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Economic Analysis of Public Transportation in Reno, Nevada

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Arts in
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by

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Abstract

Access to public transit is important and beneficial economically and socially in numerous ways. Using economic and demographic variables from U.S. Census data, we have examined who is being served by public transit in Reno, as well as examined the flow of workers to their jobs to identify possible locations for expansion. We focus on areas with high densities of workers and jobs, especially those that are low income. The first part of the research consists of an analysis on use of public transit. We have conducted regression analyses on the factors that influence choice of transportation to work. The second part of our research looks at access to public transit, which we define as individuals living or working within 400 meters of a bus stop. After our data analyses, we have found locations that are possibly being underserved by public transit based on our specified criteria.

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Table of Contents

1. Abstract.....	i
2. Acknowledgements.....	ii
3. Introduction.....	1
4. Literature Review.....	2
5. Data and Methodology.....	13
6. Results: Use of Public Transit.....	15
7. Results: Access to Public Transit.....	23
8. Conclusions.....	35
9. Appendix.....	39
10. References.....	59

Introduction

There have been numerous studies that quantify the potential benefits of public transit. A study of Jobs Access and Reverse Commute (JARC) programs by Thakuriah, Sriraj and Persky, found that for every dollar spent on public transit, there is a return of \$1.90 to users, \$1.50 to non-users, and between \$3.10 and \$3.50 to society is expected. A benefit/cost ratio (BCR), defined as monetary benefits divided by cost of transit, was calculated to be between 1.9 and 2.5. A study by Multisystems et al. (2000) estimated the BCR of certain public transit programs in Florida, Maryland, and Kentucky for public transportation to work. The BCR of these programs was estimated to be 2.87, 2.52 and 1.01 respectively. A study by Cronin, Hagerich and Hotaling in Florida, estimated that the return to investment to the State is \$5.71 for every dollar invested on public transit trips to work. A study by HDR Decision Economics found that over 65% of public transit trips are for work and if public transportation was not available, 25% of public transit users claimed they would not be able to work, get medical care, or attend school.

The primary areas of focus for this research include: 1) Access to public transit and 2) Use of public transit, in an effort to better understand public transit access and usage. In this research, we are defining public transit as the bus system of the Regional Transportation Commission (RTC) and does not include other forms of transportation like train, subway or taxi. For the second primary focus of this research on public transit usage, we examine factors that influence the choice of transportation to work which include factors such as income, race, and gender.

Literature Review

According to Porter et al. (2015), studies have typically focused on three sections of economic impacts of investment in public transportation. The first is job creation, which occurs through capital and operation spending. The second is effects on local development patterns. The third main aspect of focus has been on the direct benefits to riders, including such things as time and cost savings (Porter et al. 2015). What has not been examined as much is the indirect impact that public transit can have. Porter et al. examine other potential indirect cost savings to other groups, not just to the riders of public transit. Other government programs may benefit as well from public transportation (Porter et al. 2015). The indirect benefits can occur due to increased access to jobs, health care, and education, which may reduce demand for other government services (Porter et al. 2015). There have been some findings on the indirect benefits of public transportation. The first finding is that transportation is a critical factor for employment. There has been a connection determined between public transit and job access, where employment increased for lower wage workers after the introduction of public transit. The second finding is that transit can improve access to educational opportunities, which also indirectly boosts employment. It has been found that more education and higher quality education leads to decreased unemployment and increased wages. The fourth finding is that improved access to preventative health care reduces costs for other health services like emergency room visits (Porter et al. 2015).

There have been numerous papers that investigate the importance of density on public transit and public transit ridership. In “Cost of a Ride: The Effects of Densities on

Fixed-Guideway Transit Ridership and Capital Costs”, Guerra and Cervero look at more than 50 transit investment projects built in the U.S. since 1970, and find a strong correlation between costs and ridership. As would be expected, capital costs and ridership are positively correlated (Guerra and Cervero 2010). In addition, both ridership and capital costs typically rise with job and population densities. By clustering trip ends near stops, concentrated development tends to have many more transit trips per square mile than the less concentrated development (Guerra and Cervero 2010). However, density typically increases construction costs as well. This is through increased costs for “right-of-way” acquisitions and building demolitions, more complicated route alignments, utility relocation expenses, and higher labor costs (Guerra and Cervero 2010). The authors show that dense areas both benefit from and support transit.

There has been a long history of attempts to quantify the required levels of urban density to support transit. The most cited study, by Pushkarev and Zupan (1977), looked at eight modes of public transportation: taxicab, dial-a-bus, local bus, express bus, light rail, light guideway transit, rapid transit and commuter rail. To study the characteristics of a city that best explained variations in the cost-effectiveness of these modes, the authors focused on three specific factors: non-residential CBD (Central Business District) floor space, residential neighborhood densities, and distance to the CBD (Pushkarev and Zupan 1977). Using regression models, these city characteristics were used to estimate travel demand and passenger operating costs, at various service frequencies. The authors found that cities with larger CBDs and higher residential densities along linear corridors could support higher levels of transit service (Pushkarev and Zupan 1977). Density is a large factor that has been shown to be related to the rate of drivers versus other modes of transportation. As

an area becomes more dispersed and less dense, the incentive to drive is increased (Duffy 2009). Overall, there has been a trend in the United States toward lower density cities. In 2005, the average American driver drove 12.4% more than they did ten years earlier (Bernstein et al., 2005). Between 1977 and 2001, total domestic vehicle miles traveled (VMT) increased 151% but population only increased by 30% (Polzin, 2004).

In 2011, Cervero and Guerra published “Urban Densities and Transit: A Multi-Dimensional Perspective” where they discuss the widely-accepted idea that a fairly dense urban development area is an “essential” feature of a successful public transit system (Cervero and Guerra 2011). The difficult part is that beyond this broad statement, the specifics become much more difficult on how exactly and when exactly to increase urban densities (Cervero and Guerra 2011). This paper examines the relationship between urban density and public transit from numerous different angles. This paper shows multiple angles in addressing the challenges of increasing urban densities and making transit investments to become cost-effective. While there indeed is empirical evidence to suggest rail investments in the U.S. have social benefits, much skepticism remains among the more vocal critics of American transit policy (Cervero and Guerra 2011). All sides agree that increasing urban densities will place public transit on firmer financial footing. The analysis suggests that light-rail systems need approximately 30 people per acre near stations and heavy rail systems require higher densities in order to be in the top 25% of cost-effective rail transit investments in the U.S. (Cervero and Guerra 2011). The ridership gains would be very significant, particularly when jobs are concentrated within 0.25 miles of a station and housing within 0.5 miles (Cervero and Guerra 2011). More research and findings are required that show the impact of higher densities combined with other factors, like higher

parking charges, and how these could be combined to create higher performing transit services (Cervero and Guerra 2011).

In “Making the Most of Transit: Density, Employment Growth, and Ridership around New Stations”, Kolko assesses how well California has achieved the integration of land use and transportation planning by looking at employment growth around new transit stations from 1996 to 2006. There are 3 key facts in the paper which show the importance of locating transit near jobs and encouraging job growth near transit (Kolko 2011). The first is that transit ridership depends on proximity to transit, especially workplace proximity. The second is that employment density is more strongly associated with transit ridership than residential density is. The third is that, in California, residential density is higher than the national average and rising, but employment density is lower than the national average and falling (Kolko 2011). The author claims that employment patterns are more important for transit ridership than residential patterns, thus the paper focuses on employment growth rather than population growth. Looking across the 200-plus transit stations that opened in California from 1992 to 2006, the author finds that the new stations located in areas with high residential density and very high employment density (Kolko 2011). However, opening new stations was not accompanied by an increase in average employment growth in the areas immediately surrounding these stations (relative to comparison areas). This includes when the stations opened and several years afterward. In addition, employment around new stations varied widely: Employment growth increased near 18 new stations and decreased near 20, relative to comparison areas, with the largest increases in areas that had higher residential and employment density prior to the station opening (Kolko 2011). For the rest of the stations, the difference between employment

growth around the station and in the comparison areas before and after the station opening was not statistically significant (Kolko 2011). Employment growth increased most around stations located in higher-density areas (Kolko 2011). There was no finding of any boost to employment growth associated with the opening of new transit stations, on average (Kolko 2011). This finding shows the crucial importance of transit being located in high density areas, and why it is a key focus of our research.

According to the American Public Transportation Association, public transit plays a “significant role in finding smart solutions to the challenges facing America today” (APTA 2009). There is a “triple effect” of 1) Helping to reduce the nation’s dependence on foreign oil, 2) reducing our impact on the environment and 3) stimulating economic growth and development by creating “green jobs” (APTA 2009). According to the APTA, using public transportation exceeds the benefits of other energy saving efforts including household ones such as energy-efficient lightbulbs, adjusting thermostats and usage of energy efficient appliances. APTA states that public transportation use saves the country the equivalent of 4.2 billion gallons of gasoline every year and more than 11 million gallons of gasoline every single day. This would translate to approximately 300,000 fewer automobile gasoline tank fillups per day (APTA 2009).

Public transportation “gives individuals affordable, energy efficient choices” (APTA 2009). Households that use public transportation save on average more than \$8000 every year, which increases as the price of gasoline rises (APTA 2009). Regarding access, households within proximity to public transportation drive an average of 4400 fewer miles compared to those without access to public transit (APTA 2009). Public transportation helps our environment in a substantial way (APTA 2009). An estimated 85 percent of

greenhouse gas emissions from the entire transportation sector are due to the “surface transportation system” (APTA 2009). Riding public transportation reduces an individual’s carbon footprint. Public transit in the US “saves 37 million metric tons of carbon dioxide annually” which is equivalent to emissions from electricity generated for “the use of 4.9 million households or every household in Washington DC, NYC, Atlanta, Denver and Los Angeles combined (APTA 2009). “If an individual switches from driving a 20 mile round trip commute to using public transportation, his or her annual CO₂ emissions will decrease by 4800 pounds per year, equal to a 10 percent reduction in a two-car household’s carbon footprint” (APTA 2009). Public transportation has the ability to reduce vehicle congestion. According to a Texas Transportation Institute report on vehicle congestion, public transportation saved travelers 541 million hours in travel time and 340 million gallons of fuel. Without public transportation, congestion costs would have been an additional 10.2 billion dollars (APTA 2009).

Public transportation “boosts the economy and creates ‘green jobs’. “The United States can create and support 1.3 million new green jobs within the next two years by implementing \$47.8 billion in supplemental transit capital projects, according to a transit needs estimate by the APTA” (APTA 2009). Public transit ridership has increased by 30% since 1995 with more than 10 billion trips taken annually. “Every \$1.25 billion investment in the nation’s transportation infrastructure supports approximately 35000 jobs” (APTA 2009). “Every \$10 million in capital investment in public transportation can return up to \$30 million in business sales alone” (APTA 2009).

According to Anderson, public transit accounts for only 1% of U.S. passenger miles traveled but nevertheless attracts strong public support (Anderson 2014). Using a simple

choice model, Anderson (2014) predicts that transit riders are likely to be individuals who commute along routes with the most severe roadway delays. The choices that these individuals make have very substantial marginal impacts on congestion (Anderson 2014). Anderson (2014) tests this prediction with data from a sudden strike in 2003 by Los Angeles transit workers. The author finds that average highway delay increases 47% when transit service ceases (Anderson 2014). According to the author, this effect is consistent with the model's predictions and many times larger than earlier estimates, which have generally concluded that public transit provides minimal congestion relief (Anderson 2014). Anderson (2014) finds that the net benefits of transit systems appear to be much larger than previously believed and shows that important detail that has not received enough attention in the existing literature is that commuters on different roadways in the same metropolitan area face "sharply different levels of congestion during peak hours" (Anderson 2014). The paper presents a "simple choice model in which commuters face differing levels of congestion and choose either to drive or take transit" (Anderson 2014). Anderson predicts effects on congestion that are approximately six times larger than a model that does no account for heterogeneity in congestion levels. This prediction is substantially greater than previous estimates in the existing literature, and "the qualitative conclusion is robust to wide variations in parameter values" (Anderson 2014). The intuition is straightforward: "Transit is most attractive to commuters who would otherwise have to drive on the most congested roads at the most congested times. Since drivers on heavily congested roads have a much higher marginal impact on congestion than drivers on the average road, transit has a large impact on reducing traffic congestion" (Anderson 2014). Anderson's estimates imply that the annual congestion relief benefit of operating the Los

Angeles public transit system is between \$1.2 billion and \$4.1 billion or \$1.20 and \$4.10 per peak-hour transit passenger mile (Anderson 2014).

The following section of the literature review will focus on the social and economic factors that can affect modal choice. There are numerous studies and articles that have addressed this topic. Can (2013) conducted a study to examine how the characteristics of domestic tourists and attributes of travel modes influence the tourists' modal choice to Nha Trang, Vietnam by using a multinomial probit model. The analysis is based on data surveyed from tourists visiting Nha Trang in March, 2011. The study consisted of 402 samples. The study provides several important findings concerning tourists' modal choice. Can (2013) finds that travel time per kilometer, per-kilometer travel cost to income ratio, mode quality variables, and income are key elements in explaining tourists' modal choice decision. In addition, tourists with a lower income tend to be more sensitive to change in per-kilometer cost. Additionally, the high-income tourists are much more likely to choose plane or train over bus.

Vij et al. (2017) look at changes in observable patterns of travel mode choice behavior over time and attempt to explain these changes in terms of possible shifts in latent modal preferences. In order to achieve this, the authors control for the confounding influence of changes in the socioeconomic environment and transportation infrastructure. Using repeated cross-sectional travel diary data collected from individuals residing in the San Francisco Bay Area in 2000 and 2012, Vij et al. (2013) develop a choice model of travel behavior. Estimation results reveal ten segments across the pooled sample populations that differ from one another in terms of their demographic composition, the travel modes that they consider, and the relative importance that they attach to travel

times and costs. The findings indicate shifts in latent modal preferences that exceed the comparable changes in observable travel mode choice patterns (Vij et al. 2013). For instance, private car mode shares decreased from 85.0% in 2000 to 81% in 2012, but the proportion of the population that only considers private vehicle when deciding how to travel is found to decline from 41.7% to 23.5% during the same period (Vij et al. 2013). Changes in economic and social factors and changes in the level of service of different travel modes are found to have had a marginal effect. Had modal preferences not changed between 2000 and 2012, over and above changes in the socioeconomic environment and the transportation infrastructure, the authors predict that private vehicle mode shares would have increased to 88.3% by 2012. Finally, shifts in modal preferences are not found to be limited to any one generation but are applicable across the population, reflecting broader cultural shifts that negate generational gaps (Vij et al. 2013).

