analysis and discussion, the same data was pulled for Austin in the 2000 census. These data is presented in figure 3 and comprised of 201 tracts at the quarter-mile distance and 593 at the half-mile distance. At the quarter-mile the population was 7,588 and 24,907 at the half-mile. The percentage of white population was slightly higher than what was observed in Dallas, 55.03% at the quarter-mile and 54.95% at the half-mile. The Black population was lower than the observations near the Dallas stations, 19.93% at the quarter-mile and 18.14% at the half-mile. The other population was 25.04% at the quarter-mile and 26.91% at the half-mile. The area within a quarter-mile was comprised of 28.83% owners and 71.17% renters. At the half-mile distance the percentage of owners increased to 34.63% and renters decreased to 65.37%. The Median age was the same at both distances and the same as the control areas in Dallas at the 30 to 34 range. The split between male and female population was also relatively similar at both distances, at a quarter-mile it was 52.6% male, 47.4% female. At a half-mile it was 52.72% male, and 47.28% female.

The examination of the demographics in Dallas did not provide evidence of major demographic shifts near the transit stops between 1990 and 2000. The most significant change came in the increase of individuals who owned their household rather than rented. This supports the idea that gentrification is typically accompanied by conversion of rental units into ownership properties; despite the traditional convention that transit oriented developments foster mixed-use buildings, which contain mostly rental units. The information on race is difficult to decipher with the change in Census methodology but it

appears there may be a slight decrease in the Black population and perhaps a decrease in the White population as well. This shift may be evidence of established Dallas households moving from the city core to the suburbs during this time, or perhaps it is skewed by the presence of the option to identify as mixed-race. Either way this indirect evidence suggest that the Austin station areas should expect a steady increase in population and a possible future increase in home ownership, despite the struggling economy.

Chapter 7: The Benefits of Mixed Income TODs and Policies to Mitigate Gentrification

Existing literature theorizes that there is a significant impact of light rail projects on property values of surrounding parcels. While this is a positive externality in terms of increased property tax revenues for the city, it also may make it difficult for existing tenants and property owners to remain in their homes or business locations. The increase in value is a result of an expectation that this area will see a significant increase in transit access, retail, and service amenities as well as an increase in customers for commercial or service establishments in the station areas. This anticipated increase makes the adjacent parcels desirable for acquisition and redevelopment into a higher use. This process is often attached to the term gentrification, a term that implies that previously low to mid-income areas become desirable for more affluent individuals, which forces current residents to move out of the area and away from transit. This is an unfortunate effect as the average American family spends 19% of their income on transportation (Lipman, 2006); a larger percentage for lower income families who would benefit most from dependable and efficient public transportation. This indicates that low-income housing near transit stations could generate numerous benefits including increased ridership and fare revenue for the transit system, better service and job access for residents, and preservation of neighborhood networks and social capital. The following articles provide policy actions that can be implemented to maintain housing for lower income individuals,

allowing them access to the transit system and allowing them to spend their income on other essentials.

In an article presented by Reconnecting America and The Center for Transit-Oriented Development (Center for Transit-Oriented Development, 2009), the authors theorize on why housing near public transportation has become increasingly expensive and how they can mitigate these effects to allow people of all incomes to reside there. TODs are often viewed as an attractive way to incorporate housing with commercial space while taking advantage of transit. These projects on the whole have been successful but they have been unable to keep up with demand for housing near transit and as a result the prices in most TOD projects have escalated. There are many obstacles to building mixed-income housing near transit such as high land prices, limited funding for affordable housing, lack of financing to accommodate the complexity of mixed income projects, and community opposition to affordable housing projects. Some of the strategies presented by the authors include: public-private partnerships to use public money or incentives to allow for the construction of these projects, examples would be tax increment financing (TIFs), in-kind matches, or government incentives for banks that provide funding. They also present an often used method of achieving housing equity; inclusionary housing, or simply put requiring a percentage of new units built to be affordable. Another strategy presented involves modifying low income housing credits to offer incentives for locating near transit. A final example of a proposed solution to gentrification is government acquisition of eligible sites for redevelopment, and selling them at a discount to developers who are willing to build a mixed-income project. This

would allow the government to capitalize on low land values before the transit is constructed and guarantee that some affordable housing would be present even if the area becomes popular for redevelopment.

The Center for Transit-Oriented Development and the Great Communities Collaborative collaborated to produce an action guide to mitigate gentrification near transit facilities (Austin, Brooks, Dong, & Hickey, 2008). The authors included a series of policy tools that can be used to preserve affordable housing near new transit stations. The first strategy is to protect against immediate renter displacement through condominium conversion controls and first-right-of-refusal laws for tenants and non-profits. The second strategy is to help lower income residents to afford homeownership opportunities in transit zones through targeted ownership assistance and limited equity housing co-ops. The third strategy is to preserve existing subsidized housing through "project-based" Section 8 preservation and limited equity housing. The fourth and final strategy is to preserve affordability of non-subsidized, low cost housing through community land trusts.

They also present strategies for putting an emphasis on housing production, the first being a link between affordable housing production and market-rate development through inclusionary zoning and incentive based zoning. The second approach is to reduce the cost of housing production through reduced parking requirements, fast-track permitting, fee waivers, and regulatory accommodation for small sites. The third strategy is to remove site-specific obstacles to development through tax forgiveness and

Brownfield remediation. The fourth strategy is to provide land acquisition for affordable housing through land baking, public land dedication, and joint public/private developments. The fifth strategy is to increase the availability of funding for affordable housing through targeted financing sources. The sixth and final strategy is to zone for a diversity of housing types through a general plan or station area specific plans.

