2019

Transit Public Opinion Survey

Final Report

February 28, 2020

redhillgroup
THE POWER OF INSIGHT

- THIS PAGE INTENTIONALLY LEFT BLANK -

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

Redhill Group thanks the staff of the San Diego Association of Governments (SANDAG), Metropolitan Transit System (MTS), and North County Transit District (NCTD) who participated in the design of this study, especially Grace Miño and her team. Their expertise, local knowledge, and insight improved the overall quality of the research presented on this report. A special thanks also to Dr. David Brownstone of University of California, Irvine who led the conditional logit modeling tasks utilized for this study.

DISCLAIMER

The statements and conclusions in this report are those of the primary authors (Mark McCourt and Ryan Mak) at Redhill Group, Inc. and not necessarily those of SANDAG. Any errors and omissions are the responsibility of the authors.

- THIS PAGE INTENTIONALLY LEFT BLANK -

EXECUTIVE SUMMARY

Overview

The main objective of the San Diego Association of Governments (SANDAG) Transit Public Opinion Survey is to profile the opinions related to public transit services from residents throughout the San Diego region, including the attitudes about public transit, personal trip characteristics, and perceptions of the current transit services and related issues. SANDAG has conducted two waves of similar studies with residents in 2003 and in 2008. Since the previous studies are over a decade old, the current survey questionnaires have been updated to reflect new topics of interests. Moreover, this study employs a stated preference method to reveal individuals' choice and sensitivity among different travel mode alternatives under varying conditions.

A total of 4,873 online surveys were conducted between October 7, 2018 and March 13, 2019. There were two phases for data collection. Phase one was conducted from October 7 to December 6, 2018 utilizing an online survey panel with a target sample of 2,500 surveys from the general public. Phase one served as the base sample of the general public representation in the San Diego region. Results were monitored and balanced to reflect SANDAG's Major Statistical Areas (MSAs), gender, and age. There were 2,839 surveys completed during this phase. Phase two was conducted as an oversample with a focus on transit riders. In phase two, the survey sample was obtained from two sources; the SANDAG household travel survey and Metropolitan Transit System (MTS) email lists. This second phase was implemented to increase the number of transit rider respondents. There were 1,557 and 477 surveys completed from the SANDAG and MTS pools, respectively.

Redhill Group worked with staff from SANDAG, MTS, and North County Transit District (NCTD) to develop and approve the final survey instrument. The survey instrument included a Stated Preference (SP) component which enabled scenario testing for alternative transit enhancements to assess their relative impact on transit ridership.

Key Findings

Resident and Trip Characteristics

- Four out of five (81%) of San Diego residents always have access to a personal vehicle. Car availability is slightly higher in the Northeast, Northwest and North City MSAs (combined 85%) and slightly lower in the Central South and East MSAs (combined 76%) with the Central MSA having the lowest auto accessibility at 71 percent.
- Access to a car is generally inversely related to easy access to a bus, Trolley, COASTER, or SPRINTER stop or station. Access to a transit stop or station is below average in the Northeast, North City and Northwest MSAs (combined 65%) and highest in the Central (87%) and South (77%) MSAs. The East MSA is the exception to this relationship, as it has both below average access to a car (79%), and also limited access to transit stops/stations at 67 percent.

- The proportion of residents using public transit is also related to each person's home-based MSA. Bus and Trolley usage are the highest in the Central and South MSAs, while COASTER and SPRINTER are more prevalent in the Northwest MSA. Use of Uber and Lyft is much more prominent in the Central MSA, likely due to the higher density, parking costs, and shorter trips.
- Average commute distance for work trips is 14 miles with school trips slightly shorter at eight miles. For trips that include both work and school in the same day, transit commutes (13 miles) are slightly shorter than commutes for those who drive alone (15 miles).
- Average trip times are much longer for transit travelers (47 minutes) than for solo drivers (27 minutes). Since trip distances are similar, travel speed is much slower for transit riders at 17 miles per hour (MPH), compared to solo drivers at 35 MPH.
- Weighting the survey results utilizing SANDAG's Activity-Based Model (ABM) trip distribution, the most common travel mode in the San Diego region is solo driving (56%), followed by carpooling (34%). Public transit accounts for three percent including bus (1.7%), Trolley (0.7%), and less than half a percent each for the COASTER and SPRINTER. Active transportation accounts for six percent with walking (5%) more predominant than bicycling (1%).

Impact of TNCs

- Almost two-thirds (65%) of residents have at least tried TNCs such as Uber or Lyft to travel in the San Diego region. TNC adoption increases with income category starting at 57 percent for those with an income below $30,000 and increasing to 78 percent for those with an income of $150,000 or more. And although income increases with age, use of TNCs is significantly higher for those under 45 (74%) than for those 45 or older (54%). TNC adoption rates are also influenced by urban density, with generally higher use in the higher population density MSAs.
- Regular TNC services are slightly more likely to be a substitute or replacement for transit (27%) than a complement which increases transit use by making it more accessible (22%). The impact is similar for pooled TNC services at 32 percent substitute, 26 percent complement.

Transit Experience

- Although transit's market share is relatively low, a good proportion of the population has had some experience riding public transit in San Diego County.
    - Twenty-four percent of current non-bus riders have used an MTS or NCTD bus at least once in the last year, and eight percent who have used the bus at some point in the past rode at least once a week.
    - For current non-Trolley riders, 36 percent rode at least once in the last year, and eight percent used to ride at least once a week at some point in the past.
    - For current non-COASTER riders, 20 percent rode at least once in the last year, while only three percent rode at least once a week.
    - For current non-SPRINTER riders, 10 percent rode at least once in the last year. In addition, three percent used SPRINTER at least once a week.

Interest in Starting to Ride or Increase Transit Use

- At 44 percent, two out of five of residents who have an opinion and don't currently use transit three or more days per week, say they are somewhat or very interested in starting or increasing their use of transit. The highest level of interest is for the Trolley, followed at slightly lower levels by the COASTER and bus.
- The level of interest follows local accessibility to each transit service. The Central and South MSAs have the highest interest in bus service. The Central and North City MSAs have the greatest interest in the Trolley, and the Northwest and Northeast MSAs have the most interest in both the COASTER and the SPRINTER.
- There is also a higher level of interest in starting to ride or increasing transit use for those under 45 than for those 45 or older, making them a better target audience for promoting transit use.

Key Barriers to Starting or Increasing Transit Use

- Barriers that are more under the agencies' control include transit being too slow, infrequent service, not being comfortable with other riders/people at stations, unreliable travel time, and services not running early or late enough.
- In the short term, several of the key barriers to transit use are significantly more difficult for transit agencies to address, including access to transit from home or destination, needing a car for work trips or running errands during the day, or to pick-up/drop-off kids.
- Difficulty with trip planning is also a barrier with two-thirds of non-riders and half of infrequent riders saying that planning a trip on public transit is somewhat or very difficult.

Current Rider Anticipated Changes in Frequency of Use

- Across all public transit modes over half (58%) to three-quarters (76%) of current riders anticipate that their use of transit next year will remain the same as this year.
    - Expectations for the bus are completely balanced with equal percentages saying they will ride more (19%) and will ride less or stop riding (19%). Nearly two-thirds (62%) indicate no anticipated change in bus usage.
    - Anticipated changes in frequency of use are more positive for the Trolley with 16 percent saying they will ride more, 12 percent indicating they will ride less or stop riding, and 72 percent saying no change.
    - For the COASTER, the proportion of riders saying they will ride more in the next year is lower (10%) compared to those saying they will ride less or stop (15%). Three-quarters (76%) anticipate no change in their use of the COASTER in the next year.
    - SPRINTER received the lowest expectation to ride more (12%) compared to riding less or stopping (30%). Fifty-eight percent indicate no anticipated change in SPRINTER usage.

- The COASTER riders that are most likely to quit riding are riders with short trips (minutes and miles), and those with less than $60,000 household income. This may indicate that short-trip pricing for the COASTER is not be competitive with driving and parking, and should be assessed for possible revision.
- The anticipated transit frequency of use did not vary significantly across the various demographic breakouts.

Reasons for Riding More Often (Infrequent and Primary Mode Transit Riders)

- The top three reasons for current infrequent and regular transit riders for riding more often are saving money (30%), being more relaxing (21%), and making better use of their time (19%). It should be noted that saving money is the top reason for bus and Trolley, while cost scores much lower for the COASTER and SPRINTER where being more relaxing is the top reason. Saving money is the top reason by more than two-to-one in the lower income South and East MSAs. Communications for MTS bus and Trolley should highlight the relatively low cost of commuting by transit, while the COASTER and SPRINTER communications need to focus on being stress-free/more relaxing.

Motivations for Choice Riders to Ride

- Choice riders are defined as individuals who use public transit three or more days per week and who always or sometimes have a personal vehicle available. The top four major reasons for choice riders to ride public transit include: reducing stress (62%), being less expensive than driving and parking (56%), helping the environment (50%), and having free time to read or relax (48%). Receiving a discounted transit pass from their employer was also cited by 41 percent.

Reasons to Ride Less Often

- By far the greatest reason for riding less often is that traveling by transit takes too long at 23 percent. Other non-access related reasons include time-variability (11%), and behavior of others (9%).

Reasons to Quit Riding

- As with riding less, transit taking too long is far and away the most important reason to stop riding entirely at 35 percent. The only other non-access related reasons cited by five percent or more were comfort while riding (9%), and safety at stops and stations (5%).
- Driving alone is the greatest threat to transit ridership with 84 percent of those who say they are going to stop riding transit indicating that they will drive or buy a car after they stop riding transit.

New Services/Technologies Impact on Transit Use

- A smartphone universal transit app has the highest average likelihood of increasing transit use, followed at slightly lower levels by public transit that helps the environment, and an integrated suite of amenities and technologies at transit centers. Driverless electric circulator vans received the lowest rating.