Cheng et al. (2016) state that low-income residents are dependent on fewer options for travel and have restricted mobility. A study by Cheng et al. (2016) examines the mode choice of low-income commuters based on an activity-based travel survey in Fushun, China. The authors use a model of integrated choice and latent variables to construct and test the significance of social and demographic variables, activity attributes, and latent attitudinal variables. The authors found results indicating that factors including gender and age play an important role for low-income individuals for underlying factors including comfort, convenience, reliability, flexibility, safety, and environmental preferences. Cheng et al. (2016) show that several times the latent-variable-enriched choice model outperforms the traditional choice model and provides insights into the importance of unobservable variables in the choice process. Preferences for the latent variables except are found to

exert a significant influence on the mode choice of low-income commuters. (Cheng et al. 2016)

Personal automobile ownership has expanded fairly rapidly over the past several decades and by 2000, the U.S. population owned 771 vehicles per 1000 people (Shoup, 2005). Although the growth in car ownership did signify strong economic growth and technological innovation, it also caused a decline in travel by other means of transit, including public transportation, bicycle, and walking. (Duffy 2009) In 1960, 12.6% of commutes to work were made by public transit and 10.3% by walking, versus 4.7% and 2.9% respectively in 2001 (Polzin, 2004), and by 2003, only 4% of the population made their commute by something other than car (Berstein , Makarewicz, and McCarty, 2005). Although increased car ownership has a lot to do with these trends, the change in community design and land use also influenced the shift to car-dependent transit. Expansion of suburbs has reduced the average density of American towns and cities and encourages reliance on cars while offering little other choice.

The presence and expansion of car ownership has also created numerous social equity problems. One major concern has been access to jobs for low-income people. As cities have become more decentralized and suburbs have become centers of economic activity, more job creation has occurred on the outskirts of metropolitan regions. Between 1980 and 1990, 65% of job growth was in suburbs (Polzin, 2004). However, the cost of living in those far suburbs prevents low-income and working-class employees from living nearby. Most affordable housing options are in the inner city or in older, inner-ring suburbs, and there is rarely public transportation service between cities and suburbs. Most low-income workers find themselves forced to take on the financial burden of a car just so they

can find a job. Many cannot afford new, efficient vehicles and so they end up paying more than wealthy drivers for gas and repairs (Bernstein et al., 2005). Private car ownership costs are one of the largest expenses of American households, who spent 19 cents out of every dollar on transportation in 2001 (Surface Transportation Policy Project (STPP), 2003), making it second only to housing cost. In comparison, public transportation is a more affordable option. According to the Bureau of Transportation Statistics, Americans who use cars or trucks spent \$1280 per year just for commuting, whereas those that used public transportation spent \$765 per year (STPP, 2003). Unfortunately, many low-income people in rural areas and older suburbs do not get to opt for the lower costs of public transportation and have to deal with the economic burden of owning a car that is out of their monetary means. Despite the fact that most Americans travel by car, not all people make that choice voluntarily. Indeed, a number of factors made certain transit modes more or less possible, including individual and environmental characteristics. An individual's age, gender, income, education, and the number of vehicles to which they have access can greatly affect their travel behavior (Duffy 2009). Similarly, the design and the composition of a place can influence the relative ease of travel by different modes. Not everyone has equal access to convenient transportation and these inequalities can be controlled by specific planning choices.

According to the 2001 National Household Travel Survey, only 5% of white households did not own a car, yet 20% of black households, 14% of Native Hawaiian/Pacific Islander households, and 15% of Latino households did not (Lucas, 2004). Although fewer minorities are driving, more of them are suffering from the negative consequences, such as air pollution and crashes involving pedestrians. Even the roads

themselves have created unbalanced burdens on communities of color, whose neighborhoods were the default choice of planners for locating new highways earlier in the century. The disparity between those that cause the externalities of private cars and those that suffer them has sparked many civil responses. In Atlanta, the Atlanta Transportation Equity Project seeks to correct the inequality between the large funding of highway projects in white suburbs and the problems caused in low-income neighborhoods by congestion, air pollution, and lack of alternative transportation (Luberoff, 2002). Even where public transit is provided, communities of color are often underserved, or their transit is underfunded. Bus transit is just such an example. The majority of bus riders are minorities, and buses carry 60% of transit passengers, yet they receive just 33% of transit funding nationally (Luberoff, 2002). A striking example of the unequal funding of transit happened in Los Angeles in the mid-1990's when the Metropolitan Transit Association (MTA) proposed a fare increase for the overcrowded bus lines that serviced low-income neighborhoods. The increased revenue would go toward funding an expansion of a rail line in surrounding suburbs that did not have as high ridership. A wide coalition of community and national organizations (including the NAACP) sued the MTA, and the case was settled out of court (Luberoff, 2002). In New York in 1995, a court overturned a previous decision that forbade bus and subway line fares higher than commuter rail (Luberoff, 2002).

Data and Methodology

- 1) Data for *use* of public transit

The data for the first part of the research comes from the Public Use Microdata Sample (PUMS) from the American Community Survey (ACS) for the year 2014. The PUMS contains a sample of actual survey responses of individuals from the ACS. Each observation in the dataset represents a single individual and their actual responses to the survey questions. The PUMS data are given at the state level, so the 2014 data we have used is for the entire state of Nevada. Using the PUMS data, we have conducted binomial logit regression analyses on mode of transportation to work. The dependent variable in these regressions is the mode of transportation to work. The explanatory variables included in these regressions represent income, race and gender. So far, we have found that income, race and gender are significant factors in mode of transportation choice and we will continue to explore this. Due to the limitations of this data set, we are not able to identify the exact individuals that are using public transit or not. Therefore, there is not a direct link between the access data and the usage data. However, we still can use the results from this data to help understand what factors contribute to the modal choice, either taking the bus or driving a car.

2) Data for *access* to public transit

The data we are using for this research come from the United States Census Bureau. The main data source for this part is the LEHD Origin-Destination Employment Statistics (LODES) from the Longitudinal Employer-Household Dynamics (LEHD). From the LODES, we have been using Origin-Destination, Workplace, and Residence data. The LODES data we are using from 2014, and these datasets provide information at the Census

Block level. Using the LODES data as well as the United States Census Bureau's "OnTheMap" program, we have performed analyses on public transit access and demographic and economic variables. We have defined public transit access by whether someone is located within 400 meters of a bus stop. We have done this for both the individual's residence and the individual's workplace. An individual is defined as having access to public transit at their home, if they live within 400 meters of a bus stop and has access to public transit at their job if their workplace is located within 400 meters of a bus stop. To create the maps and analyses, the first step was to identify and locate all of the bus stops for the RTC in the Reno area. Using data from the RTC website I was able to get the coordinates for the bus stops and then import that data using GIS software into the OnTheMap program from the census bureau. After importing the geographic locations of each and every bus stop, I then created a buffer zone around each stop of 400 meters. Using a 400-meter radius around each bus stop in the Reno area, we have defined that area as the service area. Any location outside of 400 meters from any bus stop is considered outside of the service area. By using the LODES data with the "OnTheMap" program, we have conducted analyses and created maps and tables to represent the analysis of the service area as well as the non-service area. The categories included in these analyses include variables such as worker age, earnings, industry sector, race, education and gender.

Results: Use of Public Transit

Using the PUMS data I have conducted a binomial logit regression on mode of transportation to work. The dependent variable in these regressions is the mode of transportation to work, and more specifically, whether an individual uses public

transportation. For this, created the dummy variable, BUS. If bus=1, then that individual uses the bus to get to work. If bus=0, then that person drove their car to work. This regression includes only individuals who either took the bus or drove their car and does not include individuals who used other forms of transportation. The explanatory variables included in this regression represent income, race and sex. The variable, INCOME, is the only continuous variable in this regression, and represents the individual's annual income for 2014 in dollars. For race, I created dummy variables, BLACK, HISPANIC, and ASIAN. To represent sex, I created a dummy variable called MALE.

The table below shows a summarization of income for those who took public transportation versus those who drove a car. The average income for individuals taking the bus is \$27,821 and those driving a car made an average of \$43,139. This is consistent with the hypothesis that individuals taking public transportation are likely to make less money than those who drive a car to work.

Income: Bus vs. Car

```
. sum income if bus==1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
income	395	27821.12	29130.25	0	317653.9

```
. sum income if bus==0
```

Variable	Obs	Mean	Std. Dev.	Min	Max
income	10,459	43138.98	45178.99	0	317653.9

The following shows the results from Stata for the binomial logit regression with BUS as the dependent variable, and INCOME, BLACK, HISPANIC, ASIAN and MALE

as the dependent variables. In this case, WHITE must be excluded and is therefore used as the reference for the other racial variables.