As previously noted, the lack of supply of housing near transit is the main driver in rising costs near public transit stations. An article authored by the Executive Office of Transportation outlines public funds that could be used to combat this problem throughout the nation. The office offers a number of incentives such as grants and earmarked funds that address housing specifically. An example of this would be the Priority Development Fund (PDF), which has set aside $22 million for the construction of affordable housing near transit stations. The PDF program also has a planning assistance grant program, which provides grants to municipalities of up to $50,000 towards increasing housing production through changes in planning and zoning. A final example of a program outlined by the paper is the Commercial Area Transit Node Housing Program (CATNHP) which has earmarked $10 million for projects that are dedicated to housing projects which are comprised of at least 51% affordable housing units serving residents who make below 80% of the median income for the area. These programs incentivize cities and developers to construct an eligible project to the point where it is feasible and realistic financially.

Gentrification has also been pointed to as a primary driver in the loss of the industrial sector in major cities. Former industrial centers now are seen as hotspots of opportunity; low property values and historic buildings serve as a base for the movement from manufacturing to multi-family. This theory is based on the ideal that if not for gentrifying forces these areas would remain industrial, many have argued to the contrary stating that this change is a natural progression to the land's highest and best use. However it must be noted that industrial businesses continue to move out of the city core due to price constraints, whether that be from an overwhelming increase in property values or a lack of profits in their industry. While this argument is made heavily on both sides it gives an interesting background for the breadth of changes that are associated with gentrification, affecting all land uses in every major American city.

Gentrification in areas that have recently acquired increased public transportation is seen throughout the nation due to the increasing popularity of Transit-Oriented Development (TOD) on both the developer and resident sides of the supply and demand curves. In a recent study by the Center for Transit Oriented Development (Center for Transit-Oriented Development, 2009) the researchers noted that many independent groups such as the Urban Land Institute and Price Waterhouse Coopers have dubbed the TOD as the safest bet for return on investment for a developer for five straight years. The researchers also noted that according to recent surveys, an individual who lives within a TOD is five times as likely as the normal citizen to use public transportation, and an individual who works in a TOD is 3.5 times as likely to use public transportation. TODs become popular for leasers and buyers of housing and commercial property because they

provide superior amenities to normal development, and as a result the value of these properties and the surrounding development is substantially increased. The success of this style of development has resulted in an increase in public transit ridership in the United States of 25%, and the construction of 700 new transit stations.

ECONOMIC SHIFTS

The substantial difference in amenities available is just one element which negatively affects the opportunity to maintain affordable housing near transit. An increasing gap between lower and middle class individuals resulting from wage decreases is driving demand for affordable housing and lower reliance on auto transportation. Additionally the availability of loans for home purchases has significantly decreased leading to a strain on the rental market, as a majority of housing near transit tends to be rental, these areas are often a first stop for leases by middle class households who are looking to capitalize on transit opportunities.

The increasing cost of gasoline is also driving lower and middle class households closer to transit, individuals looking to reduce their dependence on autos and still be able to access all their necessary services. Finally a shift in the standard demographics of a household in the United States is resulting in a retreat from the standard vision of a home, decreasing persons per household, and the lack of affordability in a large portion of the housing stock has resulted in new choices in where households choose to locate. These factors combine to make housing near transit the most viable option for many families, and the supply cannot keep up with demand. This results in soaring property values and

decreased affordability for the lower class, pushing these households away from transit and increasing their costs, resulting in further disparity from individuals in the middle class.

IMPORTANCE OF AFFORDABLE HOUSING

Preserving affordable housing is a difficult task in any area of a major city, but this task becomes even more difficult when transit is extended to this area. If the area did not previously have a strong public transportation element then it will see rapid changes in land use with the incorporation of the new stations. In order to be successful the city officials must have the goal of retaining affordability at the outset of the transportation project and act proactively to ensure that options are available for all income levels. The up converting land uses will bring an influx of new housing units, and with careful preparation and long term vision a significant portion of these new units and existing units can be maintained to create a diverse TOD.

In a city such as Austin there are many different proactive steps that can be taken when planning for a new transportation project in order to maintain affordable housing near transit stations. Several of these proactive steps are focused on zoning changes to the area that promote certain types of development. Since zoning classifications are often broad in terms of density and affordable housing requirements are often set city-wide at insufficient levels for transit areas, an overlay zone can be used to direct the types of development. If the City of Austin would use a TOD overlay zone to increase affordable housing requirements to 25% of total units while allowing greater density it could allow

not only for more affordable units but also make the transaction more profitable for developers. If building within a zone that has a higher affordable housing requirement is undesirable for a developer, the opportunity to add on a significant number of market rate units could make for higher returns and increased overall project value. This would also prevent significant strain on the city government by preventing a major overhaul of zoning code throughout the city.

Affordable unit requirements, also known as inclusionary zoning, were noted previously but can be rewritten to increase the number of units that are available to low-income households near transit. One example is to restrict off-site compliance, in some cities the builder of a development is allowed to place their affordable units in an area where it is less expensive to build and they can designate the units in the premium area as all market rate. By removing this option or restricting it to a short radius from the site (for example half-mile), the city can guarantee that these units will be accessible to transit rather than in the outskirts of the city. This approach can also be applied to the often-used "in-lieu" fees, where developers pay into a fund rather than including affordable housing. These types of programs would need to be removed or the funds applied to a government-sponsored project near the transit station to prevent the stock of affordable housing from dwindling.