EV Plug-In Charging Stations

- Plug-in electric vehicles (EVs) appear to be popular with transit riders, as 61 percent of transit riders that don't own an EV are either somewhat or very likely to consider a plug-in EV if transit stations had chargers.

Stated Preference Survey (SP)

SP analysis provides three useful outputs. The first is Value of Time (VOT) which shows which demographic groups are most time-sensitive. The second is Average Mode Choice Probability (AMCP), which shows the relative likelihood of choosing each travel mode under a hypothetical set of parameters for the different travel modes. This can be used to change the parameter levels, performing sensitivity analysis to determine the impact of various investments and policies. The third is the Alternative Specific Constant (ASC) which covers differences that are not specifically explained by the variables used in the SP model. From a technical standpoint, the ASC is considered an error term because it is not explained by the variables included in the model. However, the ASC is essentially a factor for everything not specifically identified in the model. It is generally negative for transit modes. It can be interpreted as "resistance" to selecting a transit mode, and can be used to assess relative resistance across different demographic groups. These three outputs can provide guidance in selecting optimal target audiences and potential service enhancements to increase transit ridership.

- Access mode (how people get to transit stops), number of transit transfers, and station features and amenities were three of the initial parameters in the model. However, they did not significantly impact the mode choice decision, and were omitted from the final SP model. This indicates that promoting these features, while potentially beneficial for rider retention, would not serve as an effective message to attract new riders.
- The resistance to selecting bus[1] as a travel mode increases with income, but resistance to selecting the COASTER does not. In line with this, the average mode choice probability of selecting the COASTER increases with income while selecting bus decreases with income. Given the relative costs of bus and the COASTER, communications for each mode should focus on the appropriate income categories.

[1] Bus is the general term used throughout this report for all MTS and Breeze bus service, including both *Rapid* and local buses.

- Students have the lowest resistance to all public transit modes and retirees have the highest resistance. This indicates that concentrating efforts on converting current student riders into future employed riders as they get out of school and start working is likely to provide a greater positive impact on ridership than investing in converting retirees.
- Retired persons also have a relatively high VOT, and as VOT increases with age, investments to increase ridership are better allocated to people under 30 than those 60 or older.
- The decision to select transit as a travel mode is relatively insensitive to changes in the cost of transit compared to the changes in the cost of driving alone. For instance, when transit cost was decreased by 10 percent, the likelihood to choose transit as a travel mode only increases about half a percentage point. In comparison, when the cost of driving a car was increased by 10 percent, the likelihood to choose transit increases by 1.5 percentage points. Hence, increased cost for traveling by car will likely cause more mode shift to transit than reductions in transit costs. Based on this, policies like congestion pricing and increased parking costs are likely to have a greater impact than lowering transit fares.
- Reducing transit travel time has more impact than reducing transit cost in improving the likelihood to choose public transit. A 10 percent decrease in the cost of driving alone has at least twice as big an increase in the likelihood of using this travel mode as a 10 percent decrease has for any of the public transit options. Conversely, a 10 percent decrease in travel time for public transit modes produce an increase in mode share for the public transit options that is comparable to the impact of a similar reduction in the travel time when driving alone.

Key Recommendations

- Because people under 30 have a lower VOT and those under 45 show a higher interest in starting or increasing transit use than older residents, marketing resources to attract new bus and Trolley riders should have a greater impact on people under 45 than those that are older. Programs that motivate current student riders to continue to ride as they become employed have the potential for increased mode share.
- Complete development and implementation of a universal transit app that works as well as TNC or Google apps, or work with a third party like Google to make an effective transit app universally available. This will reduce the significant trip planning barrier that currently exists for infrequent and non-riders.
- The service enhancements that are likely to have the greatest impact on rider retention and attracting new riders are efforts to reduce travel time by transit; e.g. additional Rapid service, pre-boarding payment to reduce time for boarding, and dedicated bus lanes. These enhancements can help improve trip-time and service frequency without increasing the amount of bus services.
- For the bus and Trolley, emphasize lower costs than driving alone and parking, and focus communications on younger, lower-income potential riders.
- Focus on middle to higher income potential riders for the COASTER and SPRINTER, emphasizing reduced stress/relaxation.

- Do not consider reducing fares to attract riders with the exception of the COASTER for short trips, where a fare reduction may be necessary to make the COASTER more competitive with cars for short trips.
- Being environmentally friendly is one of the key reasons that current riders ride and potential riders might consider transit. Accordingly, having EV plug-in stations at transit centers, particularly in outlying areas, may have a positive impact on ridership.
- Identify ways to improve the customer experience at stops and transit stations, as the behavior of others and safety at stops/stations were cited by six percent as a reason for stopping riding and by 10 percent for reducing transit use.

- THIS PAGE INTENTIONALLY LEFT BLANK -

CHAPTER 1 – INTRODUCTION

1.1 Background

The San Diego Association of Governments (SANDAG) serves as a forum for regional decision-making, representing 18 cities and the county government within its jurisdiction. As a primary metropolitan planning organization in the San Diego region, SANDAG plays a critical role in regional policies about growth, transportation planning, environmental management, housing, open space, energy, public safety, and binational collaboration.

Improving transportation, as one component to the larger vision of promoting sustainable and high quality of life requires SANDAG to have factual and up-to-date information regarding the travel needs and characteristics of its residents and others who place demand on the region's transportation infrastructure. Thus, SANDAG periodically conducts a survey to collect information that will guide them in planning, marketing, and financial decision making with respect to transit use and operations. In addition to SANDAG, the two transit agencies in the region, MTS and NCTD, will use the collected information for their future planning and marketing efforts.

SANDAG has conducted two waves of similar studies to assess the opinions of the residents in 2003 and in 2008. Since the previous studies are over a decade old, the current survey questionnaires have been updated to reflect new topics of interests. Moreover, this study also employs a stated preference method to reveal individual's choice and sensitivity among different travel mode alternatives under varying conditions. Only residents of San Diego region who are at least 18 years old were invited to participate in this study which includes non-transit users, current transit riders, and former transit riders.

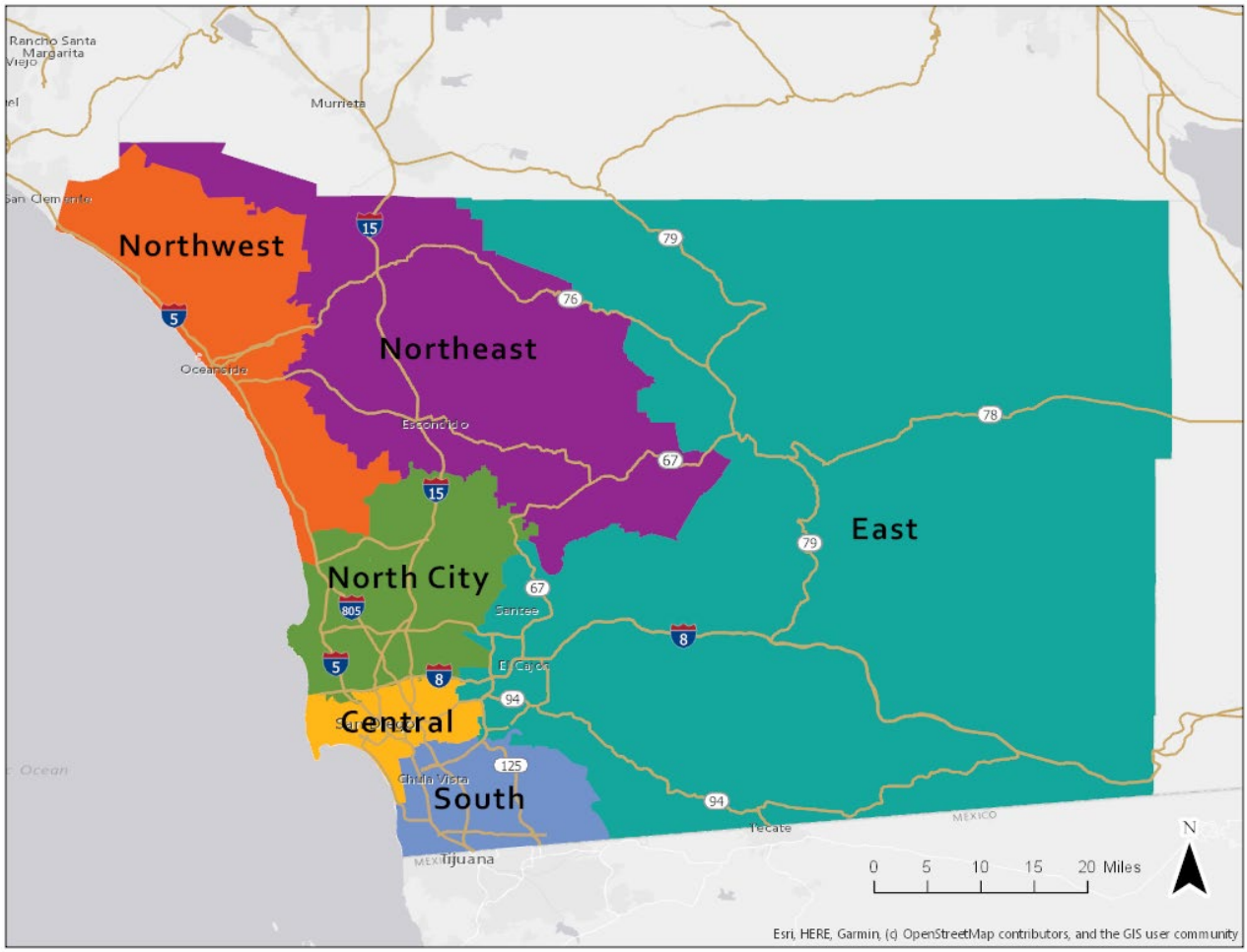
The main objective of this study is to profile the opinions related to public transit services from riders and non-riders throughout the San Diego region, including the attitudes about public transit, personal trip characteristics, and perceptions of the current transit services and related issues. Specifically, the survey addresses:

- Reasons for riding transit (riders)
- Reasons why riders stopped riding (former riders)
- Factors to motivate transit ridership (non-riders)
- Transportation Network Company (TNC) use
- Auto ownership and recent purchases
- Driver's license status
- Price sensitivity (e.g., TNC costs, gas prices)
- Technological options (e.g., smartphone ownership, willingness to use app-based services/products)

1.2 Study Area

Data collection was conducted with residents who reside within the designated MSAs in the San Diego region based on zip codes. The total number of MSAs was updated from five to six MSAs after finalizing the survey instrument (Central and South are two separate MSAs now). There are four MSAs in the MTS district and two for NCTD as shown in Figure 1. The MTS district is comprised of North City, Central, South, and East while NCTD district includes the Northwest and Northeast MSAs.