```
Marginal effects after logit
y = Pr(bus) (predict)
= .02824582
```

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
income	-4.02e-07	.00000	-7.31	0.000	-5.1e-07	-2.9e-07		42581.5
black*	.0836832	.01266	6.61	0.000	.058865	.108501		.064032
hispanic*	.0203358	.00448	4.54	0.000	.011562	.02911		.236871
asian*	.017645	.00743	2.38	0.018	.003087	.032203		.089737
male*	.0112328	.00288	3.90	0.000	.005583	.016883		.528377

(*) dy/dx is for discrete change of dummy variable from 0 to 1

We can see from this binomial logit regression that all the independent variables in the model are statistically significant. By looking at the marginal effects, we can get a sense of the meaning behind the coefficients. For income, the marginal effects are taken at the mean, and we can see that income is significantly negatively related with taking the bus. As income increases, the probability of an individual taking the bus decreases, holding all other factors constant. As for the racial variables, we can see that BLACK, HISPANIC, and ASIAN are all statistically significant and positive. This means that individuals who are Black, Hispanic, and Asian are more likely to take public transportation than those who are White. MALE is also statistically significant and positive, showing that males are more likely to take public transportation than females. The predicted probability of someone taking public transit in this model is 2.82%. The following four logit regressions now look at the impact of race and gender at different levels of income. These groups are split into low-income, mid-income, and high-income as with the previous data.

Low-Income

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .04905245$$

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
black*	.2141044	.04008	5.34	0.000	.135552	.292657		.067234
hispanic*	.0523438	.01361	3.85	0.000	.025662	.079025		.277021
asian*	.0658565	.02823	2.33	0.020	.01053	.121183		.079574
male*	.0098861	.00847	1.17	0.243	-.006719	.026492		.457021

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Mid-Income

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .03803115$$

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
black*	.1035485	.02176	4.76	0.000	.060898	.146199		.078488
hispanic*	.0189306	.00763	2.48	0.013	.00397	.033892		.316104
asian*	.0222767	.01366	1.63	0.103	-.0045	.049053		.105288
male*	.0120011	.00578	2.08	0.038	.000666	.023336		.488155

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Low + Mid-Income

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .04242625$$

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
black*	.1383079	.01987	6.96	0.000	.09937	.177246		.074437
hispanic*	.0292172	.00682	4.29	0.000	.015855	.04258		.302037
asian*	.0343316	.01285	2.67	0.008	.009153	.05951		.096033
male*	.01089	.00482	2.26	0.024	.001439	.020341		.476949

(*) dy/dx is for discrete change of dummy variable from 0 to 1

High-Income

Marginal effects after logit
 y = Pr(bus) (predict)
 = .01539689

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
black*	.0117343	.01104	1.06	0.288	-.009902	.033371		.048324
hispanic*	.0143909	.00672	2.14	0.032	.001213	.027569		.138497
asian*	-.0028002	.00674	-0.42	0.678	-.016006	.010406		.080231
male*	.0154187	.00365	4.22	0.000	.008264	.022574		.606012

(*) dy/dx is for discrete change of dummy variable from 0 to 1

We can see from these binomial logit regressions that the coefficients and significance are different at different income levels: low, mid and high. For the low-income group, the predicted probability for taking the bus for this group is 4.9%. We can see that the racial variables are statistically significant while the gender variable is not. This is interesting that for the low-income group, it appears that gender is not a significant factor in decision to take public transit. BLACK has the largest coefficient of .2141. For the mid-income group, BLACK and HISPANIC are significant at the 1% and 5% level respectively. However, ASIAN is no longer significant at the 10% and MALE becomes significant at the 5%. This is different than for the low-income group, with gender now becoming a significant factor. The coefficient on BLACK is .1035 compared with the .2141 for the low-income group. The predicted probability in this case has decreased from 4.91% to 3.80%. For the next regression, the low-income and mid-income groups are combined, meaning any worker making under \$40,000 is included. In this case, all three racial variables are significant at the 1% level and the gender variable is statistically significant at the 5% level. The predicted probability for this combined group is 4.24%. If we look at the individuals making over \$40,000 annually, the predicted probability for taking public

transit drops all the way to 1.54%. Additionally, HISPANIC is the only significant racial variable, however, MALE is also significant. The following set of four regressions considers the effects of income for the different racial groups: Black, Hispanic, Asian, and White, as well as the gender variable once again.

Black

Marginal effects after logit

y = Pr(bus) (predict)
= .08184377

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-2.92e-06	.00000	-6.62	0.000	-3.8e-06 -2.1e-06	35166
male*	.0285171	.01878	1.52	0.129	-.008287 .065322	.51223

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Black, low-income

Marginal effects after logit

y = Pr(bus) (predict)
= .20835603

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-6.41e-06	.00000	-3.64	0.000	-9.9e-06 -3.0e-06	7287.15
male*	.0624666	.04087	1.53	0.126	-.017638 .142571	.51223

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Hispanic

Marginal effects after logit

y = Pr(bus) (predict)
= .04868512

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-8.12e-07	.00000	-3.67	0.000	-1.2e-06 -3.8e-07	29935.1
male*	.0093586	.00823	1.14	0.256	-.006773 .025491	.554648

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Hispanic, low-income

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .07143929$$

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-1.16e-06	.00000	-2.69	0.007	-2.0e-06 -3.2e-07	6695
male*	.0134082	.01197	1.12	0.263	-.010061 .036877	.554648

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Asian

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .02584194$$

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-8.78e-07	.00000	-5.07	0.000	-1.2e-06 -5.4e-07	40002.3
male*	.0206419	.00978	2.11	0.035	.001474 .03981	.454825

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Asian, low-income

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .07773323$$

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-2.50e-06	.00000	-2.37	0.018	-4.6e-06 -4.3e-07	6858.91
male*	.0581439	.02672	2.18	0.030	.005769 .110519	.454825

(*) dy/dx is for discrete change of dummy variable from 0 to 1

White

Marginal effects after logit

$$y = \text{Pr}(\text{bus}) \text{ (predict)}$$

$$= .01905542$$

variable	dy/dx	Std. Err.	z	P>|z|	[ 95% C.I.]	X
income	-1.16e-07	.00000	-2.51	0.012	-2.1e-07 -2.5e-08	49326.9
male*	.0083371	.00345	2.42	0.016	.001572 .015103	.531367

(*) dy/dx is for discrete change of dummy variable from 0 to 1

White, low-income

Marginal effects after logit

y = Pr(bus) (predict)

= .02478698

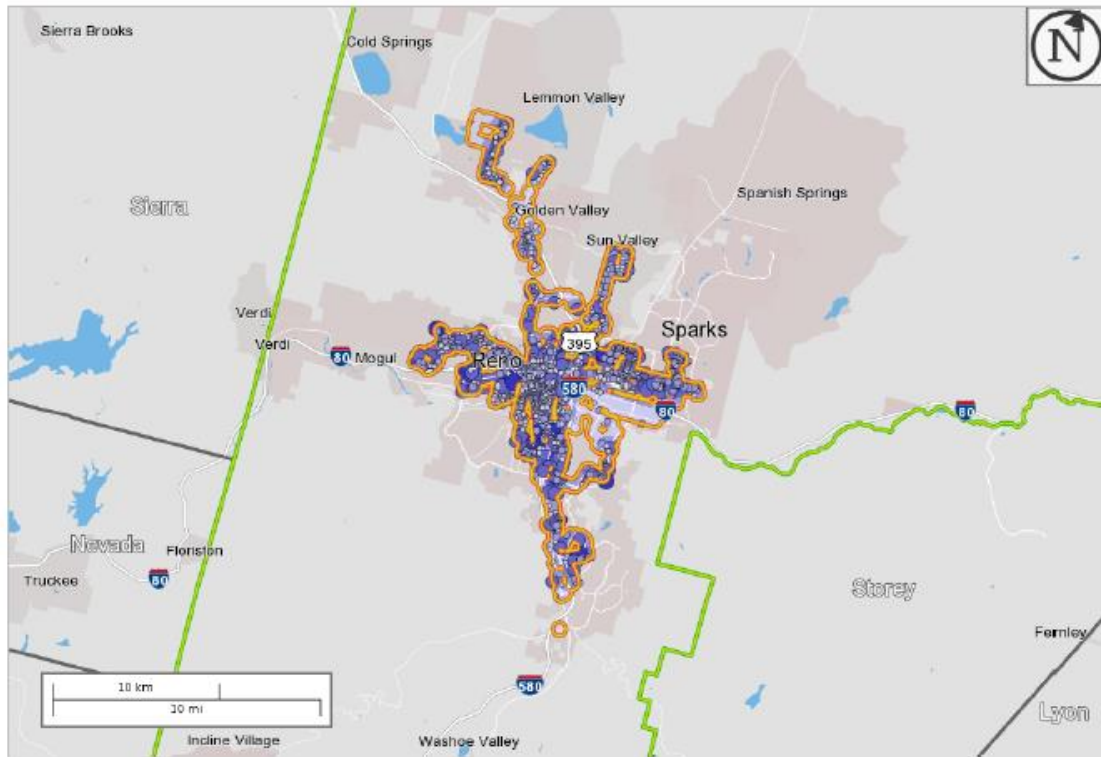
variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
income	-1.50e-07	.00000	-1.99	0.046	-3.0e-07	-2.4e-09		5917.89
male*	.0107802	.0047	2.29	0.022	.001565	.019995		.531367

(*) dy/dx is for discrete change of dummy variable from 0 to 1