The cost of developing parking for a multi-family project is surprisingly high and can make the construction and designation of affordable units even less desirable for a developer. By lowering the parking requirements outlined in the zoning code, the city can

make these units more affordable for the developer. Since these projects will be within transit areas the need for parking should be less in general, but these requirements can be even lower for affordable units who will solely use public transit, especially those households who qualify for the lowest income pricing. This change in parking requirements can be applied through the overlay zones. Since less ground space is being used by parking, the developer can build a larger structure, further increasing the profitability of the project along with the developer's willingness to include affordable housing.

One program that is already in place and widely used within in Austin is fast-track permitting. By lowering the time that it takes to secure all the permits necessary to start construction and make a building able to be occupied the city can significantly reduce the costs for the developer and make it easier for them to secure financing. The costs of holding a piece of property while attempting to start construction are extremely high, and at the same time the developer is paying property taxes on a vacant lot in a highly desirable area. These costs add up quickly for a developer and they would be more open to including affordable housing in their project if this time can be reduced. The quick turnaround time is also desirable to developers because of the precarious relationship they must maintain with their financing agent. The uncertainty in the permitting process makes the risk for the investor or bank much higher, but if the project is more likely to go through with affordable housing included or the approval would come more quickly the originator of the loan will feel that it is less risky to provide the financing for the project. The typical project takes 18-24 months to go from inception to completion and the

expenses associated with this time period are often not realized by the general public, but any reduction in this time can result in huge savings for a developer which will lead to higher profits and more affordable housing options.

In additional to fast-track permitting, the City of Austin also has a program to reduce impact fees for developers who are including affordable housing in their project. When a new project is developed it adds to the local population, which puts a strain on public services such as sewer, roads, and schools. To recoup these costs a city will often charge impact fees, which are dependent on the expected population that will be added to the area. In order to encourage mixed-income development a city can reduce these fees on a sliding scale determined by the percentage of units dedicated to affordable housing. These fees can be reduced through waivers, reductions, or deferrals, but since these developments do impact the ability to provide services to other residents a city will often opt for deferrals. This allows the developer to avoid incurring the costs up front and instead pay the impact fees once their cash flows are established when the project matures.

In areas lacking affordable housing, local government can encourage the development process through Public Land Dedications or Public/Private Partnerships. A local government will often hold a number or parcels throughout the city in expectation of future infrastructure/services projects or will hold a piece of land after the original use if vacated (old schools, airports, power plants, etc.), and these parcels can be given or sold at a discounted price to developers who will provide a large portion or an entire

complex of affordable housing. In some cases a city government will purchase property near transit station for the explicit use in a public/private partnership to develop affordable housing. These land dedications can make a project comprised of completely affordable housing or a majority of affordable housing feasible for a developer. Purchasing land and holding it until development is extremely costly for a developer, especially in a highly desirable area, if this cost can be eliminated or reduced the project automatically becomes much more profitable for a developer even if they are receiving much lower rents from the affordable units. A public/private partnership is very similar in the sense that the local government will share a portion of the costs in order to have affordable housing in the area, again this reduction in costs can make even low-rent units a viable option for a developer.

As mentioned previously the availability of financing for development is relatively limited in difficult economic times, but if a developer is dedicated to building an affordable housing project they can often rely on federal, state, and local loan programs to fund their land acquisition and construction costs. Examples of these programs are Low-Income Housing Tax Credits, the Federal Home Loan Bank Affordable Housing Program, HOME, CDBG, Redevelopment Affordable Housing Set-Aside Funding, and Housing Trust Funds. All of these programs along with other specific state and local programs can provide a low interest funding option for a developer who is looking to an affordable housing project in areas where the stock is low. These programs can also have perks like longer repayment periods, tax credits, or higher Loan to Value (LTV) limits.

In addition to programs that would encourage the construction of new affordable housing, there are also programs that would preserve the existing stock of affordable units near transit. One option to maintain current affordable housing levels is to limit condominium conversion. When an area becomes more desirable for housing the existing stock usually undergoes an inevitable strain to become condominiums, home ownership is not only desirable for tenants, it is also an attractive option for the owner of the building, allowing them to avoid the maintenance and management costs associated with maintaining a multi-family complex. To prevent the shift from rentals to condominiums, a municipality can use a combination of fees, restrictive conditions, and permit limits to discourage the transition. These fees may be enough to discourage a building owner from converting the units, but if not the revenue generated from these fees can be put into a fund to apply to affordable housing elsewhere. A conversion limit could also be enforced; setting a maximum number of units that can be switch to condos in a given year. This would prevent a dramatic shift, and give the local government some lead-time to provide other affordable housing options in the area. While these options provide a solution to a dramatic change in housing options, they are not a permanent fix, and it is important to allow for some home ownership. The purpose of these programs is to give the area a chance to adjust to the change and allow the housing stock to adjust to the needs of the area, while waiting for new development to provide affordable units.

A final option for maintaining affordable housing options near transit is a voucher system for low-income families to use towards rents in market rate units. If the stock of

affordable is insufficient for the demand a voucher system could be introduced to avoid the costs associated with the construction of new affordable housing complexes. These vouchers would cover the difference between the market rate and the reduced rate that would be given to qualifying households. This type of program would greatly increase the diversity of housing available to low-income renters; however the logistical problems associated with implementing such a program often make it a difficult option. It is impossible to have a voucher program for every market rate building in the area, and it is often difficult to have a building owner participate in the project. These owners often sign a contract over a period of 10-15 years to allow for vouchers in their complex, but at that point they can opt out of the program, and they often do. This is another example of a temporary fix, but it can be useful to provide housing options and bide time while constructing other affordable housing projects.