Figure 1: SANDAG's Major Statistical Areas



The East MSA was originally comprised of two regions: East Suburban and East County, which were collapsed into one MSA for the purpose of allocating the target samples. A full description of the sampling and weighting methodology employed for this study are included in Appendix A.1 and Appendix A.2.

1.3 Report Organization

This report presents survey results and analysis on the opinions pertaining to public transit to support SANDAG, MTS, and NCTD in their planning and financial decision making. To provide the proper context, the survey results are depicted with summary of findings as opposed to the detailed statistics, especially for the stated preference results where explaining the model output can be highly technical. For the interest of some readers, the model outputs are contained at the end of this report.

There are five chapters overall, with each chapter focusing on transit public opinions from a different perspective. Results are presented from the viewpoints of current conditions, stratified by transit regions, and between transit and non-transit users. The contents for each chapter are summarized below.

Chapter 1: Introduction sets the stage for the 2018 Transit Public Opinion study, including a brief background of why SANDAG conducted this study, along with a discussion of the project objectives.

Chapter 2: Resident Profiles provides the profile of residents in the San Diego region, including if they are transit or non-transit users, employment status, vehicle access, age, and income.

Chapter 3: Trip Characteristics provides an in-depth look into trip characteristics, such as the typical travel mode, frequency of use, and trip purposes. New survey questions about the use of TNCs, as well as electric vehicle purchases, are discussed in this section.

Chapter 4: Motivations and Obstacles to Use Transit explores individual's likelihood to start, continue, or stop using public transit, whether they will ride more or less in the next year, and their interest in using new innovative services for transit. In addition, barriers and motivational factors related to public transit will be addressed.

Chapter 5: Stated Preference Survey Results summarize the choice model results and variation across different socio-demographic attributes. The summary of results is presented using Value of Time (VOT) which is the measurement of how much an individual is willing to pay to save time for a particular mode choice. This section will also highlight the average probability of choosing public transit given several alternatives, such as increased car cost and reduced transit wait time.

Percentages in individual charts or tables throughout the report may not sum exactly to 100 percent due to rounding, or where a question is a multiple-response question.

- THIS PAGE INTENTIONALLY LEFT BLANK -

CHAPTER 2 – RESIDENT PROFILES

Resident profiles provide a profile of the existing and potential customer base for transit services and how they vary by MSA. This information is useful for Title VI analysis and to support the policy and marketing decision-making process. In addition to socio-economic information, the resident profile includes access to a personal vehicle, and availability of a transit stop or station near home.

Table 1: Distribution of Survey Results – Demographics and Travel Characteristics

Demographic Category	Overall	Northwest	Northeast	North City	Central	South	East
Gender							
Male	48%	49%	48%	47%	48%	50%	46%
Female	52%	51%	52%	53%	52%	50%	54%
Age							
18-29	28%	26%	27%	27%	32%	30%	25%
30-44	26%	24%	25%	27%	29%	26%	24%
45-59	24%	25%	25%	24%	21%	23%	26%
60+	22%	25%	23%	22%	18%	21%	25%
Income							
Less than $30,000	19%	17%	24%	12%	22%	24%	20%
$30,000 - $59,999	25%	21%	23%	21%	27%	27%	35%
$60,000 - $99,999	24%	23%	24%	27%	22%	26%	22%
$100,000 - $149,999	17%	18%	19%	21%	15%	14%	15%
$150,000 or more	14%	20%	11%	20%	14%	8%	8%
Occupation							
Employed, full-time	46%	44%	44%	53%	47%	43%	41%
Employed, part-time	12%	14%	11%	10%	13%	10%	14%
Parent/Caregiver	5%	7%	7%	4%	5%	5%	4%
Retired	18%	18%	17%	18%	15%	18%	20%
Student	8%	7%	7%	8%	11%	8%	6%
Unemployed	7%	6%	8%	6%	5%	11%	8%
Disabled	4%	4%	6%	1%	3%	5%	6%
Car Availability							
Always	81%	84%	86%	85%	71%	79%	79%
Sometimes	12%	9%	9%	8%	15%	16%	13%
Rarely	3%	4%	3%	2%	5%	2%	3%
Never	4%	3%	2%	4%	9%	3%	4%
Transit Stop Near Home							
Yes	71%	69%	56%	68%	87%	77%	67%
No/Don't know	29%	31%	44%	32%	13%	33%	33%

Compared with the Census, the survey distribution by gender is reasonably balanced for San Diego County residents and within the MSAs with the survey results having a slightly higher proportion of women than the Census data (52% vs 50%). The average age is 44 years old and is generally balanced as well, with the exception of the Central MSA which has a slightly higher proportion of younger residents.

More than half (58%) of residents are employed full- or part-time. Employment levels range from a low of 53 percent in the South MSA to a high of 63 percent in the North City MSA.

Similarly, household income was fairly evenly distributed when compared with the Census distribution across all income categories ranging from a low of 14 percent for the highest income category of $150,000 or more, to the highest proportion at 25 percent for the $30,000-$59,000 range. All other categories were between 17 and 24 percent of the total population. Based on the survey results, the estimated median household income for San Diego region overall is $70,000 annually. The North City and Northwest MSAs have the highest median income at $85,185 and $80,870 respectively. In contrast, the East MSA has the lowest median household income at $55,714. Respondents who report a household income below $30,000 account for 19 percent of all San Diego residents, and the proportion is somewhat higher in the Northeast (24%), South (24%), and Central (22%) MSAs.

Travel demographics show that most of San Diego residents (81%) always have personal vehicles available to them. Vehicle access generally is inversely related to the availability of public transit service with the highest percentage of always having a car available in the Northeast (86%), North City (85%), and Northwest (84%) MSAs. Conversely, in the Central MSA 14 percent never or rarely have a car available, compared to the regional average of seven percent. The Central and South MSAs are more likely to have a transit stop near home with an average of 83 percent saying they have a stop or station within 15 minutes walking distance. This is higher than the combined Northeast, Northwest, North City and East MSAs where this percentage averages 65 percent.

CHAPTER 3 – TRIP CHARACTERISTICS

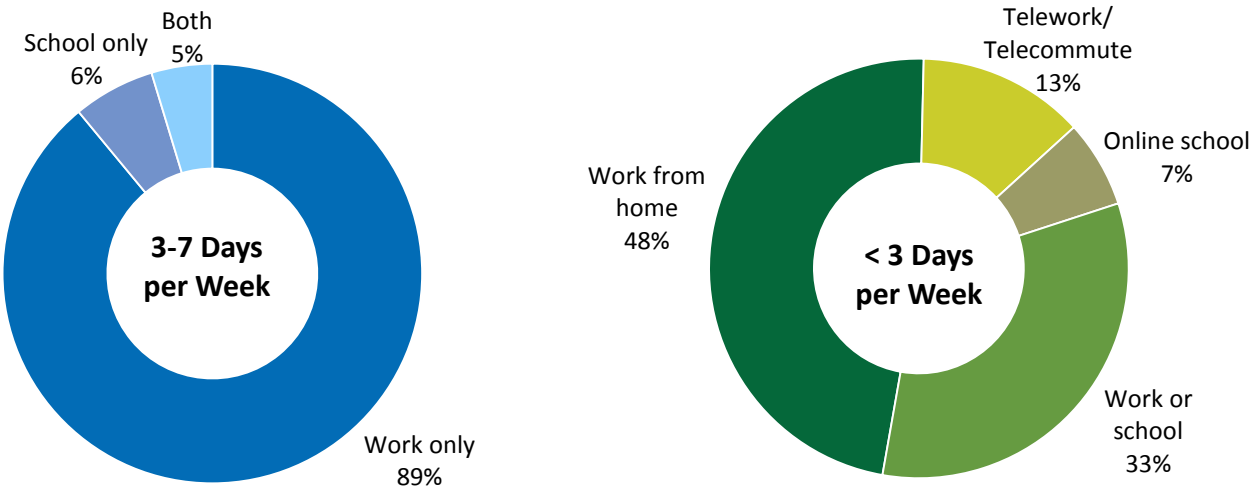
Transportation planning efforts in the San Diego region has long aimed toward two objectives: enhancing quality of the commute and enabling and encouraging commuters to switch to sustainable transit modes. Prior to improving the quality of public transit to entice commuters, it is important to first understand the current travel behavior of residents in the San Diego region. This includes identifying the trip purpose, primary travel mode, and the frequency associated with their use of transit alternatives, as well as the impacts of TNCs and electric vehicle ownership on transit ridership.

3.1 Trip Purpose, Trip Distance, and Travel Time

Since a vast majority of commutes in the San Diego region are work or school related, the survey question (Do you commute to work or school at least three times a week?) was designed to capture the proportion of work or school trips by two frequency categories; trips that are made at least three days per week and those that are made less frequently. Only respondents who are employed or a student were presented this question. Within the worker/student group, 84 percent commute at least three times a week while 16 percent commute less frequently. The breakout of the work/school status for each group is provided in Figure 2.