This set of binomial logit regressions show some interesting results as well. The coefficients and significance are different at different income levels: low, mid and high. The regressions also show that the predicted probability for taking public transit varies among different races at different income levels. In the first regression, we see that income is strongly significant, however gender is not for black individuals. The predicted probability evaluated at the mean income level for all blacks of \$35,166 is 8.18%. However, when evaluating the probability of taking public transit at the mean income level for blacks in the low-income group, the probability jumps up to 20.84%. The predicted probability for Hispanic is 4.87% at the mean income and 7.14% at the mean for low-income Hispanics. The probability for Asians is 2.58% at the mean level, however it jumps to 7.77% for low-income Asians. So, it appears that Asians are less likely than Hispanics to take public transit generally, however, low-income Asians may be just as likely if not more likely to take the bus than low-income Hispanics. The predicted probability for whites is only 1.91% at the average income of \$49,326.90, and evaluated at the low-income average of \$5917.89, the probability of taking public transit only increases to 2.48%. These results show that when evaluated at similar levels of income, the probability of taking public transit varies greatly among different races.

Results: Access to Public Transit

Map 1: Residence within Service Area



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 190
- 191 - 747
- 748 - 1,676
- 1,677 - 2,975
- 2,976 - 4,647

Job Count [Jobs/Census Block]

- 1 - 2
- 3 - 28
- 29 - 141
- 142 - 444
- 445 - 1,084

Selection Areas

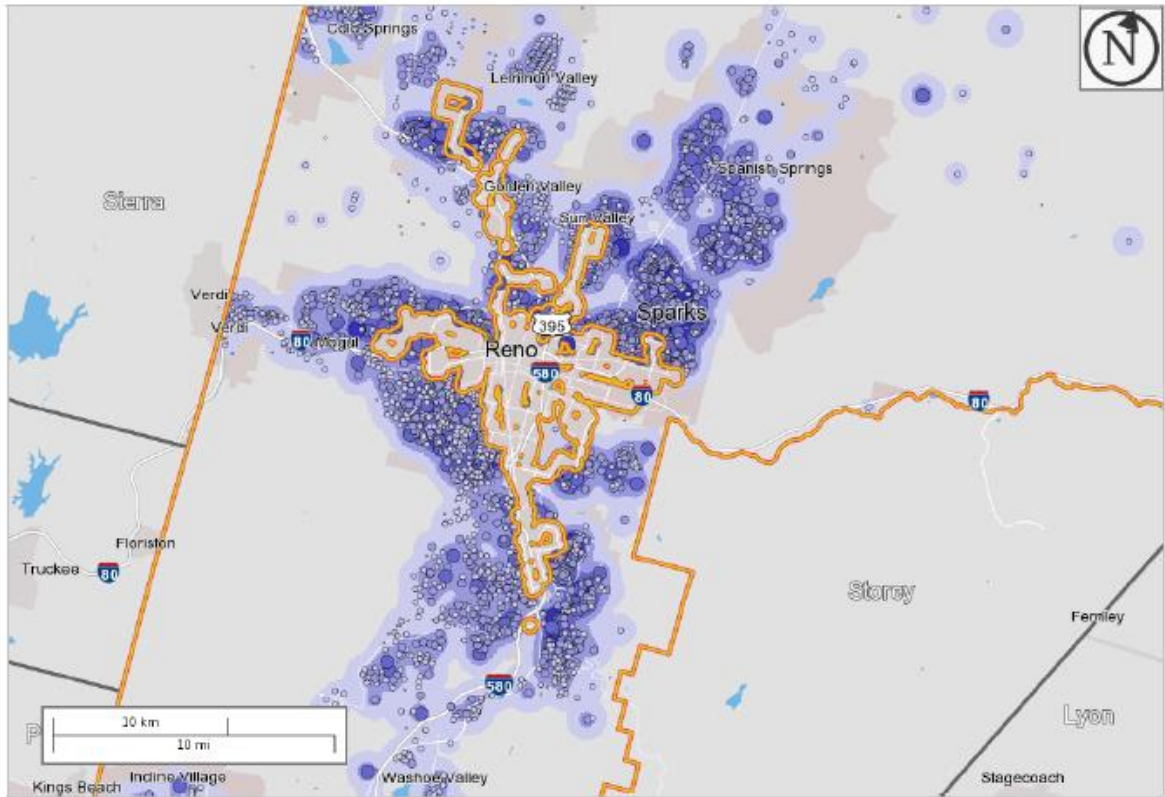
- ✎ Analysis Selection
- ✎ Advanced Selection



Map 1 above is a visual display of the service area, which is shown by the orange borders, and the residences inside the service area. The dots on the map indicate workers living in that location, with larger dots representing higher counts of workers and darker shades of purple for increased density. It can be seen from this map that the population of residences in the service area is not equally distributed and there are certain areas with

more worker residences and higher densities. As can be seen in Table 2, 41.6% of workers live inside of the service area.

Map 2: Residence Outside of Service Area



Map Legend

Job Density [Jobs/Sq. Mile]	Job Count [Jobs/Census Block]
■ 5 - 133	○ 1 - 2
■ 134 - 517	○ 3 - 21
■ 518 - 1,157	○ 22 - 105
■ 1,158 - 2,053	● 106 - 330
■ 2,054 - 3,206	● 331 - 805
	Selection Areas
	★ Analysis Selection
	★ Advanced Selection



Map 2 shows the service area once again, this time showing the residences in Washoe County that are outside of the service area. As can be seen from this map, there is a substantial population in the surrounding area that does not have access to public

transportation. The majority of workers live outside of the service area, 58.4% versus the 41.6% inside.

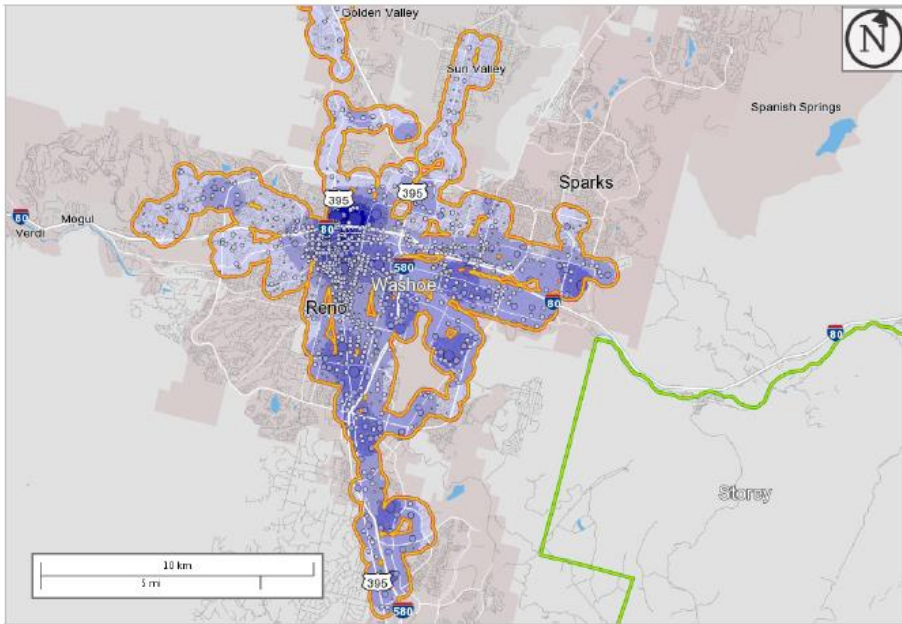
Table 2 shows a breakdown of the workers by several demographic categories including age, earnings, industry, race, education, and sex. The “Homes Inside” column represents the workers living inside the service area, as seen in Map 1. The “Homes Outside” column represents the workers living outside of the service area, as seen in Map 2. There are 79,067 workers living inside the service area and 111,122 workers living outside. In Table 2, we can see that the breakdown of demographics is not the same for those living inside the service area as those living outside the service area. For instance, if we look at the income breakdown for those living inside versus outside, we can see that those living inside are relatively poorer. Only 27.6% of those living in the service area make more than \$3,333 per month compared to 45% outside of the service area. We can also see from this table that there is a big discrepancy when it comes to race. 74.2% of people living outside the service area are white, compared to just 58.7% being white inside the service area. Inside the service area, there is a much larger proportion of minorities compared to outside the service area.

Table 2: Analysis of Residence

Total All Jobs	Homes Inside			Homes Outside			Homes Total	
	Count	Share Within	Share of Total	Count	Share	Share of Total	Count	Share of Total
Total All Jobs	79,067	100.0%	41.6%	111,122	100.0%	58.4%	190,189	100.0%
Jobs by Worker Age								
	2014			2014				
	Count	Share		Count	Share			
Age 29 or younger	20,837	26.4%	11.0%	22,822	20.5%	12.0%	43,659	23.0%
Age 30 to 54	41,494	52.5%	21.8%	61,762	55.6%	32.5%	103,256	54.3%
Age 55 or older	16,736	21.2%	8.8%	26,538	23.9%	14.0%	43,274	22.8%
Jobs by Earnings								
	2014			2014				
	Count	Share		Count	Share			
\$1,250 per month or less	20,133	25.5%	10.6%	23,021	20.7%	12.1%	43,154	22.7%
\$1,251 to \$3,333 per month	37,078	46.9%	19.5%	38,062	34.3%	20.0%	75,140	39.5%
More than \$3,333 per month	21,856	27.6%	11.5%	50,039	45.0%	26.3%	71,895	37.8%
Jobs by NAICS Industry Sector								
	2014			2014				
	Count	Share		Count	Share			
Agriculture, Forestry, Fishing and Hunting	265	0.3%	0.1%	428	0.4%	0.2%	693	0.4%
Mining, Quarrying, and Oil and Gas Extraction	321	0.4%	0.2%	614	0.6%	0.3%	935	0.5%
Utilities	232	0.3%	0.1%	706	0.6%	0.4%	938	0.5%
Construction	4,132	5.2%	2.2%	6,273	5.6%	3.3%	10,405	5.5%
Manufacturing	5,051	6.4%	2.7%	6,911	6.2%	3.6%	11,962	6.3%
Wholesale Trade	3,390	4.3%	1.8%	5,068	4.6%	2.7%	8,458	4.4%
Retail Trade	9,464	12.0%	5.0%	12,024	10.8%	6.3%	21,488	11.3%
Transportation and Warehousing	5,506	7.0%	2.9%	6,762	6.1%	3.6%	12,268	6.5%
Information	816	1.0%	0.4%	1,305	1.2%	0.7%	2,121	1.1%
Finance and Insurance	2,031	2.6%	1.1%	3,276	2.9%	1.7%	5,307	2.8%
Real Estate and Rental and Leasing	1,393	1.8%	0.7%	1,921	1.7%	1.0%	3,314	1.7%
Professional, Scientific, and Technical Services	3,523	4.5%	1.9%	6,125	5.5%	3.2%	9,648	5.1%
Management of Companies and Enterprises	902	1.1%	0.5%	1,736	1.6%	0.9%	2,638	1.4%
Administration & Support, Waste Management and Remediation	6,326	8.0%	3.3%	6,833	6.1%	3.6%	13,159	6.9%
Educational Services	5,279	6.7%	2.8%	11,056	9.9%	5.8%	16,335	8.6%
Health Care and Social Assistance	8,363	10.6%	4.4%	12,616	11.4%	6.6%	20,979	11.0%
Arts, Entertainment, and Recreation	2,410	3.0%	1.3%	3,116	2.8%	1.6%	5,526	2.9%
Accommodation and Food Services	14,651	18.5%	7.7%	14,392	13.0%	7.6%	29,043	15.3%
Other Services (excluding Public Administration)	2,121	2.7%	1.1%	2,951	2.7%	1.6%	5,072	2.7%
Public Administration	2,891	3.7%	1.5%	7,009	6.3%	3.7%	9,900	5.2%
Jobs by Worker Race								
	2014			2014				
	Count	Share		Count	Share			
White Alone	46,394	58.7%	24.4%	82,486	74.2%	43.4%	128,880	67.8%
Hispanic or Latino	20,330	25.7%	10.7%	15,964	14.4%	8.4%	36,294	19.1%
Black or African American Alone	3,243	4.1%	1.7%	2,463	2.2%	1.3%	5,706	3.0%
American Indian or Alaska Native Alone	1,477	1.9%	0.8%	1,722	1.5%	0.9%	3,199	1.7%
Asian Alone	5,428	6.9%	2.9%	6,030	5.4%	3.2%	11,458	6.0%
Native Hawaiian or Other Pacific Islander Alone	386	0.5%	0.2%	373	0.3%	0.2%	759	0.4%
Two or More Race Groups	1,809	2.3%	1.0%	2,084	1.9%	1.1%	3,893	2.0%
Jobs by Worker Ethnicity								
	2014			2014				
	Count	Share		Count	Share			
Not Hispanic or Latino	58,737	74.3%	30.9%	95,158	85.6%	50.0%	153,895	80.9%
Jobs by Worker Educational Attainment								
	2014			2014				
	Count	Share		Count	Share			
Less than high school	10,289	13.0%	5.4%	10,111	9.1%	5.3%	20,400	10.7%
High school or equivalent, no college	14,309	18.1%	7.5%	20,259	18.2%	10.7%	34,568	18.2%
Some college or Associate degree	18,598	23.5%	9.8%	29,545	26.6%	15.5%	48,143	25.3%
Bachelor's degree or advanced degree	15,034	19.0%	7.9%	28,385	25.5%	14.9%	43,419	22.8%
Educational attainment not available (workers aged 29 or younger)	20,837	26.4%	11.0%	22,822	20.5%	12.0%	43,659	23.0%
Jobs by Worker Sex								
	2014			2014				
	Count	Share		Count	Share			
Male	41,233	52.1%	21.7%	57,282	51.5%	30.1%	98,515	51.8%
Female	37,834	47.9%	19.9%	53,840	48.5%	28.3%	91,674	48.2%