The number of options available for Austin provides a range of investment of time and money, each action providing different strength and weaknesses. A combination of these programs would be the best option to ensure that an acceptable amount of affordable housing near transit would be available to low-income households who wish to lower the impact of transportation costs on their budgets. Austin policymakers have the advantage of current land use near transit; many of these areas would be very receptive and available to redevelopment. The best option would be using public funds to acquire land near transit and once the system was operating dedicate the land for affordable housing uses. Until this time the city would be wise to use a voucher system or condominium conversion controls to prevent the complete removal of affordable housing

options near the transit stations. The city should continue to use the well-established fast-track permitting system, and use their TOD zoning classification to raise the affordable housing requirements for new developments. This would ensure that there are adequate affordable housing options to allow low-income households to take advantage of public transportation investments while providing a diversity of housing options that will lead to greater community and expanded development.

Chapter 8: Conclusion

As light rail transit systems continue to be built across the United States and throughout the world, economists, policy makers, real estate developers, and residents near light rail stations will continue to take interest in the effect of transit accessibility on property values. In the past researchers have found fairly varied results when they attempt to determine the strength of the relationship between the variables of access to light rail transit and property value, some have found minimal to moderate effects on value, others have found substantial changes in land values with the arrival of rail transit. This study looked at the effect of the announcement of light rail transit on property values which was a very significant relationship. In Austin a 12.35% premium was found at a quarter-mile distance from the stations, the premium was even higher at the half-mile distance, 15.62%. The level of the impact is affected by the placement of the stations and how they are integrated into the city fabric. Austin saw such high increases in property values near transit resulting from the citywide need for improved accessibility.

These increased property values often tend to have an effect on the land use around stations as some uses become unaffordable or undesirable with increasing property values. When looking at Dallas and attempting to determine if there was a change in land uses resulting from the construction of light rail, the results were unclear due to problems with the data. Despite these problems the residential uses saw increases in acreage, while vacant land and industrial uses began to reduce near stations. There was

also an increase in parking which illustrates that park and rides were constructed to enhance local ridership. The demographics in Dallas near light rail stations did not significantly change with the arrival of light rail transit, however population density did increase as more residents moved closer to the transit stations in order to access more of the city. While these two aspects of this study did yield significant or stunning results, it can be said that they warrant further investigation as the light rail system in Dallas continues to grow and residents are forced to make decisions on where they reside as property values continue to increase and pressures to redevelop the areas near stations intensifies.

These decisions on where to locate households are highly dependent on the two inputs in every household's budget that greatly affects their spending and saving power, these two factors are transportation and housing. Previous studies that were examined for this paper concluded that the average American household spent over half of their annual budget on housing and transportation. With increasing property values near transit stations, households must decide if they are willing to pay more for housing in order to lower their transportation costs, or if they save on housing and spend more money to commute from outside of the city core. Increases in either of these costs tend to have much more significant impacts on low-income households than those who are more stable. The ideal situation to mitigate the impact of these changes would be to make it possible for low-income households to find affordable housing near these transit stations, which would allow them to lower both of these costs and keep them relatively stable. The benefits of making this possible would be allowing these households to spend their

income on more important draws such as education, healthy foods, and basic services that are often neglected when budgets are constrained.

While the ability to make affordable housing near light rail transit stations is important, it is also important to see that actions to encourage these mixed-income developments is helpful in promoting a public good. By focusing Transit Oriented Development on the inclusion of mixed-income housing it provides a stable transit ridership. If the ridership is stable it will continue to have the environmental, traffic reduction, and financial benefits for the entire area. Locating affordable housing near light rail transit stations allows for truly affordable housing, by limiting transportation costs and housing costs at the same time. It also increases access to job opportunities, which stabilizes the workforce and allows low-income individuals to find stable jobs without concern for transportation costs to commute there. While it may seem like this concept would be widely accepted as a practice to address equity near transit stations and throughout the city, it is often ignored because it is not the most profitable model of developing TODs.

To make mixed-income housing an integral part of TODs and avoiding over-gentrification to the point where residents are displaced, cities constructing light rail transit lines would have to enact a series of policies which would make the inclusion of these affordable housing options more profitable and feasible. While there are many options that could be employed in Austin as the Red Line goes into service in 2010, city officials may benefit the most by taking an active role in ensuring that housing near

transit is available to residents of all income levels. They could do this by using public funds to purchase land near transit stations and use public-private partnerships to develop the lands jointly with private developers to include a high level of affordable housing while still making the project profitable and desirable for the developer. The alternative to this approach would be to utilize a voucher system for residences near transit that would allow low-income households to rent units in TODs well below market rate and give them an opportunity to increase their accessibility to jobs and services.

The arrival of the Red Line in Austin, Texas is the first in a number of steps to reinvestment in public transportation within the city and reduce traffic on already stressed roadways. The city has taken a number of steps to meet this period of change with reduced friction but a significant reinvention of the areas near transit stations in unavoidable. Through strict policies to prevent over-gentrification it is possible to add a dynamic element to the city that serves a variety of local residents and in turn lowering their transportation costs. This would create a surplus of money that could not only be reinvested into the city but also reinvested into the individuals themselves through education and better food choices. While the effects of the arrival of transit will not be fully realized for decades to come, it is possible to take preemptive steps to ensure it is a transition that is beneficial to all.