Among the 66 percent of San Diego residents who are either employed and/or a student, the majority (84%) state that they commute to work or school at least three times a week. These frequent commuters consist of 89 percent who travel to work only, six percent to school only, and five percent that travel to both. For those who commute less than three days a week, the most common reasons explaining why they are infrequent commuters are because they work from home (48%), that they telework/telecommute (13%), or are enrolled in online school (7%). The remaining one-third (33%) just indicate they commute less than three days per week with no specific reason.

Figure 2: Trips Purpose by Frequency of Use



A closer look at the relationship between work/school trips and the distance traveled provides additional insights about the commute patterns in the San Diego region. Overall, the average (mean) distance traveled from home to work or school, one-way, is 14 miles. Work-only trips also average 14 miles. School-only trips are somewhat lower with an eight-mile average trip-length, while trips that include both work and school in the same day average 15 miles. Comparing public transit users and motorists (Single Occupancy Vehicle or SOV, poolers, motorcyclists), public transit riders have a slightly shorter average trip-length at 13 miles, compared to 15 miles for motorists.

Figure 3: Work or School Trips by Trip Distance

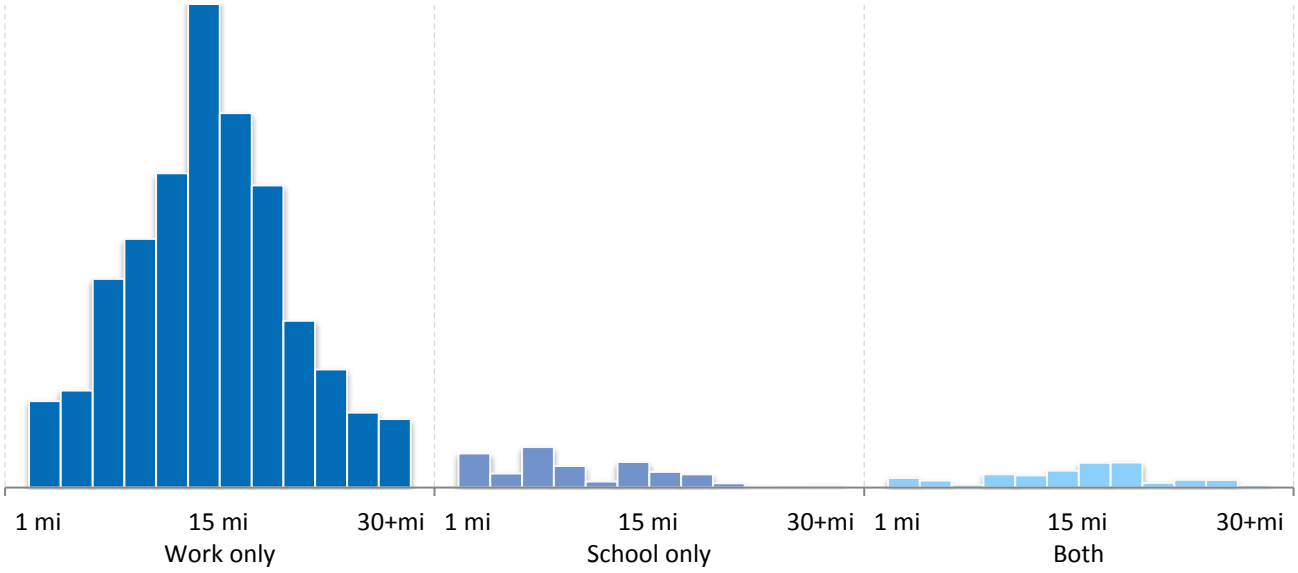


Table 2: Average Speed of Work or School Trips

Trip Category	Avg. Distance (miles)	Avg. Travel Time (minutes)	Avg. Speed (miles per hour)
Work only	14	27	31
School only	8	23	21
Both	15	32	28
Overall	14	27	31

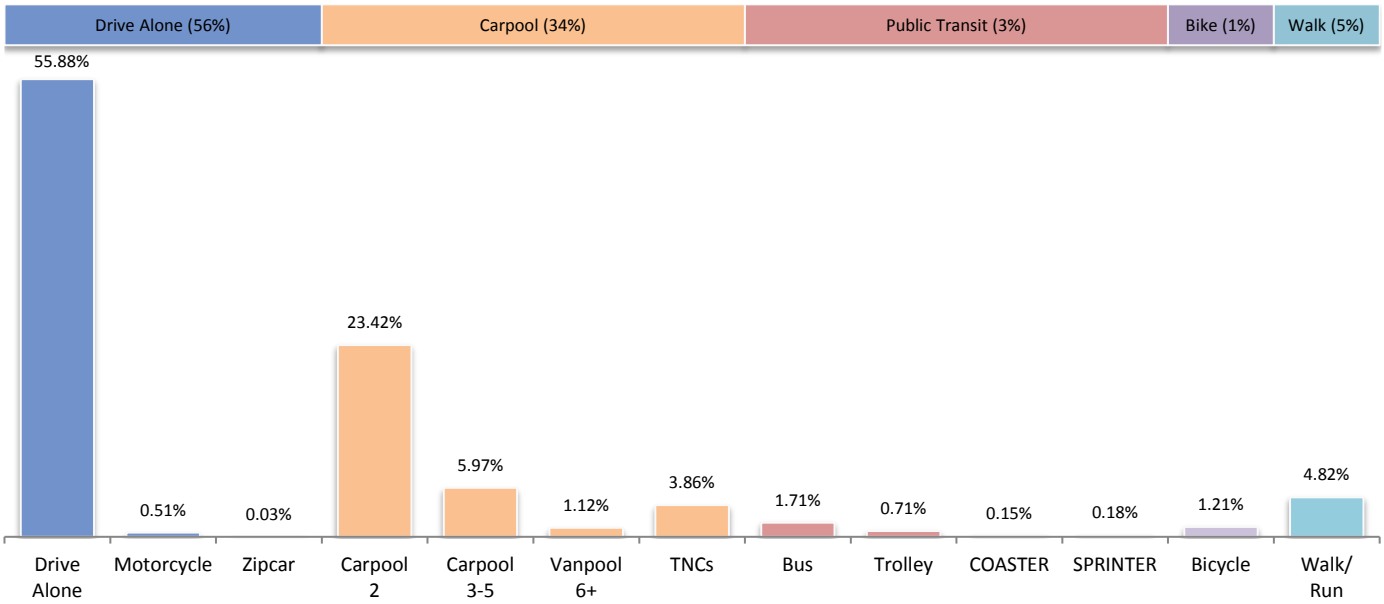
In relation to trip distance, the average travel time from home to work/school in the San Diego region based on the survey results is 27 minutes. Student-only travelers have both the shortest travel distance (8 miles) and travel time (23 minutes). At the other end of the spectrum, those who are both workers and students have the longest travel distance (15 miles) and the longest commute time (32 minutes). Dividing the reported trip distance by the reported trip travel time produces an overall average speed of 31 MPH. The average travel times are similar for those who stated they work only (31 MPH), or both work and go to school (28 MPH). However, those that are only students have shorter trips that produce a lower average speed of 21 MPH.

The average trip distance is similar for both public transit riders and SOV commuters. However, travel time varies greatly between these two modes with SOV commuters having an average commute time of 26 minutes compared to 47 minutes for transit riders. Based on the similar trip distances and the much longer travel time for transit riders, the average trip speed is much slower for transit riders at 17 MPH compared to SOV motorists with an average of 35 MPH.