Map's 3 and 4 use the same logic as Map 1 and Map 2, but instead of showing residences, these maps show workplaces. Map 3 represents the workers by their workplace inside the service area. When comparing Map 3 to Map 1, we can see that the workplaces inside the service area are much more concentrated than the residences inside the service area. There is a high job count and density in the area around the 395 and I-80 intersection. Map 4 shows the workplaces outside of the service area. When comparing with Map 2, it can be easily seen that there are many more residences outside of the service area than workplaces. Table 3 shows an analysis of workers based on workplace inside and outside of the service area. In addition, Table 2 and Table 3 show that there are only 46,544 individuals who work outside of the service area, while there are 111,112 workers living outside of the service area. From Table 2 and Table 3, we can see that 76.1% of individuals in the dataset work inside of the service area, while only 41.6% live inside of the service area. Therefore, most workers have a bus stop near their workplace, but not near their residence.

Map 3: Workplace within Service Area



Map 4: Workplace Outside of Service Area

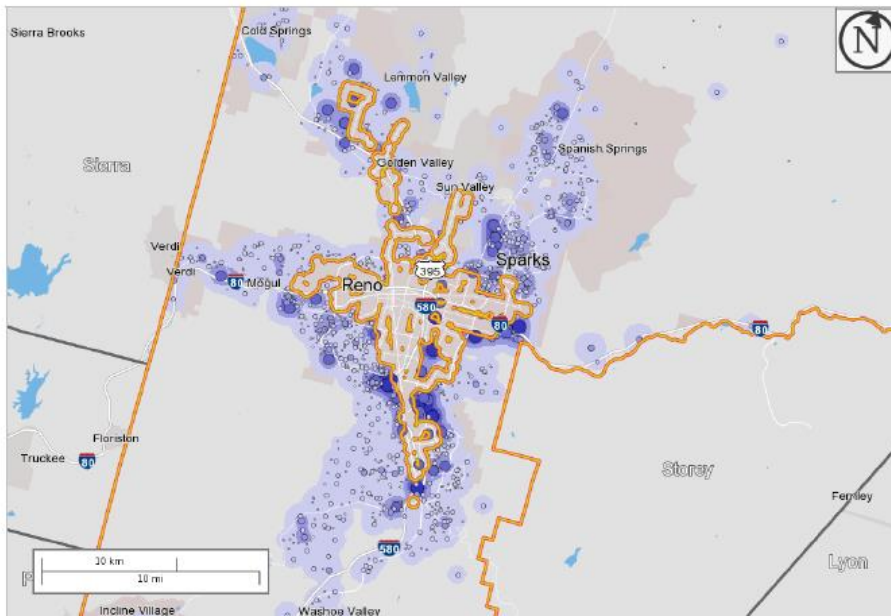


Table 3: Analysis of Workplace

Total All Jobs	Work Inside			Work Outside			Work Total	
	2014			2014			Count	Share of Total
	Count	Share	Share of Total	Count	Share	Share of Total		
Total All Jobs	148,895	100.0%	76.1%	46,844	100.0%	23.9%	195,739	100.0%
Jobs by Worker Age	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
Age 29 or younger	34,037	22.9%	17.4%	11,384	24.3%	5.8%	45,421	23.2%
Age 30 to 54	80,564	54.1%	41.2%	24,893	53.1%	12.7%	105,457	53.9%
Age 55 or older	34,294	23.0%	17.5%	10,567	22.6%	5.4%	44,861	22.9%
Jobs by Earnings	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
\$1,250 per month or less	33,876	22.8%	17.3%	11,670	24.9%	6.0%	45,546	23.3%
\$1,251 to \$3,333 per month	58,140	39.0%	29.7%	20,085	42.9%	10.3%	78,225	40.0%
More than \$3,333 per month	56,879	38.2%	29.1%	15,089	32.2%	7.7%	71,968	36.8%
Jobs by NAICS Industry Sector	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
Agriculture, Forestry, Fishing and Hunting	23	0.0%	0.0%	96	0.2%	0.0%	119	0.1%
Mining, Quarrying, and Oil and Gas Extraction	238	0.2%	0.1%	131	0.3%	0.1%	369	0.2%
Utilities	592	0.4%	0.3%	197	0.4%	0.1%	789	0.4%
Construction	6,804	4.6%	3.5%	4,079	8.7%	2.1%	10,883	5.6%
Manufacturing	8,111	5.4%	4.1%	3,473	7.4%	1.8%	11,584	5.9%
Wholesale Trade	6,588	4.4%	3.4%	2,731	5.8%	1.4%	9,319	4.8%
Retail Trade	16,725	11.2%	8.5%	5,449	11.6%	2.8%	22,174	11.3%
Transportation and Warehousing	8,325	5.6%	4.3%	4,527	9.7%	2.3%	12,852	6.6%
Information	1,835	1.2%	0.9%	393	0.8%	0.2%	2,228	1.1%
Finance and Insurance	4,495	3.0%	2.3%	1,245	2.7%	0.6%	5,740	2.9%
Real Estate and Rental and Leasing	2,411	1.6%	1.2%	1,096	2.3%	0.6%	3,507	1.8%
Professional, Scientific, and Technical Services	6,917	4.6%	3.5%	3,448	7.4%	1.8%	10,365	5.3%
Management of Companies and Enterprises	2,283	1.5%	1.2%	537	1.1%	0.3%	2,820	1.4%
Administration & Support, Waste Management and Remediation	11,125	7.5%	5.7%	3,705	7.9%	1.9%	14,830	7.6%
Educational Services	16,278	10.9%	8.3%	820	1.8%	0.4%	17,098	8.7%
Health Care and Social Assistance	17,556	11.8%	9.0%	4,240	9.1%	2.2%	21,796	11.1%
Arts, Entertainment, and Recreation	2,859	1.9%	1.5%	2,703	5.8%	1.4%	5,562	2.8%
Accommodation and Food Services	24,241	16.3%	12.4%	5,842	12.5%	3.0%	30,083	15.4%
Other Services (excluding Public Administration)	3,926	2.6%	2.0%	1,458	3.1%	0.7%	5,384	2.8%
Public Administration	7,563	5.1%	3.9%	674	1.4%	0.3%	8,237	4.2%
Jobs by Worker Race	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
White Alone	101,193	68.0%	51.7%	31,091	66.4%	15.9%	132,284	67.6%
Hispanic or Latino	27,562	18.5%	14.1%	9,517	20.3%	4.9%	37,079	18.9%
Black or African American Alone	4,938	3.3%	2.5%	1,404	3.0%	0.7%	6,342	3.2%
American Indian or Alaska Native Alone	2,364	1.6%	1.2%	994	2.1%	0.5%	3,358	1.7%
Asian Alone	9,092	6.1%	4.6%	2,656	5.7%	1.4%	11,748	6.0%
Native Hawaiian or Other Pacific Islander Alone	641	0.4%	0.3%	171	0.4%	0.1%	812	0.4%
Two or More Race Groups	3,105	2.1%	1.6%	1,011	2.2%	0.5%	4,116	2.1%
Jobs by Worker Ethnicity	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
Not Hispanic or Latino	121,333	81.5%	62.0%	37,327	79.7%	19.1%	158,660	81.1%
Jobs by Worker Educational Attainment	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
Less than high school	15,286	10.3%	7.8%	5,430	11.6%	2.8%	20,716	10.6%
High school or equivalent, no college	26,458	17.8%	13.5%	8,709	18.6%	4.4%	35,167	18.0%
Some college or Associate degree	37,808	25.4%	19.3%	11,631	24.8%	5.9%	49,439	25.3%
Bachelor's degree or advanced degree	35,306	23.7%	18.0%	9,690	20.7%	5.0%	44,996	23.0%
Educational attainment not available (workers aged 29 or younger)	34,037	22.9%	17.4%	11,384	24.3%	5.8%	45,421	23.2%
Jobs by Worker Sex	2014			2014				
	Count	Share	Share of Total	Count	Share	Share of Total		
Male	75,241	50.5%	38.4%	25,654	54.8%	13.1%	100,895	51.5%
Female	73,654	49.5%	37.6%	21,190	45.2%	10.8%	94,844	48.5%

Map 5: Identifying Non-Served Areas by Residence

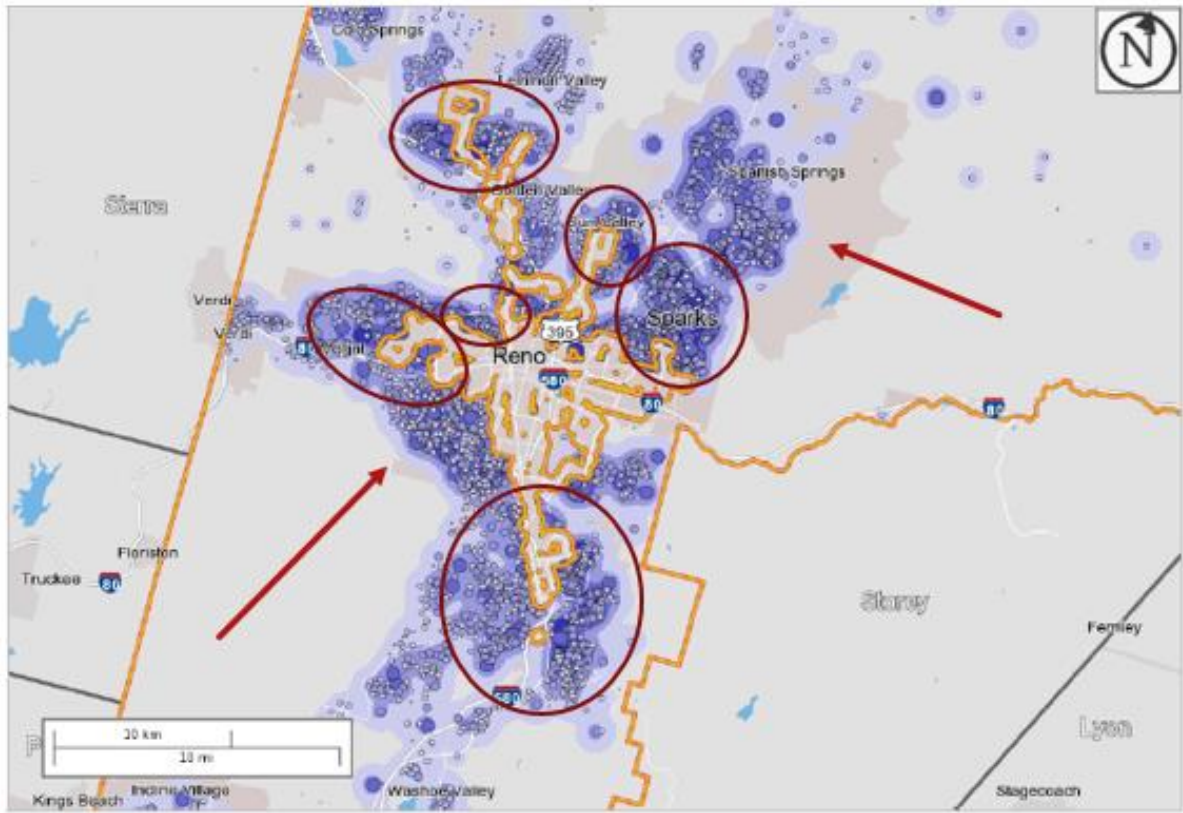
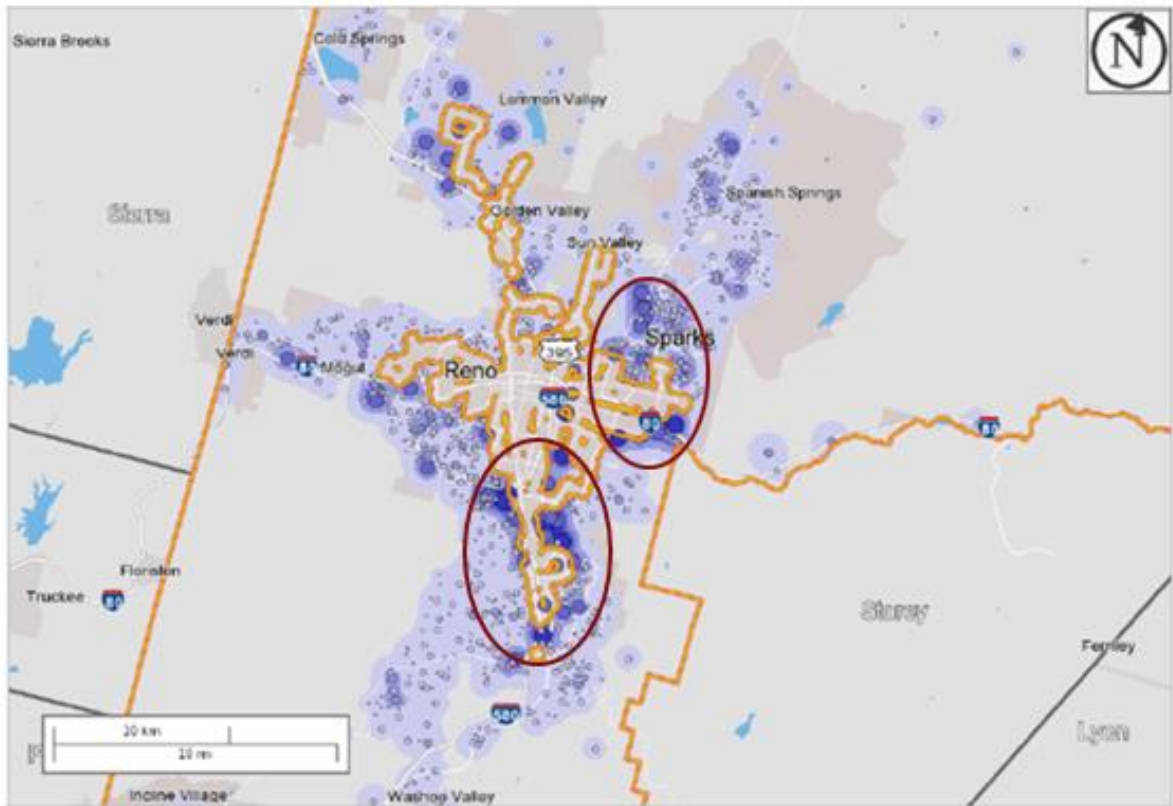


Table 4: Workers (Residence)

Area	Sun Valley		West Univ.		Sparks		Stead		Northwest		South Reno	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Size (Sq. Mi.)	1.014	1.751	1.061	1.771	3.626	3.728	3.354	2.704	5.368	2.251	7.031	11.85
# of Census Blocks	41	82	103	146	269	241	177	96	254	143	310	443
Total Count	2848	3277	2391	5101	9784	9663	6732	2652	6791	5595	6142	5427
Low-Inc	645	814	627	1330	2069	2279	1430	612	1468	1276	1202	1074
Mid-Inc	1462	1692	889	2125	4122	4467	3044	1351	2196	2071	1832	2089
Density (Workers/sq. mi.)	2808.68	1871.50	2253.53	2880.29	2698.29	2592.01	2007.16	980.77	1265.09	2485.56	873.56	458.13
Low-Inc	636.09	464.88	590.95	750.99	570.60	611.32	426.36	226.33	273.47	566.86	170.96	90.66
Low + Mid-Inc Density	2077.91	1431.18	1428.84	1950.88	1707.39	1809.55	1333.93	725.96	682.56	1486.89	431.52	267.01

Map 6: Non-Served Areas by Workplace**Table 5: Jobs (Workplace)**

Area	Sun Valley		West Univ.		Sparks		Stead		Northwest		South Reno	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Service												
Size (Sq. Mi.)	1.014	1.751	1.061	1.771	3.626	3.728	3.354	2.704	5.368	2.251	7.031	11.846
# of Census												
Blocks	41	82	103	146	269	241	177	96	254	143	310	443
Total Count	86	434	111	1341	1576	11022	808	919	1497	2469	12534	21617
Low-Inc	43	164	34	470	519	2900	205	111	387	909	2582	4929
Mid-Inc	39	212	52	624	685	5056	289	533	719	1116	5657	7573
Density (Jobs/sq. mi.)	84.81	247.86	104.62	757.20	434.64	2956.55	240.91	339.87	278.87	1096.85	1782.68	1824.84
Low-Inc Density	42.41	93.66	32.05	265.39	143.13	777.90	61.12	41.05	72.09	403.82	367.23	416.09
Low + Mid-Inc Density	80.87	214.73	81.06	617.73	332.05	2134.12	147.29	238.17	206.04	899.60	1171.81	1055.38

Table 6: Combined Workers and Jobs

Area	Sun Valley		West Univ.		Sparks		Stead		Northwest		South Reno	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Service												
Size (Sq. Mi.)	1.014	1.751	1.061	1.771	3.626	3.728	3.354	2.704	5.368	2.251	7.031	11.846
# of Census Blocks	41	82	103	146	269	241	177	96	254	143	310	443
Total Count	2934	3711	2502	6442	11360	20685	7540	3571	8288	8064	18676	27044
Low-Inc	688	978	661	1800	2588	5179	1635	723	1855	2185	3784	6003
Mid-Inc	1501	1904	941	2749	4807	9523	3333	1884	2915	3187	7489	9662
Density (Combo/sq. mi.)	2893.49	2119.36	2358.15	3637.49	3132.93	5548.55	2248.06	1320.64	1543.96	3582.41	2656.24	2282.96
Low-Inc Density	678.50	558.54	623.00	1016.37	713.73	1389.22	487.48	267.38	345.57	970.68	538.19	506.75
Low + Mid-Inc Density	2158.78	1645.92	1509.90	2568.61	2039.44	3943.67	1481.22	964.13	888.60	2386.49	1603.33	1322.39

These maps and tables show areas that are good candidates for public transit service, as well as a comparison between current served areas and non-served areas. Map 5 shows the non-served areas that I have identified as having relatively high densities of workers, which are circled in the map. The regression results showed that lower income workers are more likely to take public transit, so not only are we comparing the total densities in the served and non-served areas, but also the density of low and middle income workers. The arrows point to two locations that seem to have high densities by looking at the map, however these areas are both high-income areas. Therefore, these areas would not be good candidates for public transit expansion, as shown in the regression results with high-income workers being very unlikely to take public transit. Map 6 shows two circled areas that have high densities of non-served jobs based on workplace. As we saw in the previous maps and tables, workplace is much better served than residence, and therefore there are not as many non-served areas identified in this map. Sparks is identified in both maps, so that means the only new area identified in Map 6 compared to Map 5 is South Reno.