Appendix

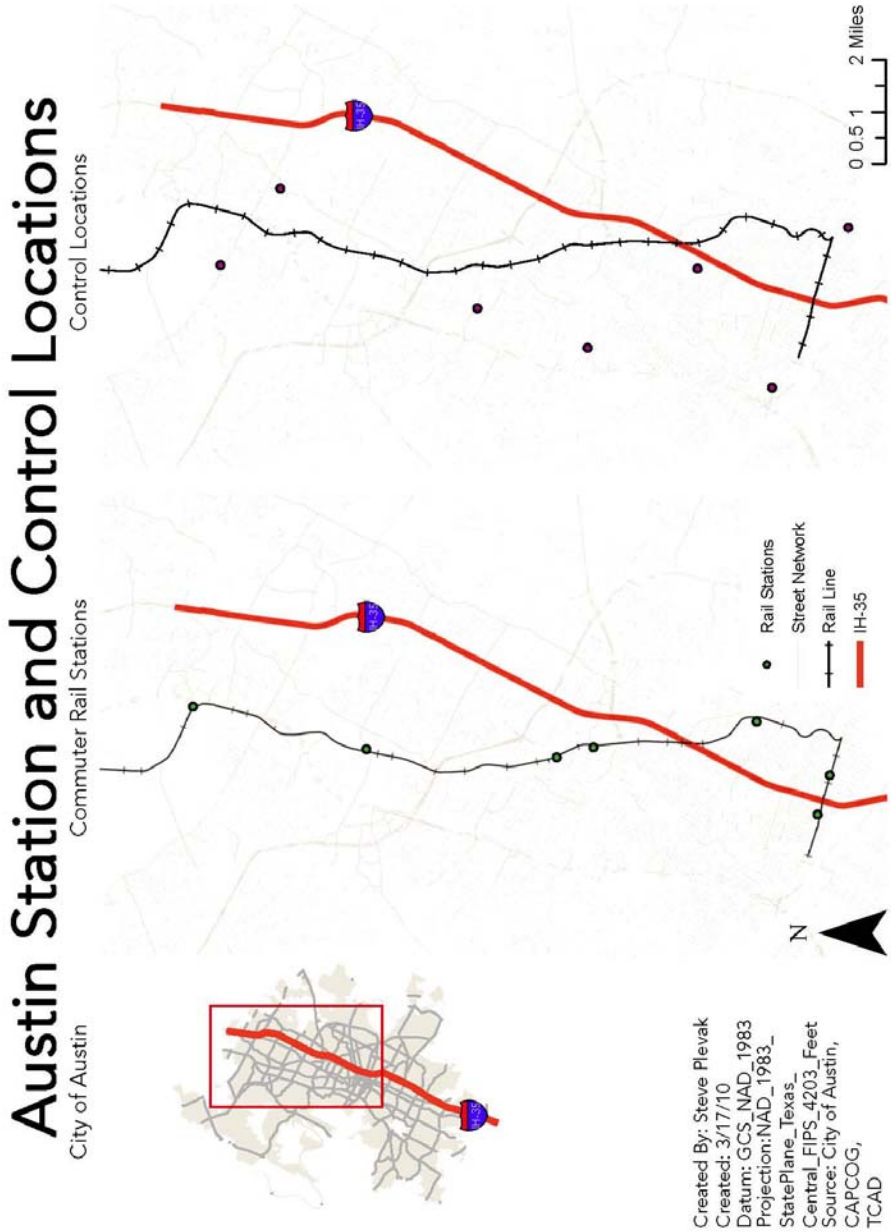

Figure 3. Austin Station and Control Locations (CAPCOG and City of Austin)