3.2 Travel Mode Distribution

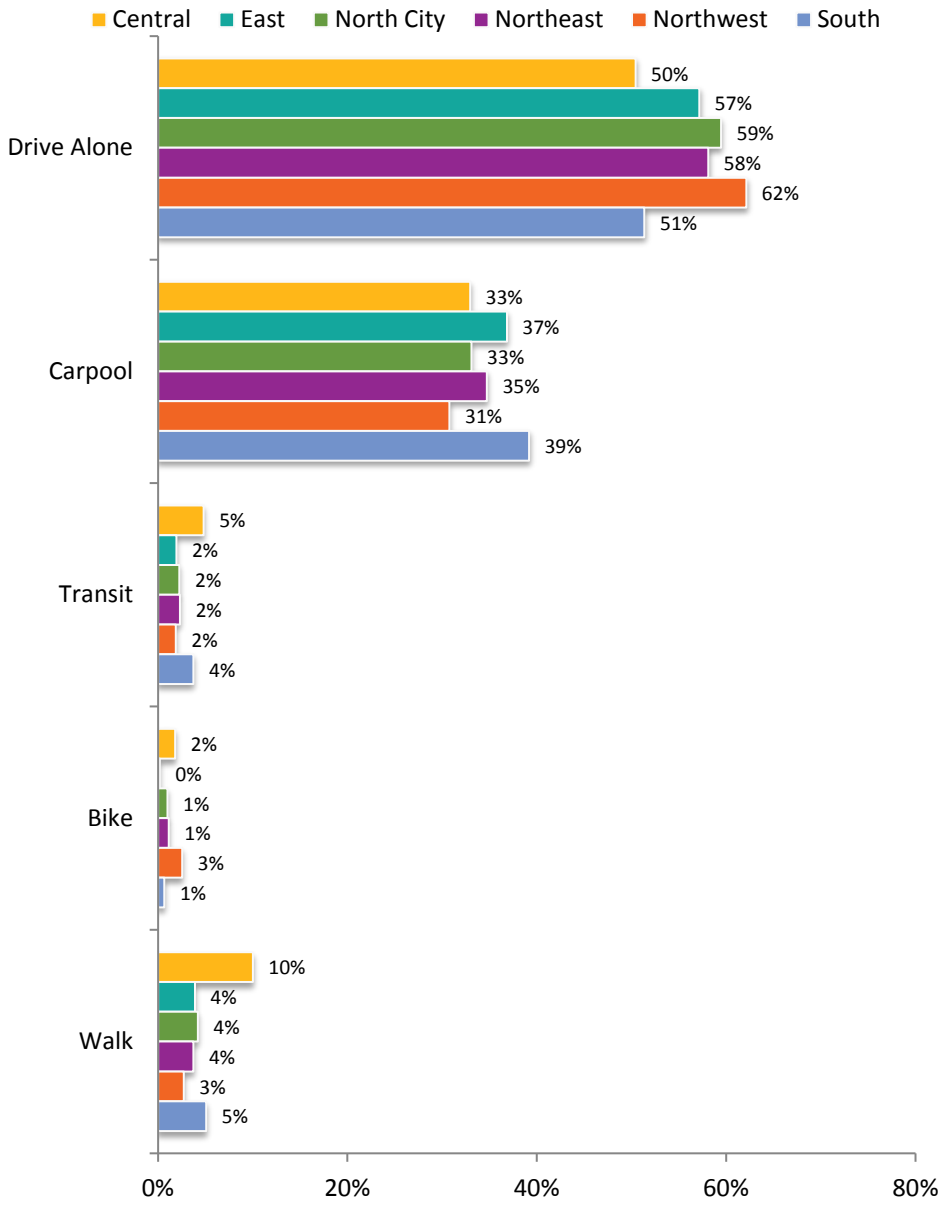
Although the actual survey question asks residents for their "primary travel mode," the survey result is presented as a travel mode that is consistent with SANDAG's travel household survey which was used to supplement the weighting methodology. SANDAG's Activity-Based Model (ABM) which is based on person-trips instead of primary travel mode, includes both inter and intra household travels. As a result, each mode-share now represents person trips instead of the primary travel mode. Some of the travel mode response categories have also been consolidated from more detailed mode options in the survey, to higher level mode options to match the ABM mode choices. Please refer to Appendix A.2 for the cross-walk between the two choices.

Figure 4: Travel Mode Distribution



The most common travel mode in the San Diego region is solo driving (56%), followed by carpooling (34%), walking/running (5%), and using public transit (3%). Within carpooling, TNCs, such as Uber or Lyft, account for four percent of all trips. Public transit modes are comprised primarily of bus (1.7%), Trolley (0.7%), and less than one percent for COASTER (0.15%) and SPRINTER (0.18%).

Figure 5: Travel Mode by Major Statistical Areas



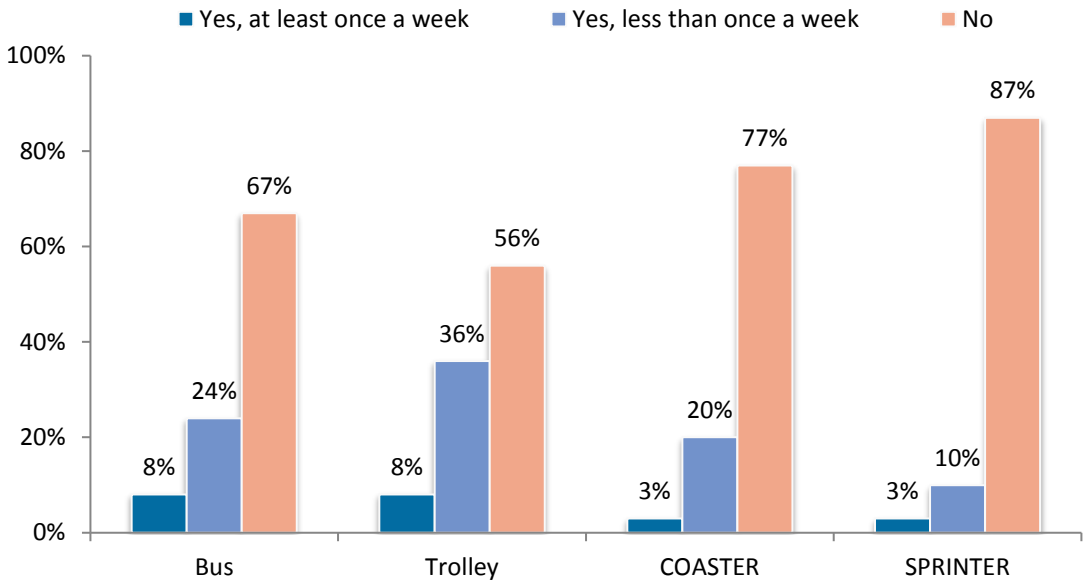
The travel mode distribution is relatively similar across all six regional MSAs. Solo driving is the highest in the Northwest MSA (62%) while public transit is most frequent in the Central (5%) and South MSAs (4%) where there is a high concentration of transit services. Walking/running also has the largest share in Central and South MSAs due the higher population density.

The pattern of using public transit is also consistent across MSAs. Bus and Trolley usage is highest in the Central and South MSAs while COASTER and SPRINTER are more apparent in the Northwest MSA. On-demand ride services, such as Uber or Lyft are the most predominant in Central MSA (6%), likely due to a higher proportion of employment and shorter trips.

3.3 Prior Use of Public Transit

In order to capture the proportion of riders who have either reduced their use of public transit, or stopped riding altogether, respondents were asked if they have used each of the region's key transit services during the last year. Residents that had used transit services were then asked how often they previously used those services in a typical week, which may have been at any time in the past. Respondents that currently use a specific public transit as a primary mode were not asked about their previous use for that mode. For example, respondents whose current primary mode is the Trolley were not asked if they had used the Trolley in the last year, but would be asked about bus, COASTER and SPRINTER.

Figure 6: Previous Use of Public Transit

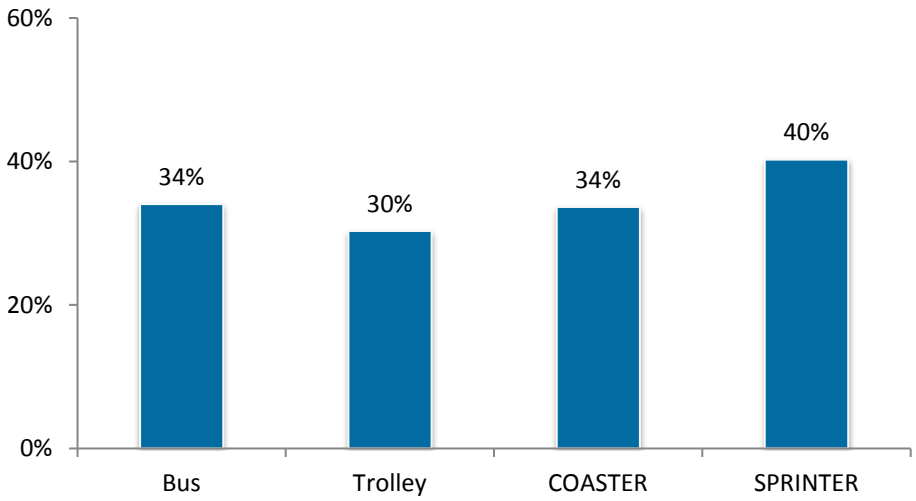


For people who do not identify bus as their primary travel mode, two-thirds (67%) say they have not used a bus at all in the last year. Twenty-four percent say they have used the bus at least once in the last year, and eight percent say they previously rode the bus at least once a week. The percentages are much higher for the Trolley with 36 percent of residents who do not have the Trolley as their primary mode, riding less than once a week and eight percent previously riding at least once a week. These proportions are much lower for the COASTER (20%, 3%) and the SPRINTER (10%, 3%).

Residents that were identified as reduced or previous transit riders were defined by two factors: 1) they have used some form of public transit at least three days a week at some point in the past, and 2) their previous transit mode is no longer their current primary mode. This excludes people who have used transit in the past, but less than three days a week when they did ride. For example, people who only used transit when their car was repaired or to go to a Padres game or other social event would not be included in these percentages.

Using this definition, 34 percent of residents who have ridden a bus at least three days a week at some point in the past, are now driving alone as their primary mode. The mode shift from other public transit modes to driving alone are 30 percent for the Trolley, 34 percent for the COASTER, and 40 percent for the SPRINTER.

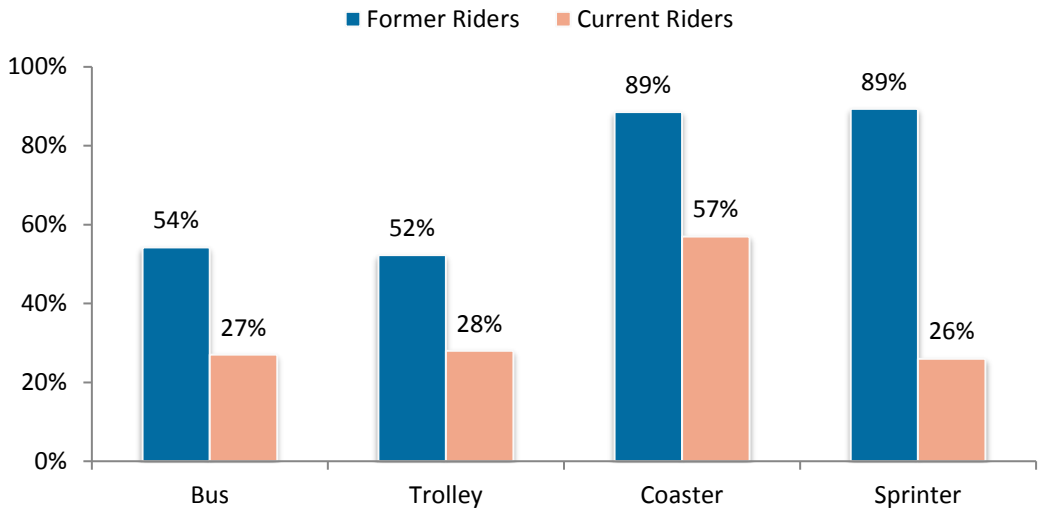
Figure 7: Mode-Shifting from Transit to Driving Alone



Geographically, the proportion of mode shift is consistent with the key transit services in each MSA. In Central, South, North City, and East MSAs where MTS services are more predominant, the majority of mode shift comes from the bus and the Trolley. Similarly, mode shifting from the COASTER and SPRINTER is more pronounced in Northeast and Northwest MSAs of the NCTD region.