Table 7: Ranking of Areas by Density

Rank	Area	Service	Density (Combo/sq. mi.)
1	Sparks	Served	5548.55
2	West Univ.	Served	3637.49
3	Northwest	Served	3582.41
4	Sparks	Non-Served	3132.93
5	Sun Valley	Non-Served	2893.49
6	South Reno	Non-Served	2656.24
7	West Univ.	Non-Served	2358.15
8	South Reno	Served	2282.96
9	Stead	Non-Served	2248.06
10	Sun Valley	Served	2119.36
11	Northwest	Non-Served	1543.96
12	Stead	Served	1320.64
Rank	Area	Service	Low-Inc Density
1	Sparks	Served	1389.22
2	West Univ.	Served	1016.37
3	Northwest	Served	970.68
4	Sparks	Non-Served	713.73
5	Sun Valley	Non-Served	678.50
6	West Univ.	Non-Served	623.00
7	Sun Valley	Served	558.54
8	South Reno	Non-Served	538.19
9	South Reno	Served	506.75
10	Stead	Non-Served	487.48
11	Northwest	Non-Served	345.57
12	Stead	Served	267.38
Rank	Area	Service	Low + Mid-Inc Density
1	Sparks	Served	3943.67
2	West Univ.	Served	2568.61
3	Northwest	Served	2386.49
4	Sun Valley	Non-Served	2158.78
5	Sparks	Non-Served	2039.44
6	Sun Valley	Served	1645.92
7	South Reno	Non-Served	1603.33
8	West Univ.	Non-Served	1509.90
9	Stead	Non-Served	1481.22
10	South Reno	Served	1322.39
11	Stead	Served	964.13
12	Northwest	Non-Served	888.60

Tables 4, 5 and 6 consist of statistics for the six areas that are identified in Maps 5 and 6. The first row list the names of the six different areas: Sun Valley, West University, Sparks, Stead, Northwest, and South Reno. The second row says “No” for the area that is not being served, and “Yes” for the area that is being served. The third row consist of the size of the specific area in square miles. The next row shows the number of census blocks in that area. The total count row represents the total number of workers in that area. The “Low-Inc” row represents individuals who make under \$15,000 per year in their jobs. The “Mid-inc” row shows workers who make between \$15,000 and \$40,000 in annual income. The “Density” row shows the population density in that area, which is calculated by taking the total number of workers divided by the size of the area, giving the density in the form of workers per square mile for Table 4. This is done for Table 5 as well, but instead of workers it is the density of jobs per square mile. For Table 6, the density is the number of jobs plus the number of workers to get a total density amount in that area with both workers and jobs. The last two rows show the population density for low income workers and low plus middle income workers in the respective areas. Once again, we are defining “low-income” in this case as individuals who make under \$15,000 per year in their jobs and we are defining “middle income” as workers who make between \$15,000 and \$40,000 in annual income. Therefore, the “Low + Mid-Inc Density” includes all workers or jobs where the annual income is under \$40,000.

Table 7 shows a ranking of the served and non-served areas in terms of density of workers plus jobs combined as in Table 6. This table may be helpful in identifying the best areas for expansion, because it combines both workers and jobs to get a combined density

total. There are three separate rankings: first for total density, second by low-income and density, and third by low plus mid-income density.

As can be seen in the literature review and the analysis in this paper, not only is density important but income is very important as well. Therefore, ranking by total density may not be adequate when attempting to identify the best possible areas for public transit expansion. When ranking by total density (ignoring income level) we can see that Sparks has the highest total density for non-served areas. Sun Valley, South Reno, West University and Stead come next with Northwest having lower density. Sparks, Sun Valley, and West University are the top 3 non-served areas when looking at low-income density. Next, when combining low and mid income, we can see the top ranked non-served area is Sun Valley as opposed to Sparks. As can be seen in the regression results, the predicted probability for low plus mid income workers is not much lower than low income workers alone. It is really the high income workers that are not very likely to take public transit. Looking at low and mid income combined areas may be the best option when identifying best areas for public transit. Therefore, it appears that the best areas for expansion are Sun Valley and Sparks. Good candidates are also West University and South Reno. Stead and Northwest do not appear to be as relatively good candidates as the other aforementioned areas.

Conclusions

In an effort to better understand access and usage of public transportation in Reno, Nevada, we analyzed economic and demographic data from the U.S. Census Bureau. We examined those currently with access to public transit, as well as where workers live and work in order to identify potential locations for public transit expansion in the Reno area.

The focus was placed on areas of high density levels of workers and jobs, with an emphasis on lower income workers. From our analysis on public transit access, we have found that there are several areas that have strong potential for usage should the RTC expand its service to those areas.

Despite the fact that most Americans travel by car, not all people make that choice voluntarily. We have seen that a number of factors can make certain transit modes more or less possible, including individual and environmental characteristics. An individual's age, gender, income, and race can greatly affect their travel behavior. Similarly, the design and the composition of a place can influence the relative ease of travel by different modes. Not everyone has equal access to convenient transportation and these inequalities can be controlled by specific planning choices. Even where public transit is provided, communities of color are often underserved, or their transit is underfunded. Bus transit is just such an example. The majority of bus riders are minorities, and buses carry 60% of transit passengers, yet they receive just 33% of transit funding nationally (Luberoff, 2002).

As we have seen, density is very important when it comes to public transit and its effectiveness. Not only is it important to identify the highly dense areas, but also the areas with high densities of lower income individuals. When ranking by density we can see that Sparks non-served has the highest density for non-served areas. Sun Valley, South Reno, West University and Stead come next with Northwest having lower density. Sparks, Sun Valley, and West University are the top 3 non-served areas when looking at low-income density, jumping ahead of South Reno. However, when combining low and mid income, we can see the top ranked non-served area is Sun Valley taking the place of Sparks. I believe looking at the low and mid income combined areas are ideal for identifying best areas for

public transit. Given that, it appears that the best areas for expansion are Sun Valley and Sparks. Good candidates are also West University and South Reno. Stead and Northwest do not appear to be as relatively good candidates as the others. It is clear that there are many non-served areas that have higher densities than areas currently being served.

In terms of best non-served areas for expansion, I would rank them as follows:

1. Sun Valley
2. Sparks
3. West University
4. South Reno
5. Stead
6. Northwest Reno