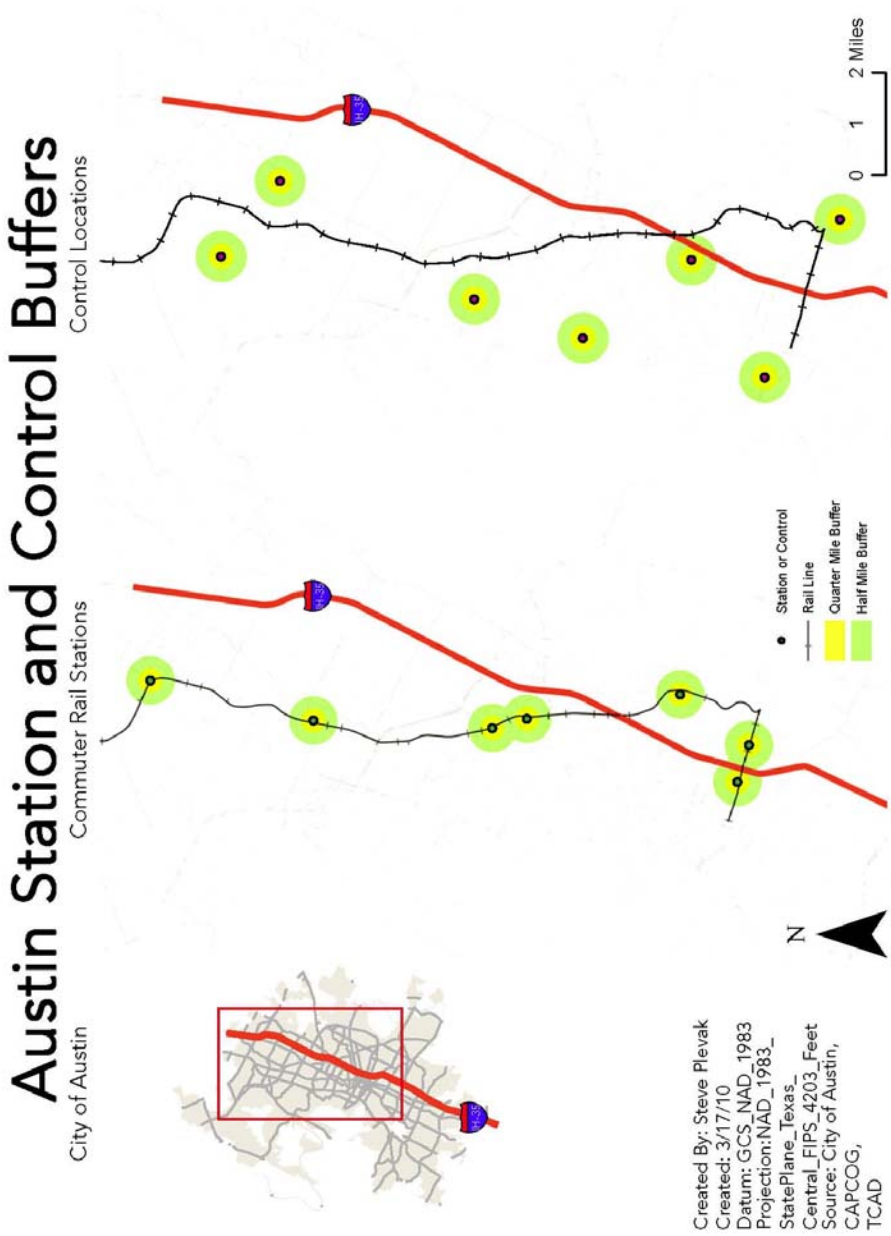

Figure 4. Austin Station and Control Buffers (CAPCOG and City of Austin)

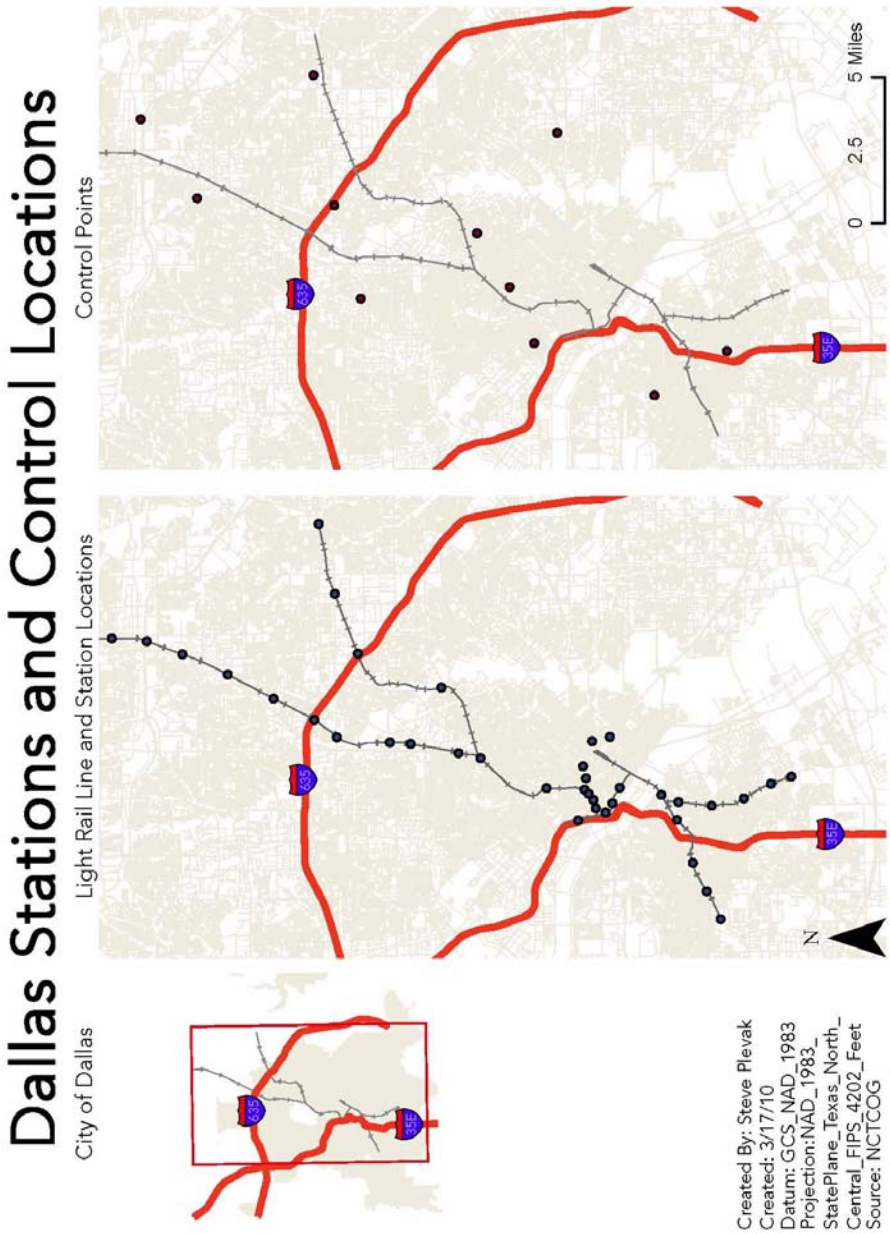

Figure 5. Dallas Station and Control Location (NCTCOG)