The most significant contributing factor for the mode shift away from public transit appears to be increased access to automobiles among former riders with 84 percent of those who say they will stop riding indicating that they will drive/buy a car. These results are consistent with another study conducted in 2018 for the SCAG region.[2] For current transit riders, the percentage of riders that always have a car available for bus, Trolley, COASTER and SPRINTER is 27, 28, 57, and 26 percent respectively. For former transit riders the percentages are much higher at 54, 52, 89, and 89 percent for each mode.

Figure 8: Car Availability Comparison between Former and Current Transit Riders



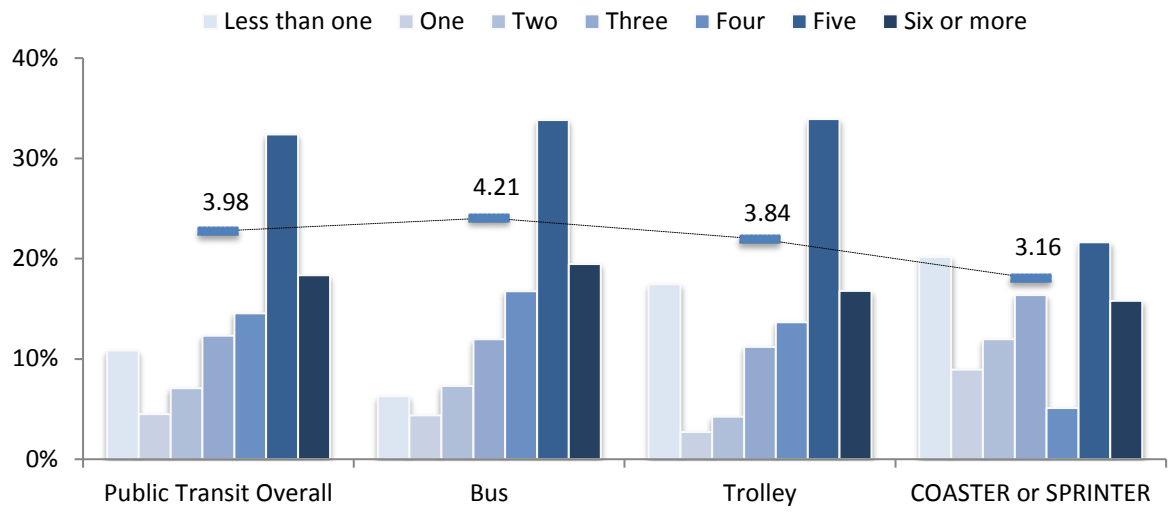
[2] Michael Manville, B. D. (2018). *Falling Transit Ridership - California and Southern California.* Los Angeles: Southern California Association of Governments.

3.4 Current Rider Frequency of Use

In order to produce the frequency of use for current public transit riders, the survey results were filtered to select only respondents who said their primary travel mode is MTS/NCTD bus, Trolley, COASTER, or SPRINTER. In addition to number of days per week, respondents who ride less than once a week were asked to specify how often they ride transit per month. For the purpose of calculating the average days per week, responses for those who travel less than once a week were converted in a numeric format. For instance, two to three days a month is 0.08 days a week, one day a month is 0.03 days a week, and so on. The frequency of use for COASTER and SPRINTER is combined into one group due to small sample size.

On average, residents who use public transit as their primary mode travel four days a week (3.98). Residents making work trips travel a higher average of 4.64 days per week compared to school where the average is lower at 4.02 days per week. Transit stop proximity to home or work also affects the average days of transit use. Residents who said there is a transit stop/station within 15 minutes from home travel an average of 4.04 days a week compared to those who indicated no nearby stop with an average of 3.24 days a week. Residents who said they had a transit stop near home and a transit stop near their work place travel and an average of 4.55 days a week, compared to those with a transit stop near home, but no transit stop near work at 4.02 days a week.

Figure 9: Frequency of Use (Days per Week)



The distribution of ride frequency is generally similar for bus and Trolley riders, although the proportion of Trolley riders that ride less than once a week is significantly higher than bus riders. In line with this, bus riders have a slightly higher average of 4.21 days per week compared to Trolley riders at 3.84. COASTER and SPRINTER riders have lower average days per week at 3.16[3] combined.

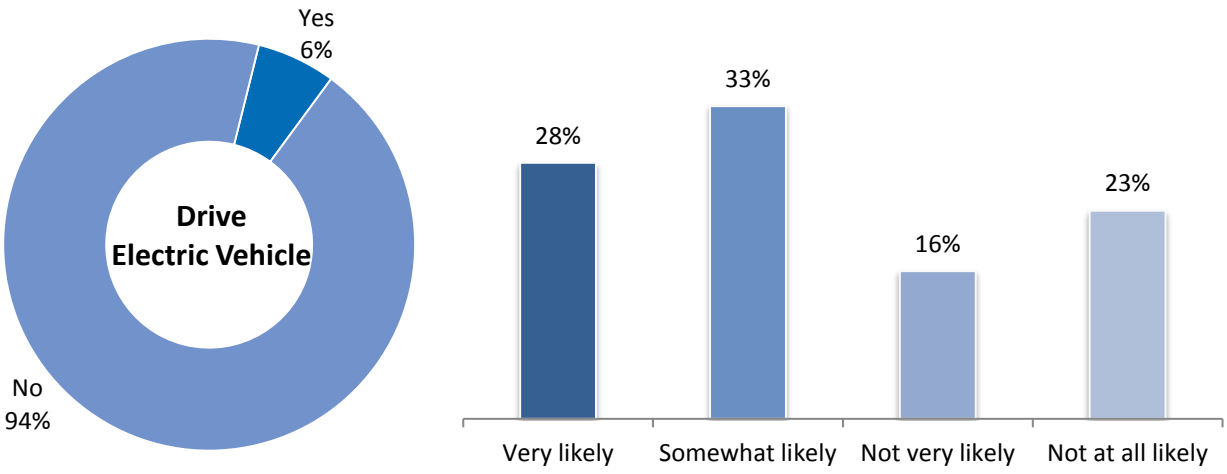
[3] COASTER and SPRINTER were combined for this chart due to a limited sample size of riders for these services.

3.5 Electric Vehicles

Since the use of electric vehicles (EV) aligns with environmental goals and objectives through the reduction of greenhouse gas emissions, public agencies have embarked on many efforts to build and maintain an EV infrastructure that allows for publicly accessible charging stations. SANDAG takes this further by facilitating the use of electric vehicles when riding transit with a potential plan to provide EV charging ports at multiple transit stations. The survey assesses the impact whether this might have the potential increased market share for EVs.

Currently, at six percent, EV ownership is low for San Diego region residents who use public transit and who have access to a car at least rarely.

Figure 10: Likelihood to Consider Plug-in EV if Transit Stations Had Charging Equipment

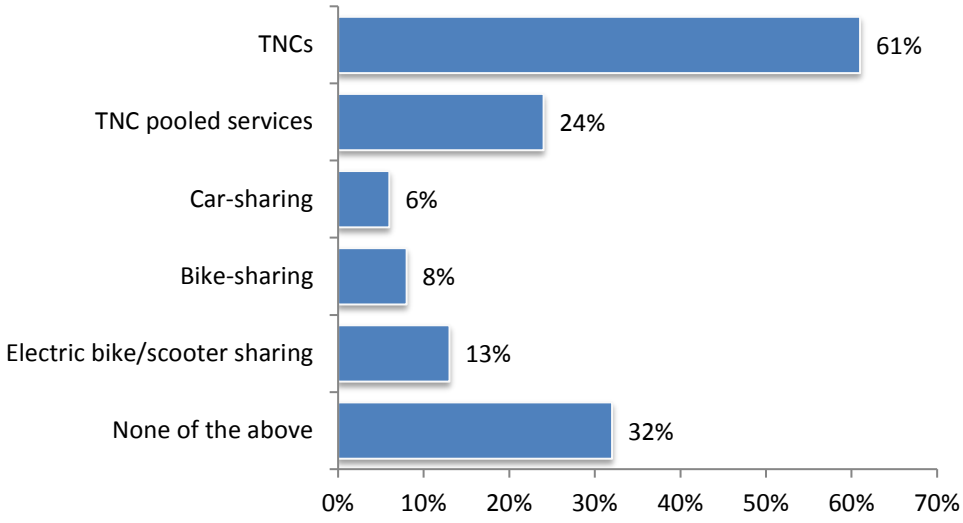


For the transit riders that either have access to a vehicle but do not own a plug-in electric vehicle, or do not have access to a vehicle at all, 61 percent are at least somewhat likely to consider a plug-in electric vehicle if transit stations were equipped with charging ports. The likelihood of considering electric vehicles generally decreases with age. Among people who are in between 18 to 29 years old, 69 percent indicate that they are very likely or somewhat likely to consider a plug-in electric vehicle. This proportion gradually decreases as age increases to a low of 38 percent for those who are at least 60 years old.