Many of the non-served areas we identified had higher densities of individuals likely to take public transit than some of the areas currently being served. Our regression analyses support the idea of lower income individuals being more likely to take public transit. Additionally, the regressions show us that not only is income an important factor, but race is influential as well. The predicted probabilities for taking public transit vary across the different racial groups studied. There are some policy implications from this research regarding public transit planning and service. These results can be helpful in terms of locating good quality locations for public transit service, as well as identifying the current service locations that may not be as good. This research has shown that there are numerous areas with strong potential for public transit usage, as well as areas that are possibly being overserved. This means that even without expansion, the RTC has the ability

to improve its service and ridership by shifting its routes to include these high potential areas and would therefore increase efficiency and ridership on the buses.

Overall, our particular analysis of Reno's public transit system shows us four important conclusions:

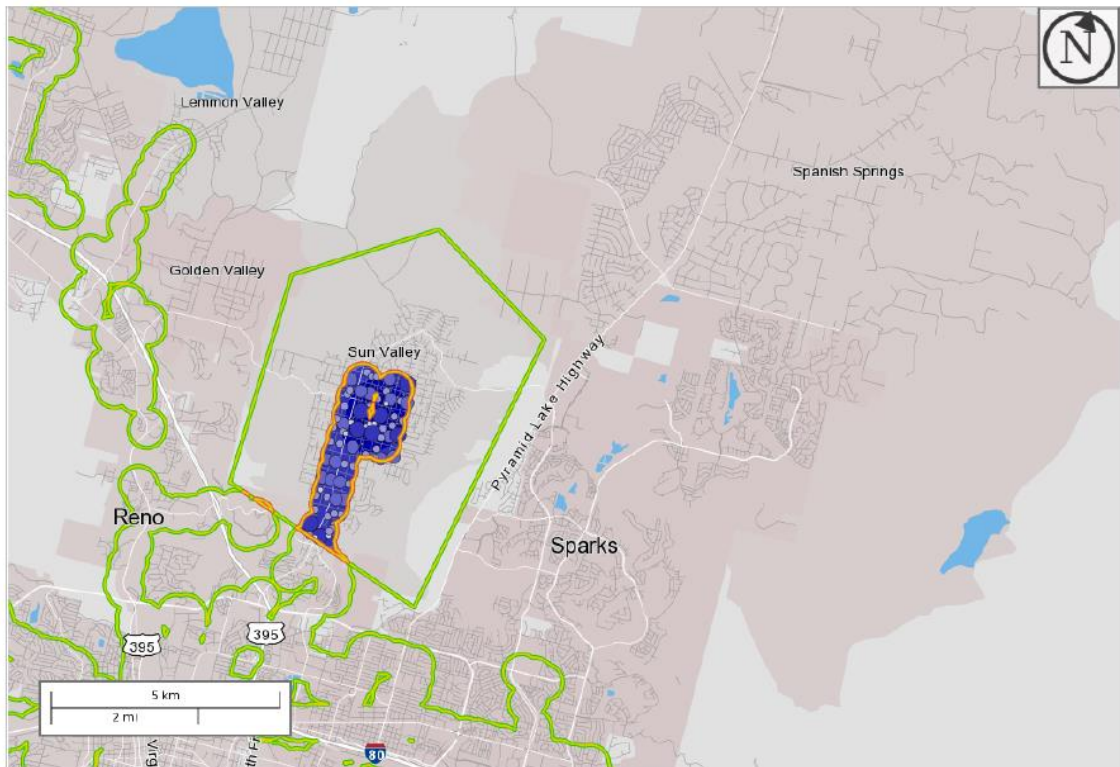
- 1) There are several areas that have strong potential for usage if the RTC were to expand its service to those areas.
- 2) Many non-served areas we identified had higher densities of individuals likely to take public transit than areas currently being served.
- 3) The regression analyses support the idea of lower income individuals being more likely to take public transit.
- 4) The regressions also show that race is an important factor in addition to income.

Appendix

Maps and Tables

The following maps and tables correspond to the locations identified in Tables 4, 5 and 6.

Sun Valley Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 82
- 83 - 313
- 314 - 699
- 700 - 1,240
- 1,241 - 1,935

Job Count [Jobs/Census Block]

- 1 - 2
- 3 - 13
- 14 - 44
- 45 - 104
- 105 - 204

Selection Areas

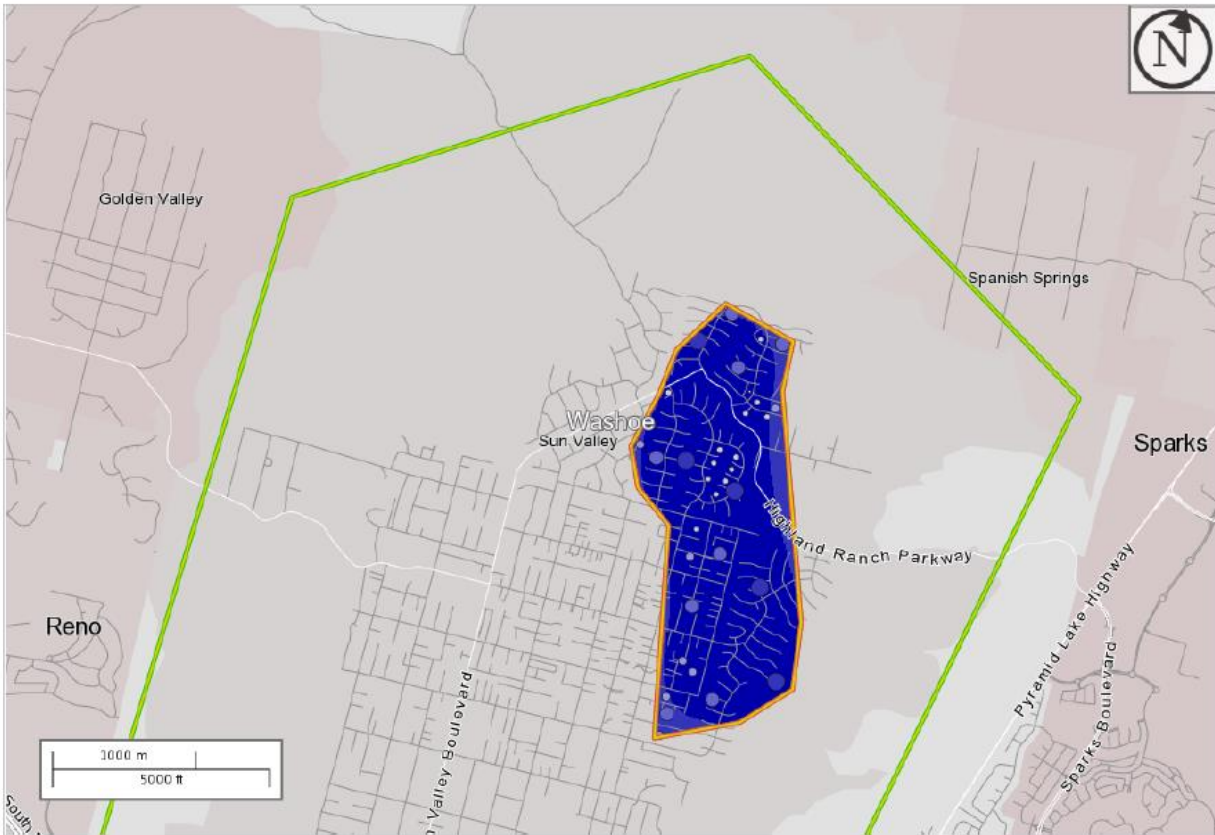
- ✦ Analysis Selection
- ✦ Advanced Selection



Sun Valley Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	3,277	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	810	24.7%
Age 30 to 54	1,789	54.6%
Age 55 or older	678	20.7%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	814	24.8%
\$1,251 to \$3,333 per month	1,692	51.6%
More than \$3,333 per month	771	23.5%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	7	0.2%
Mining, Quarrying, and Oil and Gas Extraction	16	0.5%
Utilities	6	0.2%
Construction	224	6.8%
Manufacturing	246	7.5%
Wholesale Trade	158	4.8%
Retail Trade	445	13.6%
Transportation and Warehousing	306	9.3%
Information	26	0.8%
Finance and Insurance	102	3.1%
Real Estate and Rental and Leasing	58	1.8%
Professional, Scientific, and Technical Services	106	3.2%
Management of Companies and Enterprises	33	1.0%
Administration & Support, Waste Management and Remediation	257	7.8%
Educational Services	163	5.0%
Health Care and Social Assistance	280	8.5%
Arts, Entertainment, and Recreation	121	3.7%
Accommodation and Food Services	557	17.0%
Other Services (excluding Public Administration)	95	2.9%
Public Administration	71	2.2%

Sun Valley Non Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 82
- 83 - 316
- 317 - 704
- 705 - 1,249
- 1,250 - 1,949

Job Count [Jobs/Census Block]

- 1 - 3
- 4 - 24
- 25 - 79
- 80 - 186
- 187 - 363

Selection Areas

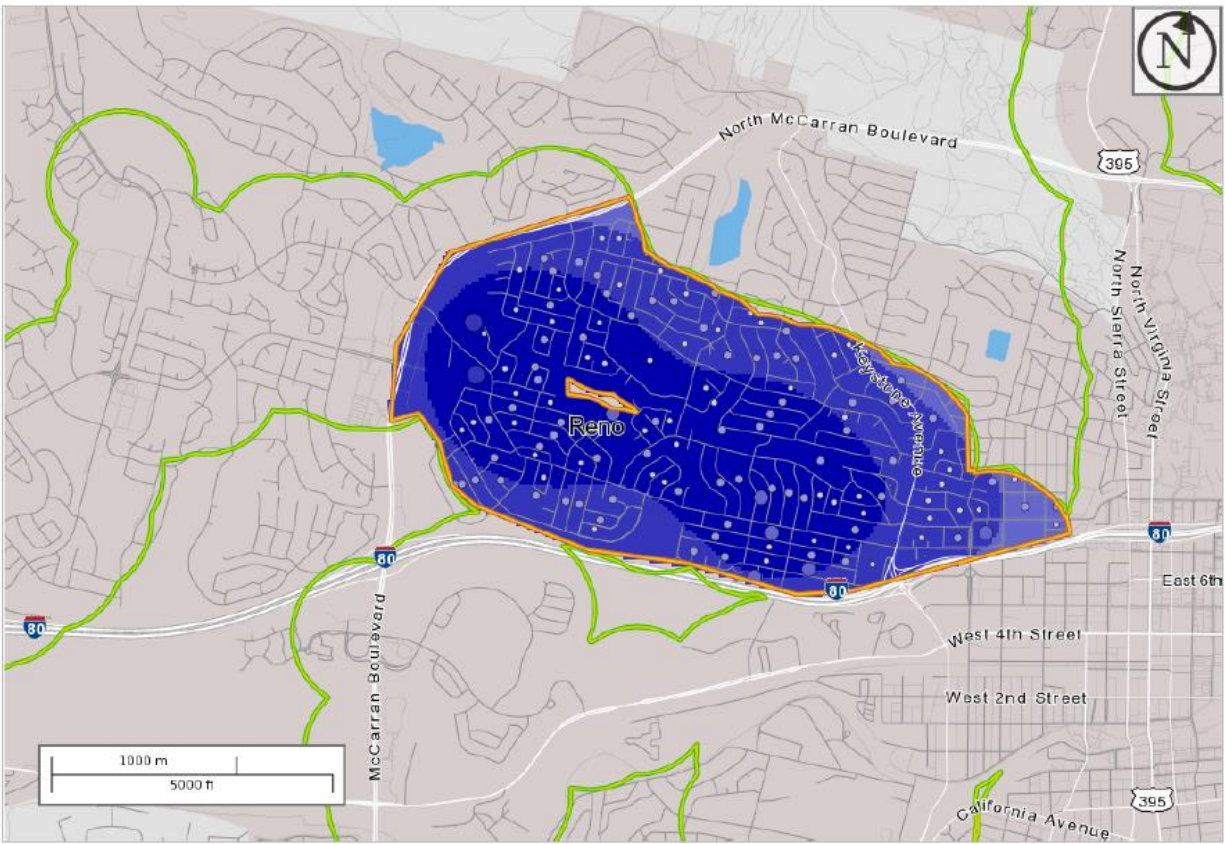
- ✦ Analysis Selection
- ✦ Advanced Selection



Sun Valley Non Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	2,848	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	707	24.8%
Age 30 to 54	1,558	54.7%
Age 55 or older	583	20.5%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	645	22.6%
\$1,251 to \$3,333 per month	1,462	51.3%
More than \$3,333 per month	741	26.0%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	14	0.5%
Mining, Quarrying, and Oil and Gas Extraction	9	0.3%
Utilities	10	0.4%
Construction	207	7.3%
Manufacturing	228	8.0%
Wholesale Trade	144	5.1%
Retail Trade	362	12.7%
Transportation and Warehousing	255	9.0%
Information	21	0.7%
Finance and Insurance	67	2.4%
Real Estate and Rental and Leasing	52	1.8%
Professional, Scientific, and Technical Services	124	4.4%
Management of Companies and Enterprises	13	0.5%
Administration & Support, Waste Management and Remediation	224	7.9%
Educational Services	156	5.5%
Health Care and Social Assistance	258	9.1%
Arts, Entertainment, and Recreation	86	3.0%
Accommodation and Food Services	441	15.5%
Other Services (excluding Public Administration)	80	2.8%
Public Administration	97	3.4%

West University Served



Map Legend

Job Density [Jobs/Sq. Mile]

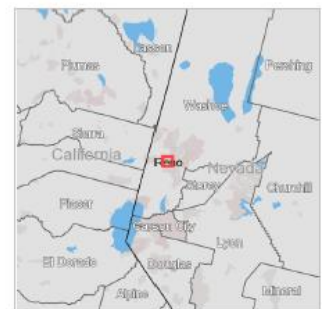
- 5 - 132
- 133 - 516
- 517 - 1,155
- 1,156 - 2,051
- 2,052 - 3,202

Job Count [Jobs/Census Block]

- 1 - 4
- 5 - 25
- 26 - 81
- 82 - 193
- 194 - 376

Selection Areas

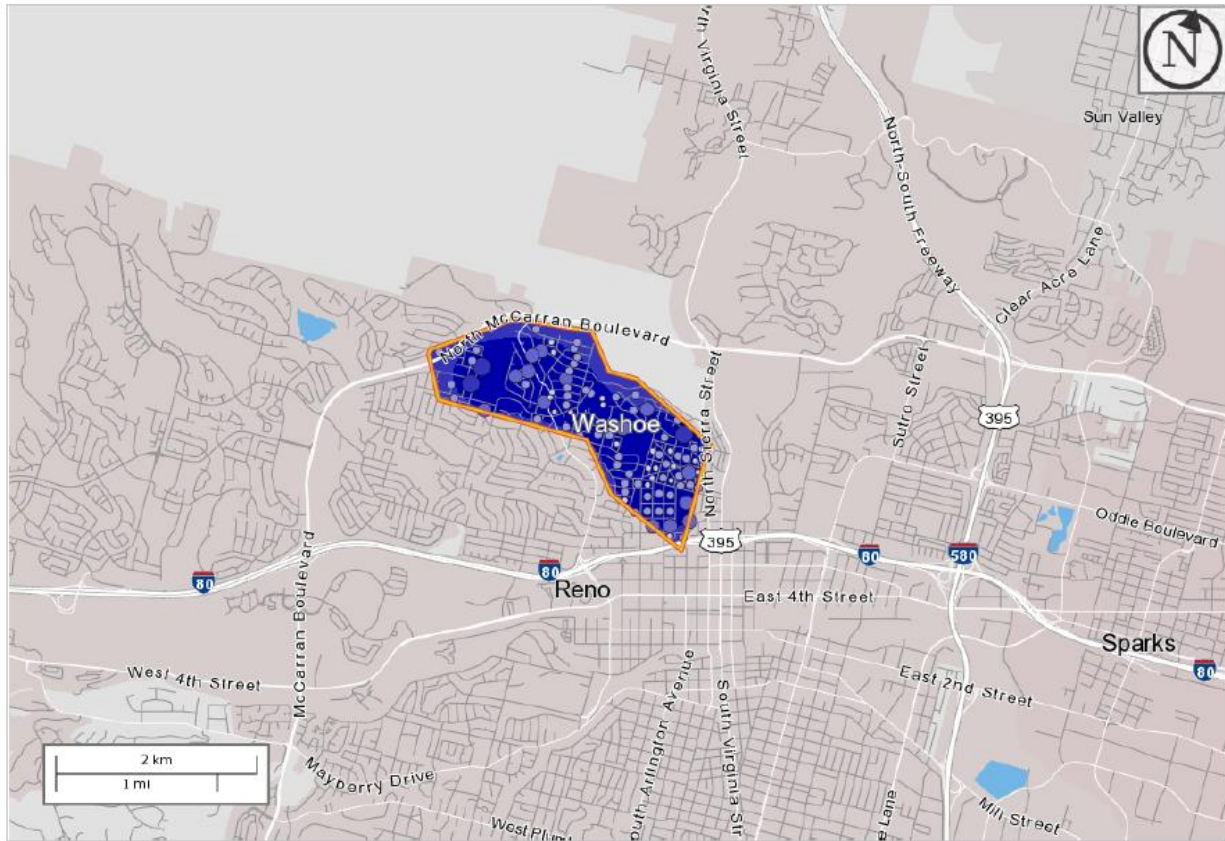
- ▲ Analysis Selection
- ▲ Advanced Selection



West University Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	5,101	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	1,430	28.0%
Age 30 to 54	2,596	50.9%
Age 55 or older	1,075	21.1%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	1,330	26.1%
\$1,251 to \$3,333 per month	2,125	41.7%
More than \$3,333 per month	1,646	32.3%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	19	0.4%
Mining, Quarrying, and Oil and Gas Extraction	12	0.2%
Utilities	19	0.4%
Construction	246	4.8%
Manufacturing	257	5.0%
Wholesale Trade	182	3.6%
Retail Trade	535	10.5%
Transportation and Warehousing	270	5.3%
Information	53	1.0%
Finance and Insurance	138	2.7%
Real Estate and Rental and Leasing	93	1.8%
Professional, Scientific, and Technical Services	250	4.9%
Management of Companies and Enterprises	76	1.5%
Administration & Support, Waste Management and Remediation	370	7.3%
Educational Services	544	10.7%
Health Care and Social Assistance	536	10.5%
Arts, Entertainment, and Recreation	166	3.3%
Accommodation and Food Services	936	18.3%
Other Services (excluding Public Administration)	143	2.8%
Public Administration	256	5.0%

West University Non Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 75
- 76 - 285
- 286 - 635
- 636 - 1,125
- 1,126 - 1,755

Job Count [Jobs/Census Block]

- 1 - 2
- 3 - 11
- 12 - 35
- 36 - 83
- 84 - 162

Selection Areas

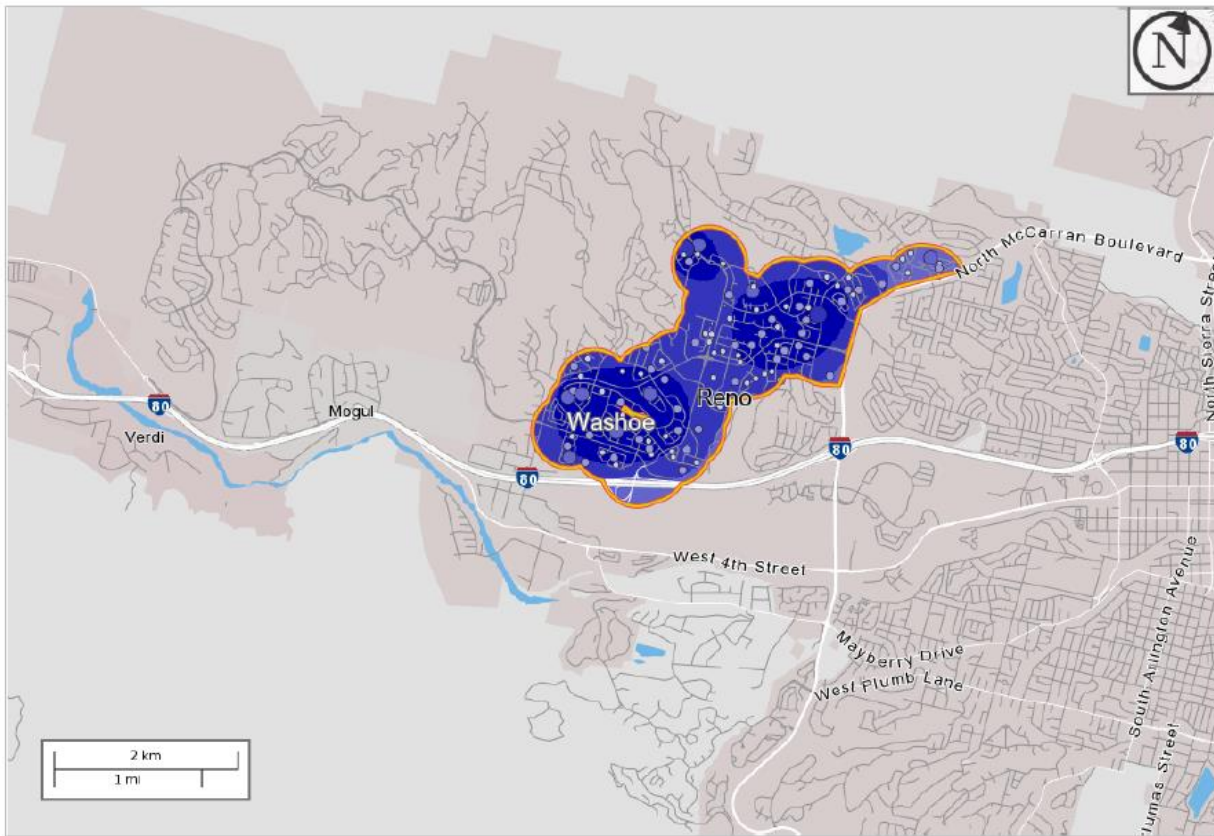
- ★ Analysis Selection



West University Non Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	2,391	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	727	30.4%
Age 30 to 54	1,175	49.1%
Age 55 or older	489	20.5%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	627	26.2%
\$1,251 to \$3,333 per month	889	37.2%
More than \$3,333 per month	875	36.6%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	8	0.3%
Mining, Quarrying, and Oil and Gas Extraction	8	0.3%
Utilities	8	0.3%
Construction	116	4.9%
Manufacturing	121	5.1%
Wholesale Trade	85	3.6%
Retail Trade	231	9.7%
Transportation and Warehousing	107	4.5%
Information	22	0.9%
Finance and Insurance	48	2.0%
Real Estate and Rental and Leasing	53	2.2%
Professional, Scientific, and Technical Services	128	5.4%
Management of Companies and Enterprises	19	0.8%
Administration & Support, Waste Management and Remediation	145	6.1%
Educational Services	290	12.1%
Health Care and Social Assistance	280	11.7%
Arts, Entertainment, and Recreation	74	3.1%
Accommodation and Food Services	447	18.7%
Other Services (excluding Public Administration)	77	3.2%
Public Administration	124	5.2%

Northwest Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 112
- 113 - 435
- 436 - 973
- 974 - 1,725
- 1,726 - 2,694

Job Count [Jobs/Census Block]

- 1 - 5
- 6 - 33
- 34 - 109
- 110 - 257
- 258 - 502

Selection Areas

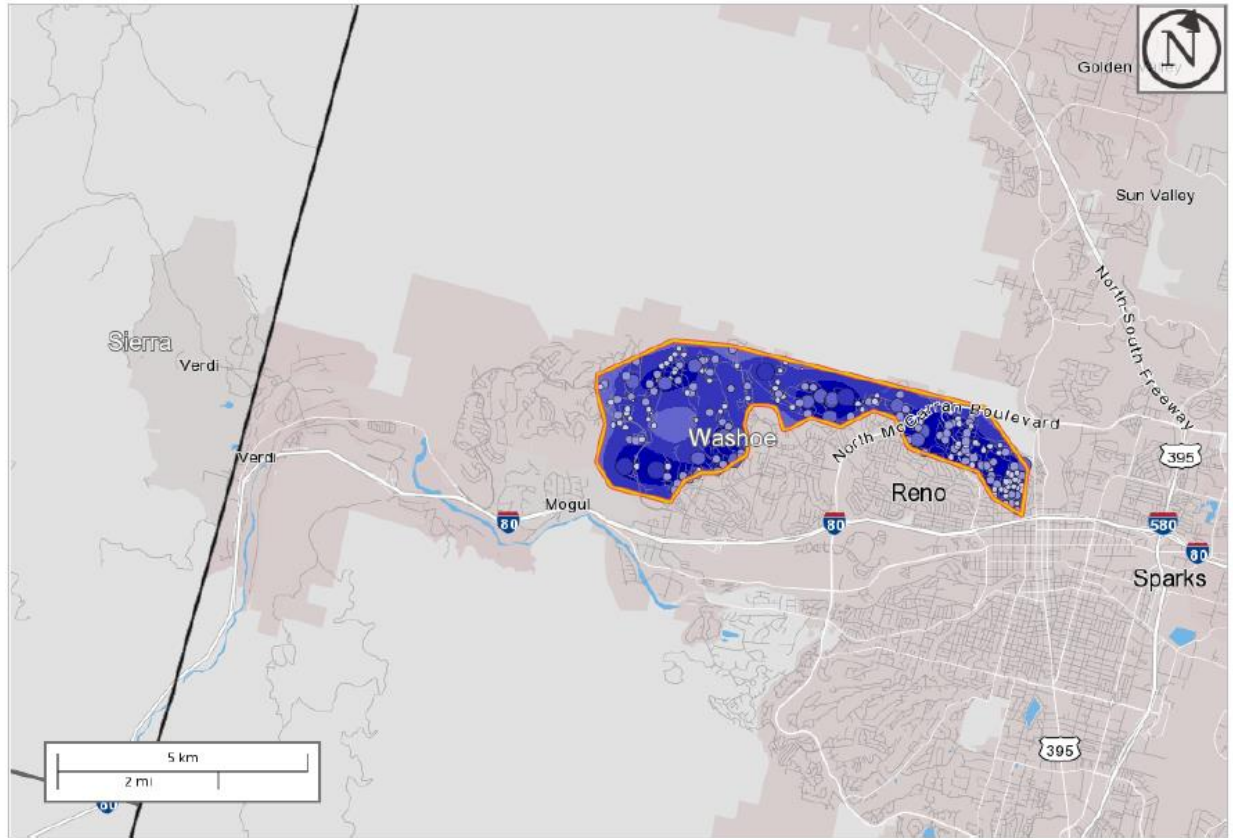
- ✦ Analysis Selection



Northwest Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	5,595	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	1,379	24.6%
Age 30 to 54	3,124	55.8%
Age 55 or older	1,092	19.5%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	1,276	22.8%