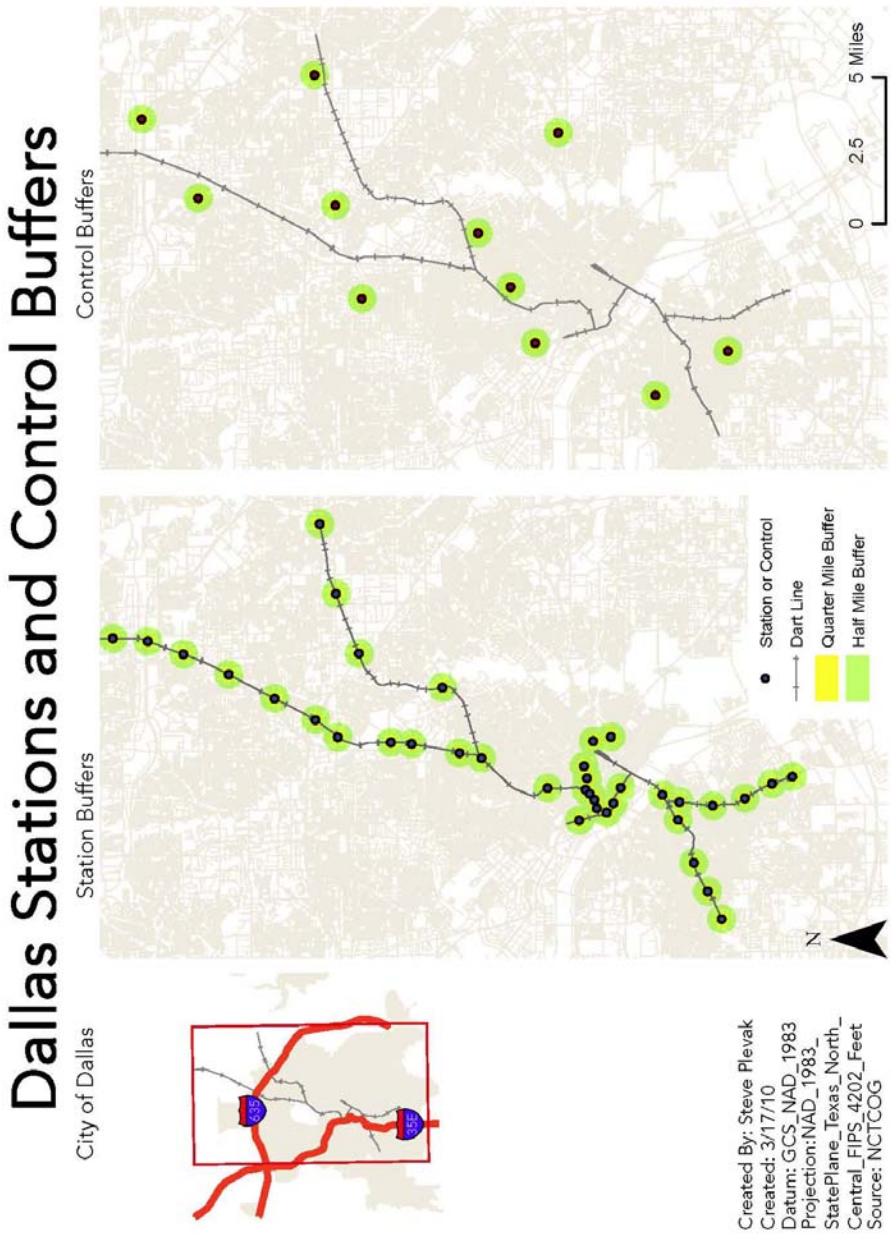

Figure 6. Dallas Station and Control Buffers (NCTCOG)