3.6 Transportation Network Companies (TNCs)

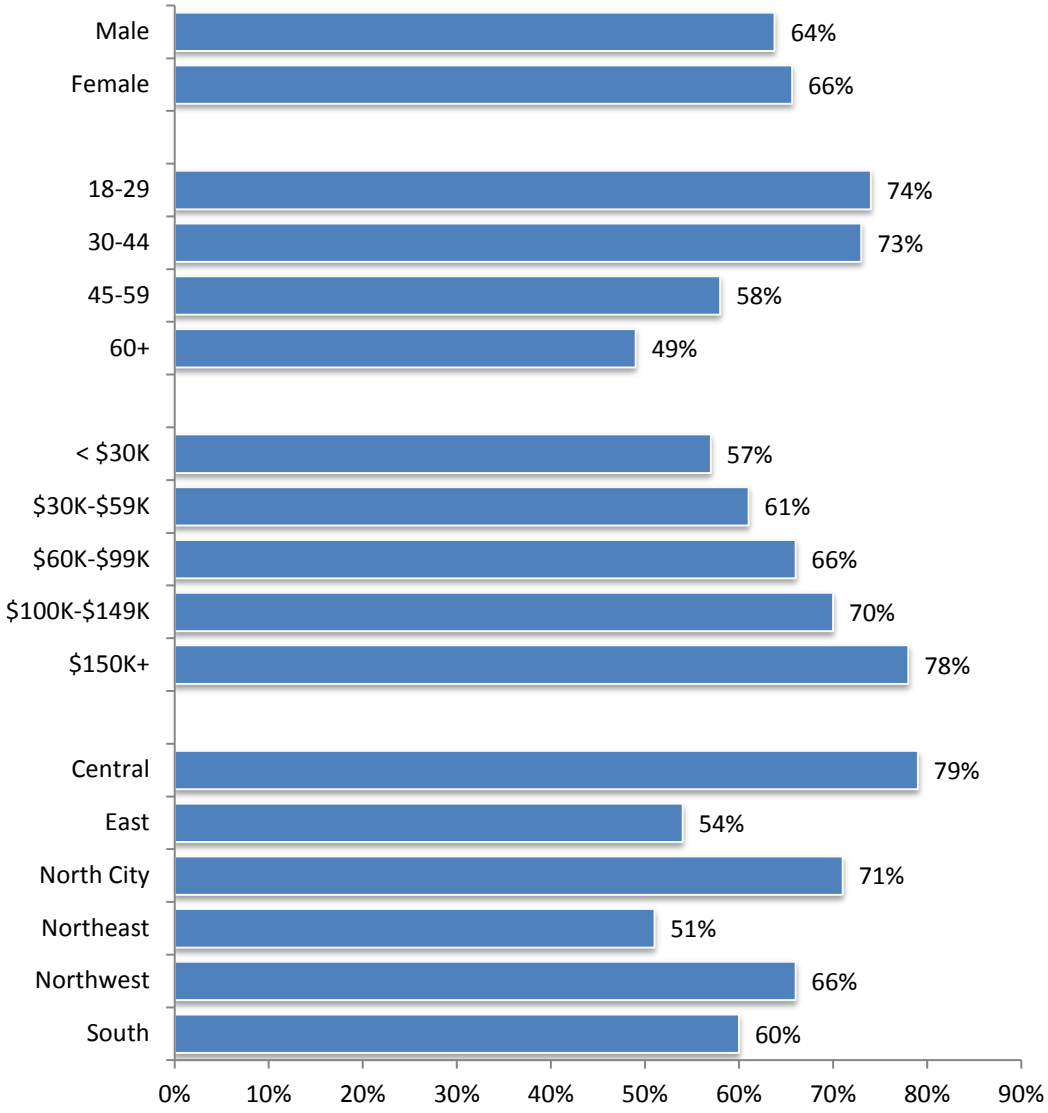
Ride-hailing services such as Uber and Lyft, which are also known as Transportation Network Companies (TNCs), have significantly changed travel choices in metropolitan cities. Despite their increasing popularity, there is limited data about key questions, such as whether TNCs influence vehicle ownership, or to what extent TNCs complement or compete with public transit. This part of the report addresses adoption rates of these relatively new shared mobility options and their impact on use of public transit.

Figure 11: Adoption Rate of Shared Mobility Services Including TNC (Multiple Responses)



About two-thirds of residents (68%) have personally tried some kind of shared mobility service at least once. TNCs are the most frequently used at 61 percent, followed by TNC pooled services at 24 percent. Bike-sharing (8%) and electric bike/scooters (13%), account for a much smaller proportion of shared mobility use. Car-sharing has the lowest usage rate at only six percent.

Figure 12: TNC Adoption by Demographics and MSA



Younger and affluent individuals are more likely to indicate that they have tried or used TNCs. Adoption rates increase with each increase in income from a low of 57 percent for an income group with less than $30,000, to a high of 78 percent for those with a household income of $150,000 or more. As the age group moves above 44 years old the proportion of those who have used TNCs drops significantly to 58 percent for the age group of 45-59 years old, and to 49 percent for those who are 60 years old or older. There is no notable difference in use of TNCs between men and women.

The high population density of Central and North City MSAs results in the highest TNC adoption rates of 79 and 71 percent respectively. It drops to significantly lower levels for the lowest population density in the Northeast and East MSAs at 51 and 54 percent respectively. The exception to the relationship with population density is the South MSA, which in spite of having the second highest population density has a

relatively low of TNC adoption rate (60%). In this case the impact of a lower average income at least partially offsets the impact of being a high population density MSA.

Table 3: Relationship between TNC Adoption and Car Availability

Car Availability	Have Tried TNC (n = 3,067)	Have not Tried (n = 1,806)
Always	81%	80%
Sometimes	12%	11%
Rarely	3%	3%
Never	4%	6%
Total	100%	100%

TNC use was also evaluated to determine any relationship between car ownership and TNC use. However, as shown in Table 3, the distribution of vehicle accessibility is very similar between those who have used and those who have not used TNC services.

Figure 13: Impacts of the Adoption of Shared Mobility Services on Public Transit

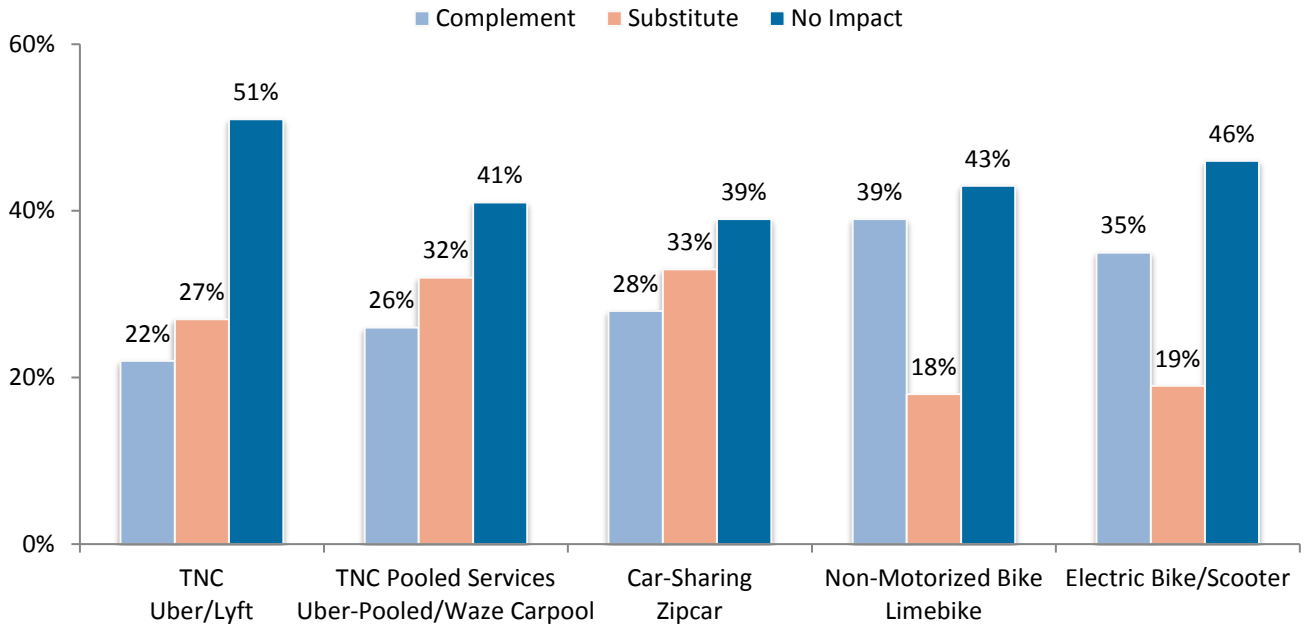
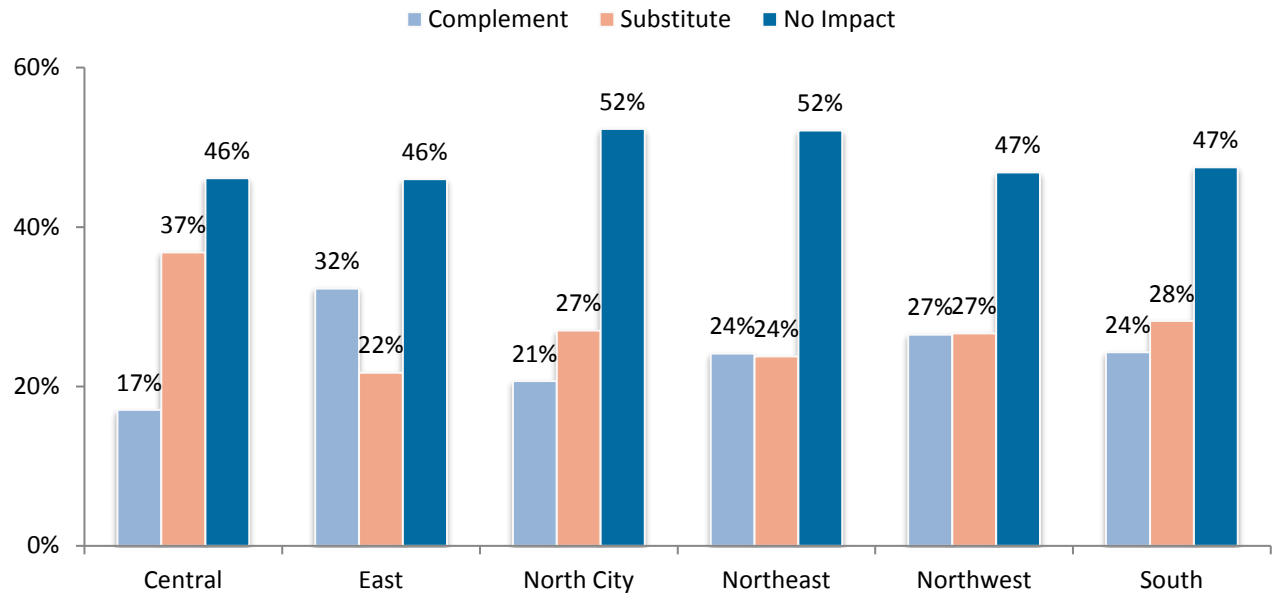