\$1,251 to \$3,333 per month	2,071	37.0%
More than \$3,333 per month	2,248	40.2%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	8	0.1%
Mining, Quarrying, and Oil and Gas Extraction	32	0.6%
Utilities	13	0.2%
Construction	249	4.5%
Manufacturing	281	5.0%
Wholesale Trade	195	3.5%
Retail Trade	712	12.7%
Transportation and Warehousing	292	5.2%
Information	58	1.0%
Finance and Insurance	167	3.0%
Real Estate and Rental and Leasing	98	1.8%
Professional, Scientific, and Technical Services	302	5.4%
Management of Companies and Enterprises	76	1.4%
Administration & Support, Waste Management and Remediation	317	5.7%
Educational Services	614	11.0%
Health Care and Social Assistance	704	12.6%
Arts, Entertainment, and Recreation	144	2.6%
Accommodation and Food Services	916	16.4%
Other Services (excluding Public Administration)	134	2.4%
Public Administration	283	5.1%

Northwest Non-Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 70
- 71 - 266
- 267 - 594
- 595 - 1,052
- 1,053 - 1,642

Job Count [Jobs/Census Block]

- 1 - 3
- 4 - 22
- 23 - 73
- 74 - 173
- 174 - 338

Selection Areas

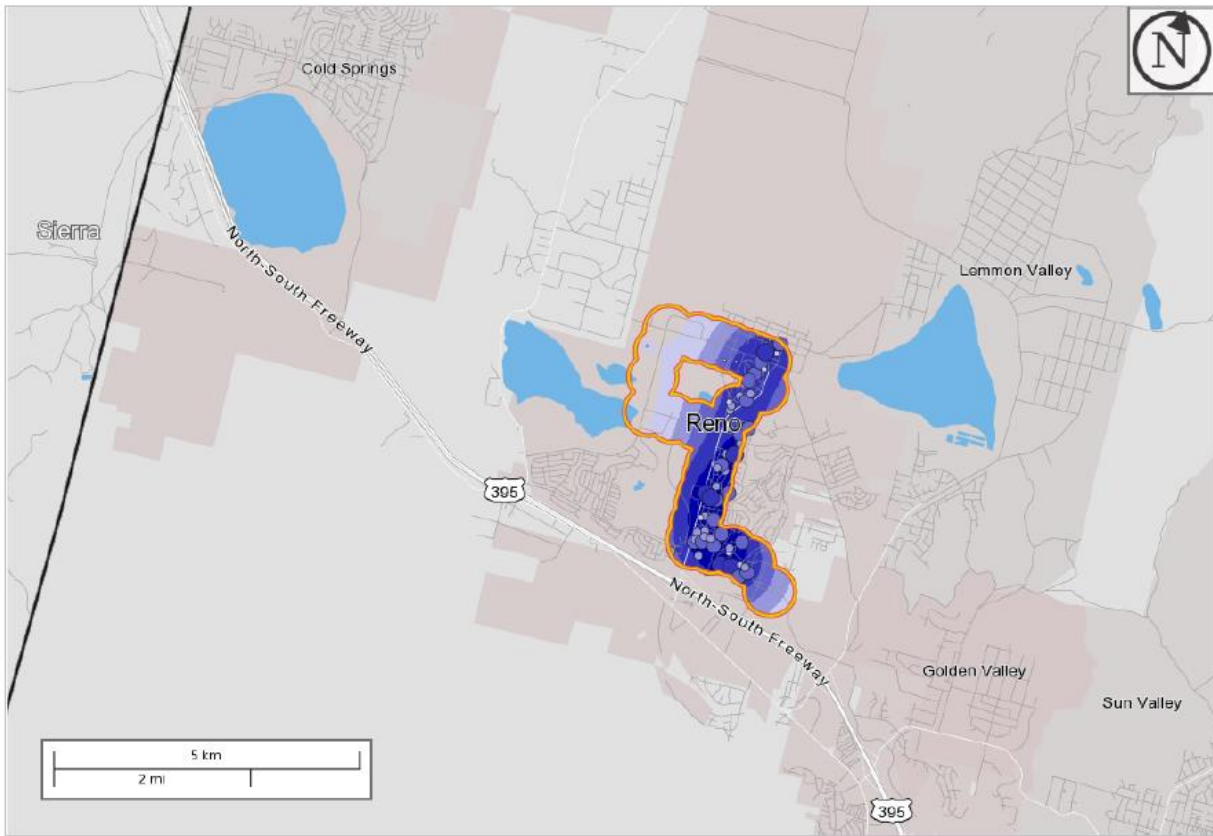
- 📍 Analysis Selection



Northwest Non-Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	6,791	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	1,546	22.8%
Age 30 to 54	3,762	55.4%
Age 55 or older	1,483	21.8%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	1,468	21.6%
\$1,251 to \$3,333 per month	2,196	32.3%
More than \$3,333 per month	3,127	46.0%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	13	0.2%
Mining, Quarrying, and Oil and Gas Extraction	18	0.3%
Utilities	29	0.4%
Construction	294	4.3%
Manufacturing	301	4.4%
Wholesale Trade	270	4.0%
Retail Trade	694	10.2%
Transportation and Warehousing	285	4.2%
Information	74	1.1%
Finance and Insurance	193	2.8%
Real Estate and Rental and Leasing	129	1.9%
Professional, Scientific, and Technical Services	384	5.7%
Management of Companies and Enterprises	106	1.6%
Administration & Support, Waste Management and Remediation	359	5.3%
Educational Services	899	13.2%
Health Care and Social Assistance	826	12.2%
Arts, Entertainment, and Recreation	196	2.9%
Accommodation and Food Services	1,101	16.2%
Other Services (excluding Public Administration)	189	2.8%
Public Administration	431	6.3%

Stead Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 78
- 79 - 299
- 300 - 667
- 668 - 1,182
- 1,183 - 1,845

Job Count [Jobs/Census Block]

- 1 - 2
- 3 - 11
- 12 - 37
- 38 - 86
- 87 - 168

Selection Areas

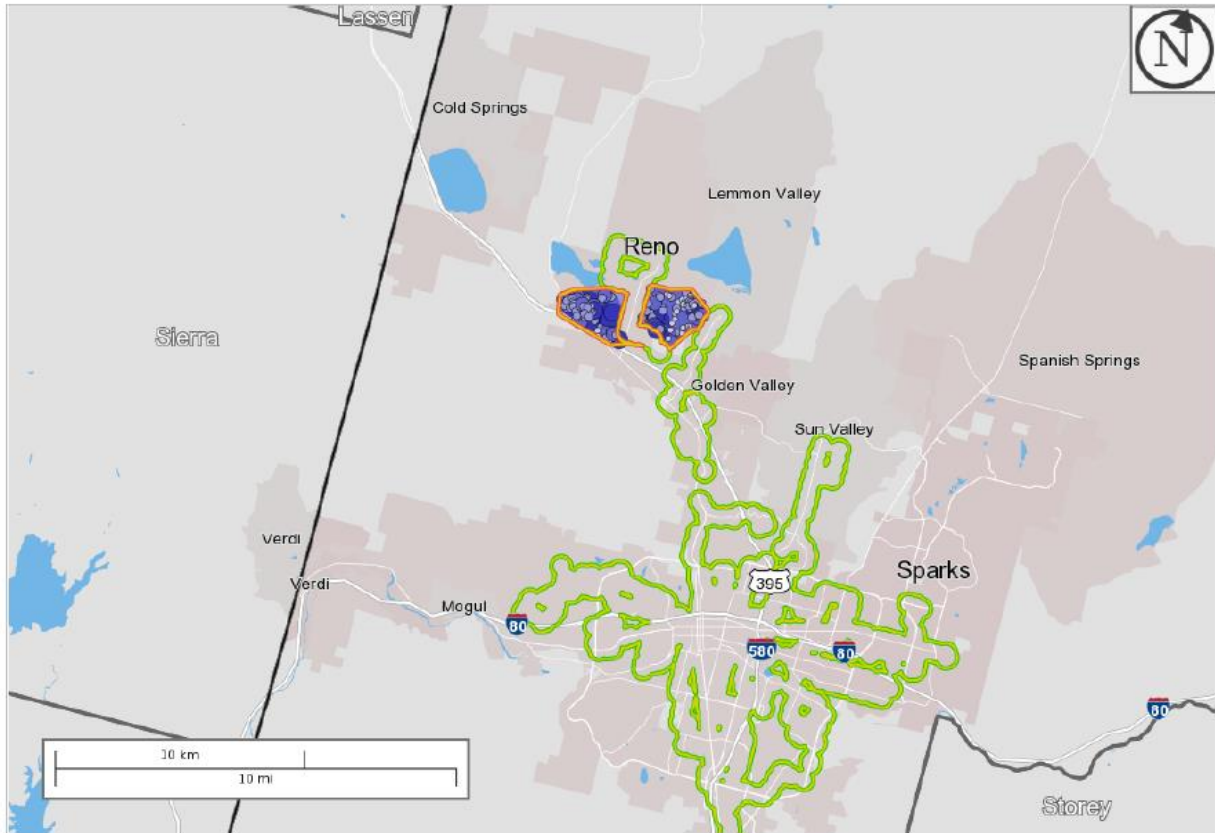
- ★ Analysis Selection



Stead Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	2,652	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	713	26.9%
Age 30 to 54	1,483	55.9%
Age 55 or older	456	17.2%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	612	23.1%
\$1,251 to \$3,333 per month	1,351	50.9%
More than \$3,333 per month	689	26.0%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	5	0.2%
Mining, Quarrying, and Oil and Gas Extraction	8	0.3%
Utilities	5	0.2%
Construction	160	6.0%
Manufacturing	212	8.0%
Wholesale Trade	121	4.6%
Retail Trade	318	12.0%
Transportation and Warehousing	264	10.0%
Information	30	1.1%
Finance and Insurance	65	2.5%
Real Estate and Rental and Leasing	50	1.9%
Professional, Scientific, and Technical Services	101	3.8%
Management of Companies and Enterprises	17	0.6%
Administration & Support, Waste Management and Remediation	205	7.7%
Educational Services	171	6.4%
Health Care and Social Assistance	264	10.0%
Arts, Entertainment, and Recreation	68	2.6%
Accommodation and Food Services	445	16.8%
Other Services (excluding Public Administration)	58	2.2%
Public Administration	85	3.2%

Stead Non-Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 134
- 135 - 523
- 524 - 1,171
- 1,172 - 2,078
- 2,079 - 3,245

Job Count [Jobs/Census Block]

- 1 - 3
- 4 - 24
- 25 - 81
- 82 - 190
- 191 - 372

Selection Areas

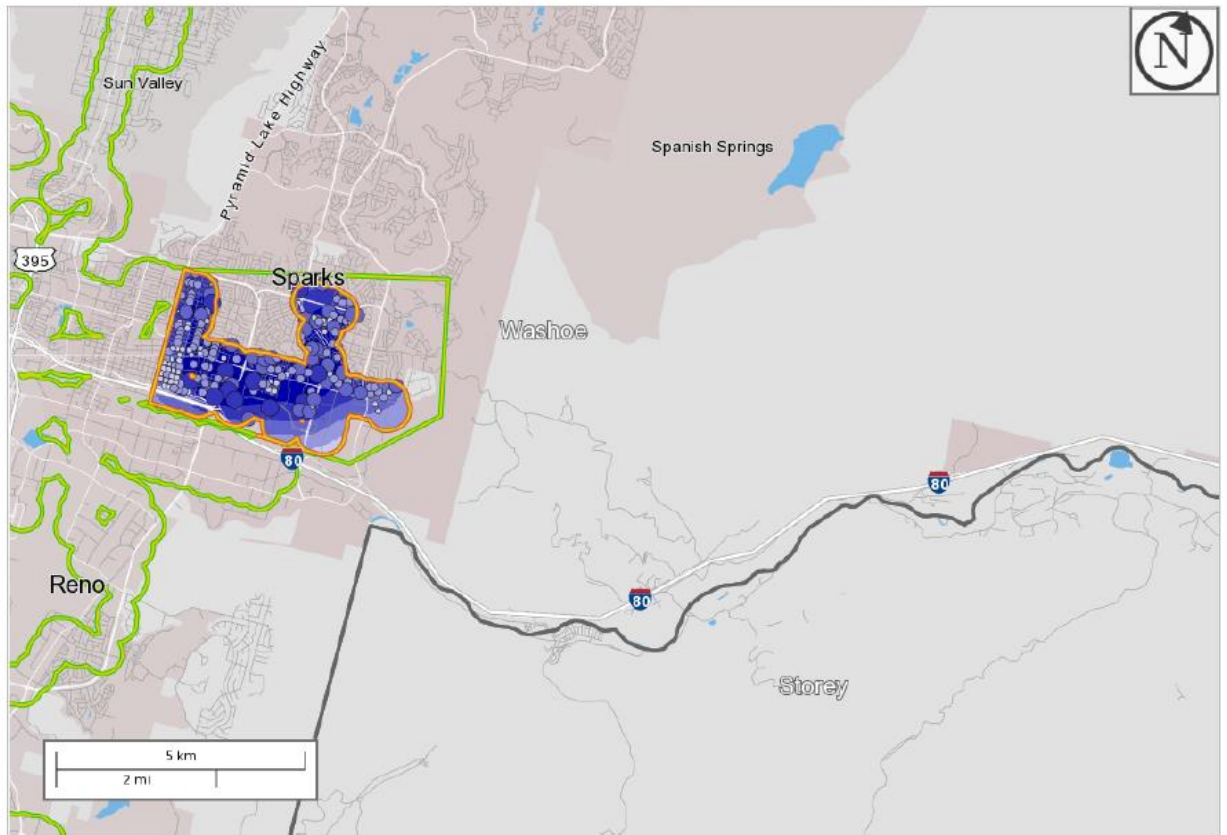
- ★ Analysis Selection
- ★ Advanced Selection



Stead Non-Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	6,732	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	1,719	25.5%
Age 30 to 54	3,916	58.2%
Age 55 or older	1,097	16.3%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	1,430	21.2%
\$1,251 to \$3,333 per month	3,044	45.2%
More than \$3,333 per month	2,258	33.5%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	20	0.3%
Mining, Quarrying, and Oil and Gas Extraction	30	0.4%
Utilities	17	0.3%
Construction	351	5.2%
Manufacturing	575	8.5%
Wholesale Trade	366	5.4%
Retail Trade	883	13.1%
Transportation and Warehousing	602	8.9%
Information	71	1.1%
Finance and Insurance	145	2.2%
Real Estate and Rental and Leasing	112	1.7%
Professional, Scientific, and Technical Services	256	3.8%
Management of Companies and Enterprises	77	1.1%
Administration & Support, Waste Management and Remediation	463	6.9%
Educational Services	512	7.6%
Health Care and Social Assistance	685	10.2%
Arts, Entertainment, and Recreation	144	2.1%
Accommodation and Food Services	1,007	15.0%
Other Services (excluding Public Administration)	166	2.5%
Public Administration	250	3.7%

Sparks Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 144
- 145 - 562
- 563 - 1,259
- 1,260 - 2,235
- 2,236 - 3,490

Job Count [Jobs/Census Block]

- 1 - 3
- 4 - 19
- 20 - 64
- 65 - 151
- 152 - 294

Selection Areas

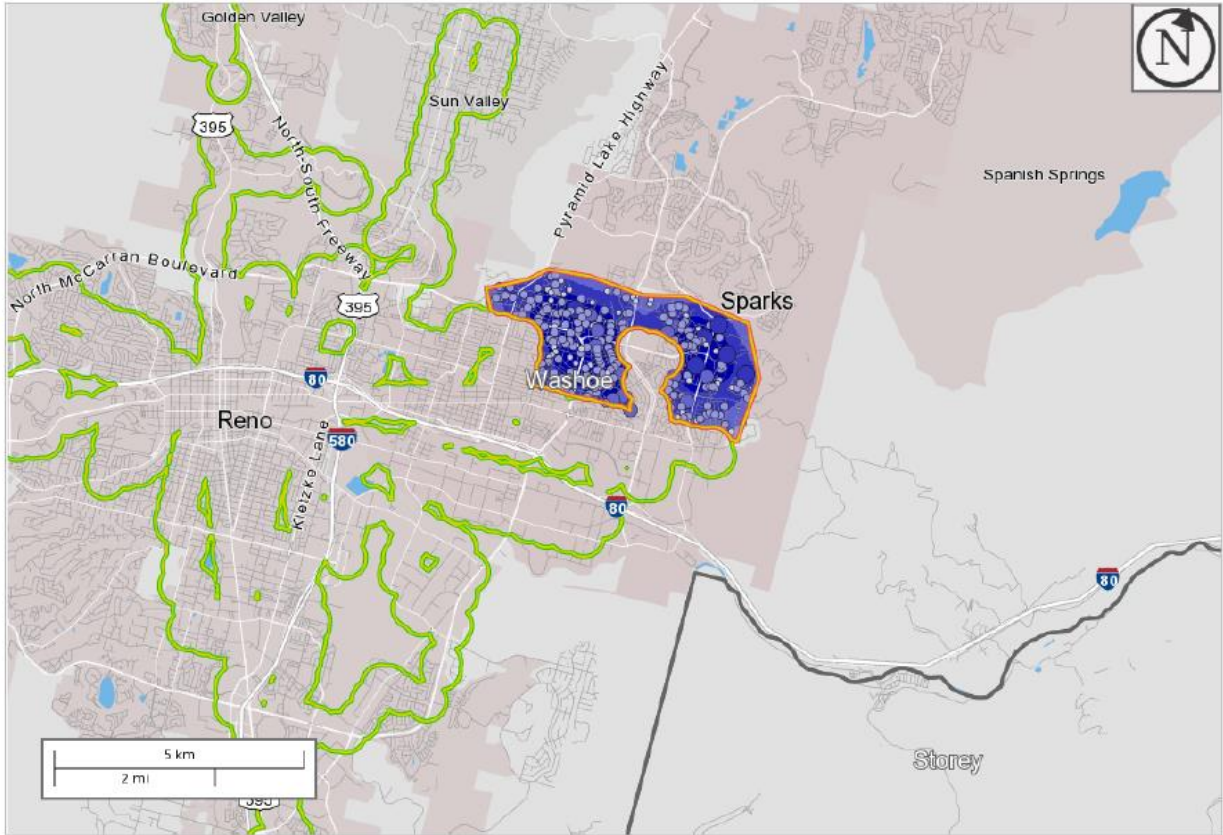
- ✦ Analysis Selection
- ✦ Advanced Selection



Sparks Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	9,663	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	2,358	24.4%
Age 30 to 54	5,042	52.2%
Age 55 or older	2,263	23.4%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	2,279	23.6%
\$1,251 to \$3,333 per month	4,467	46.2%
More than \$3,333 per month	2,917	30.2%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	21	0.2%
Mining, Quarrying, and Oil and Gas Extraction	47	0.5%
Utilities	41	0.4%
Construction	552	5.7%
Manufacturing	681	7.0%
Wholesale Trade	510	5.3%
Retail Trade	1,208	12.5%
Transportation and Warehousing	826	8.5%
Information	104	1.1%
Finance and Insurance	227	2.3%
Real Estate and Rental and Leasing	143	1.5%
Professional, Scientific, and Technical Services	368	3.8%
Management of Companies and Enterprises	111	1.1%
Administration & Support, Waste Management and Remediation	723	7.5%
Educational Services	633	6.6%
Health Care and Social Assistance	1,026	10.6%
Arts, Entertainment, and Recreation	254	2.6%
Accommodation and Food Services	1,542	16.0%
Other Services (excluding Public Administration)	264	2.7%
Public Administration	382	4.0%

Sparks Non Served



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 135
- 136 - 527
- 528 - 1,179
- 1,180 - 2,093
- 2,094 - 3,268

Job Count [Jobs/Census Block]

- 1 - 3
- 4 - 21
- 22 - 71
- 72 - 168
- 169 - 328

Selection Areas

- 🔷 Analysis Selection
- 🟢 Advanced Selection



Sparks Non Served

Total All Jobs		
	2014	
	Count	Share
Total All Jobs	9,784	100.0%
Jobs by Worker Age		
	2014	
	Count	Share
Age 29 or younger	2,238	22.9%
Age 30 to 54	5,273	53.9%
Age 55 or older	2,273	23.2%
Jobs by Earnings		
	2014	
	Count	Share
\$1,250 per month or less	2,069	21.1%
\$1,251 to \$3,333 per month	4,122	42.1%
More than \$3,333 per month	3,593	36.7%
Jobs by NAICS Industry Sector		
	2014	
	Count	Share
Agriculture, Forestry, Fishing and Hunting	29	0.3%
Mining, Quarrying, and Oil and Gas Extraction	40	0.4%
Utilities	48	0.5%
Construction	545	5.6%
Manufacturing	670	6.8%
Wholesale Trade	508	5.2%
Retail Trade	1,159	11.8%
Transportation and Warehousing	729	7.5%
Information	97	1.0%
Finance and Insurance	271	2.8%
Real Estate and Rental and Leasing	148	1.5%
Professional, Scientific, and Technical Services	396	4.0%
Management of Companies and Enterprises	123	1.3%
Administration & Support, Waste Management and Remediation	648	6.6%
Educational Services	792	8.1%
Health Care and Social Assistance	1,060	10.8%
Arts, Entertainment, and Recreation	252	2.6%
Accommodation and Food Services	1,471	15.0%
Other Services (excluding Public Administration)	261	2.7%
Public Administration	537	5.5%

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