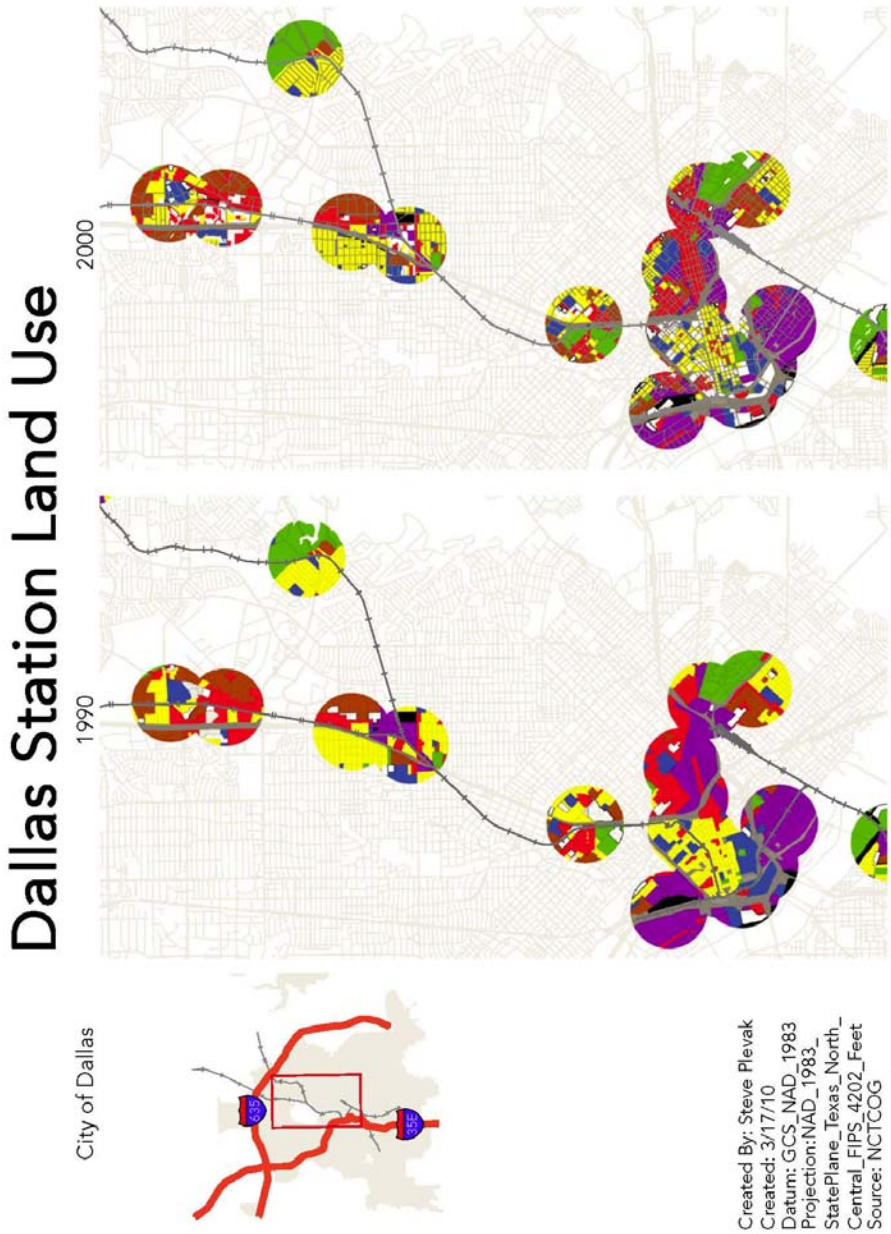

Figure 7. Example of Dallas Land Use Analysis (NCTCOG)

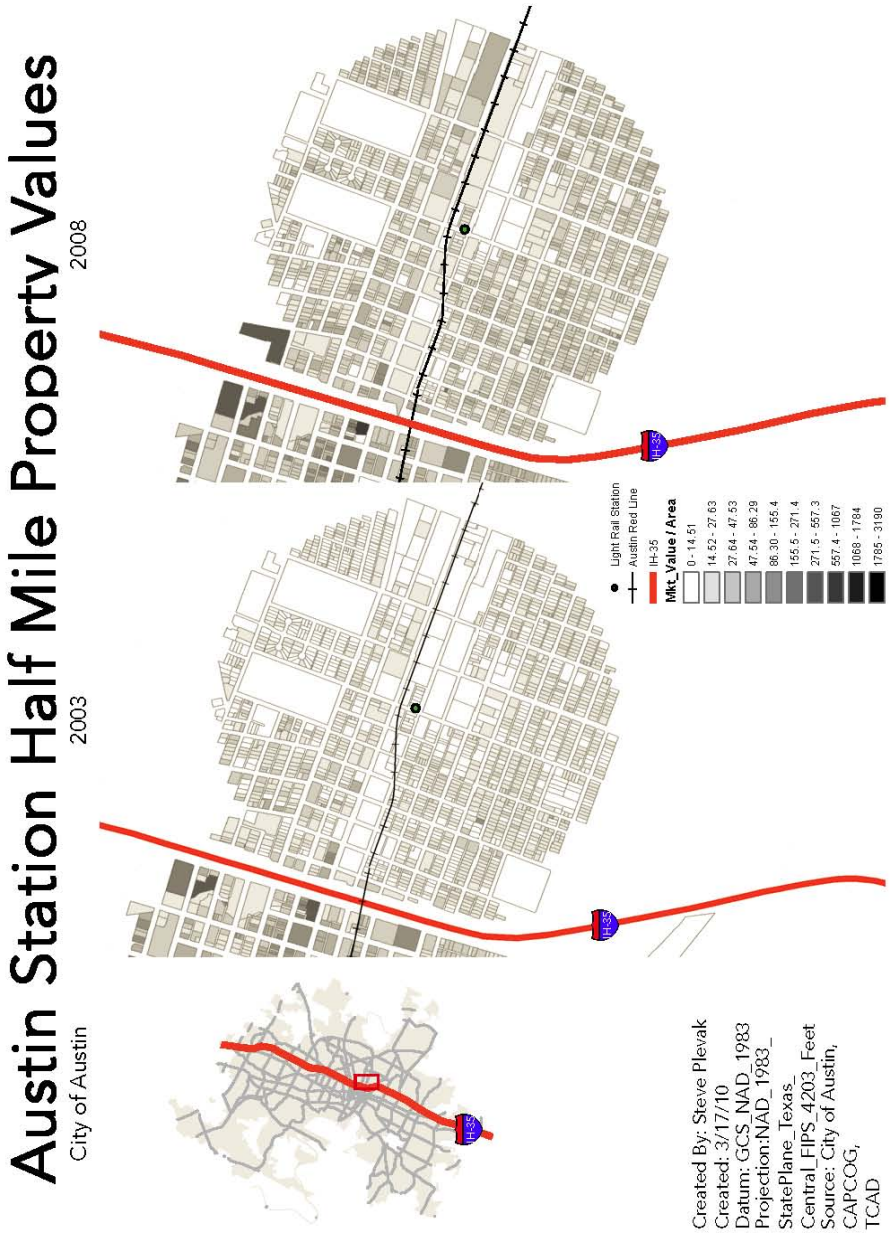

Figure 8. Example of Austin Land Value at Stations (CAPCOG, City of Austin, TCAD)

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Vita

Stephen Henry Plevak is originally from Rochester, Minnesota. To pursue his Bachelors he left Minnesota for Boulder, Colorado where he attended the University of Colorado at Boulder. He received his degree in Economics in May of 2006 and achieved Magna Cum Laude after writing a thesis on public finance and voting behavior towards green energy policies. After graduation Stephen worked primarily in two industries; first as a football coach at the University of Colorado and Georgetown University in Washington, D.C., he then made a career change, working as a financial analyst for IBM Corporation in Rochester, Minnesota and TeleTech Corporation in Englewood, Colorado. After spending two years outside of academia, Stephen decided to continue his education and to make the career transition into Community and Regional Planning. He chose to attend the University of Texas at Austin, during his tenure at the school he also worked as a Research Associate for Capitol Market Research, a well-established land and economic development consulting firm located in Austin. This combination of experience and education as well as his previous experience in the financial world led him to accept a permanent position with KB Home in Austin, Texas where he will serve as a Land Acquisition Analyst.

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