Figure 13 shows the impact of new shared mobility services on the use of public transit. Results show that car-based shared mobility services including TNCs, TNC pooled services and car-sharing all have a slightly negative impact on public transit with five or six percentage points more saying these services are a substitute as opposed to being a complement to public transit. However, non-car-based mobility services including non-motorized LimeBike and electric scooter bike programs are significantly more likely to complement transit services with non-motorized bike-sharing being twice as likely to complement transit (39%) as to substitute for it (18%). Similarly, motorized scooter/bicycle programs are much more likely to

complement transit (35%) than to be a substitute (19%). It should be noted that although the results show the direction of change, they do not provide the frequency with which the increased or decreased use occurs. The substitution or replacement could be on almost all trips, or just once or twice a year. Accordingly, although the direction of the impact is known, the actual impact on transit use is still an open question.

Figure 14: Impacts of the TNC Services by MSA



TNC services, both single-passenger and pooled services, have the highest impact on public transit use in the Central MSA. The proportion of TNCs as a substitute for public transit in this MSA (37%) is twice as large as having a positive impact on transit use (17%). Like many typical urban centers, the Central MSA is characterized by a multitude of activity centers and high employment density which contribute to greater traffic congestion in the area. Perhaps people use TNCs as a substitute to avoid long commutes (in terms of minutes) associated with riding public transit. The impacts of TNCs on public transit in North City and South MSAs are directionally the same as the Central MSA, but the magnitude is much more moderate.

The only location where TNCs have a positive impact on transit ridership is in the East MSA. In this MSA, nearly a third (32%) say that they use TNCs as a complement to public transit, while 22 percent say it is a substitute. For the remaining MSAs, the net impact of TNCs on public transit is minimal.

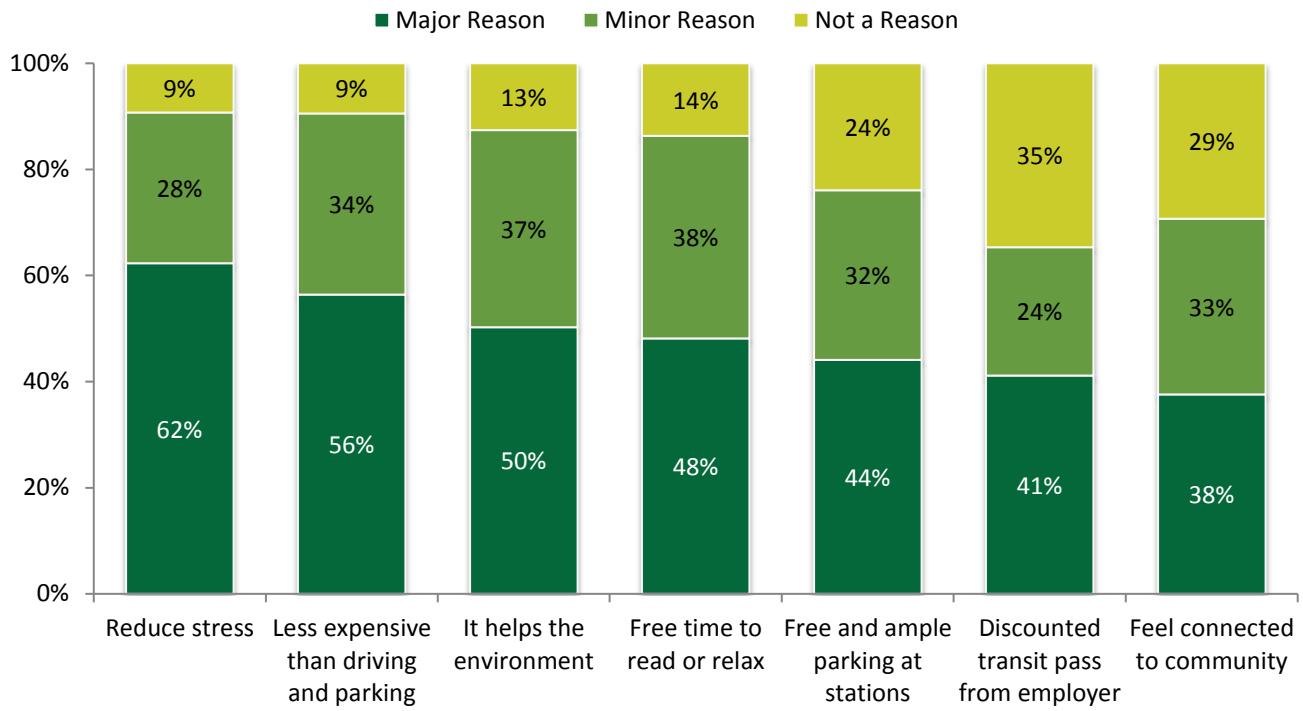
- THIS PAGE INTENTIONALLY LEFT BLANK -

CHAPTER 4 – MOTIVATIONS AND OBSTACLES TO TRANSIT USE

4.1 Reasons Choice Transit Riders Use Transit Instead of Driving Alone

Choice riders (who use public transit 3+ days/week and who also have a personal vehicle available) were presented with a short list of possible reasons why people might choose to use public transit over a personal vehicle. For each reason, the choice riders were asked to rate whether this would be a major reason, minor reason, or not a reason at all.

Figure 15: Reasons for Using Transit over Driving[4]

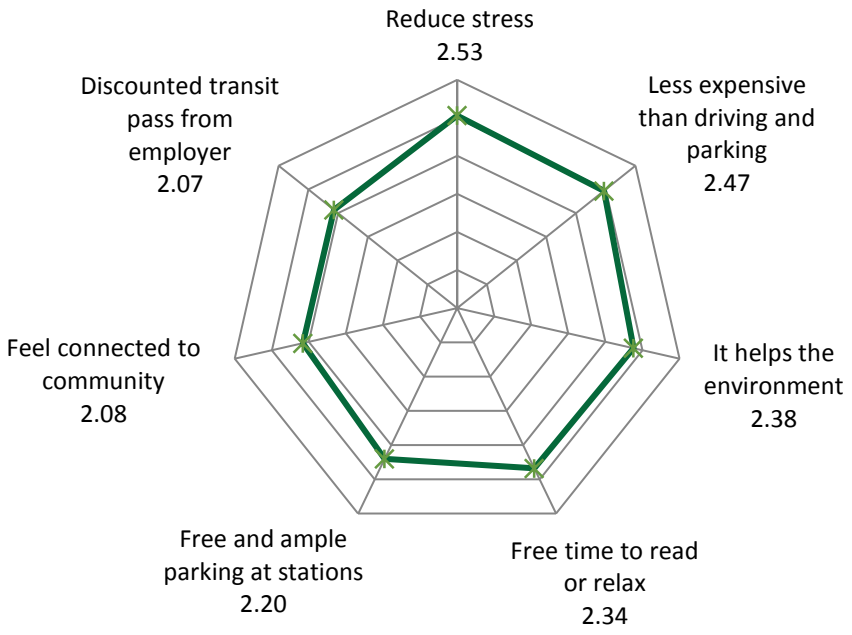


The three top reasons to choose transit, in descending order based on the factor being a major reason for this decision, are: reducing stress (62%), being less expensive than driving and parking (56%), and helping the environment (50%). Having free time to relax and read was also a major reason for almost half of the choice riders at 48 percent. The remaining three factors were all below 45 percent with free and ample parking at stations at 44 percent, discounted employee passes at 41 percent, and feeling connected to the community at 38 percent.

[4] The choice rider group has a limited sample size of 298 respondents with a broader accuracy level of ± 5.7% at a 95% confidence level.

Figure 15 provides the reasons for choosing transit based on the percentages, the following chart compares each reason using the average on a three-point scale from one (not a reason) to three (major reason). Reducing stress (2.53) and cost of driving (2.47) continue to be the motivations with the greatest impact, while community connection (2.08) and transit pass subsidy (2.07) remain the lowest.

Figure 16: Average Motivational Level for Using Transit over Driving



On average, people who are employed are more likely to cite reducing stress as the motivational factor (2.56 on a three-point scale with 3 being a major reason) than those that are not employed (2.31). Conversely, residents who are not employed are more likely to emphasize the cost of driving and parking (2.56) compared to employed residents (2.46). The cost of driving and parking is also more important for the Central (2.63) and South (2.59) MSAs than the remainder of the region, especially the Northeast and East MSAs which average 2.34 and 2.26 respectively for this factor. Also, feeling connected to the community while scoring low overall, was significantly more important to men at an average of 2.27 than for women at 1.85.

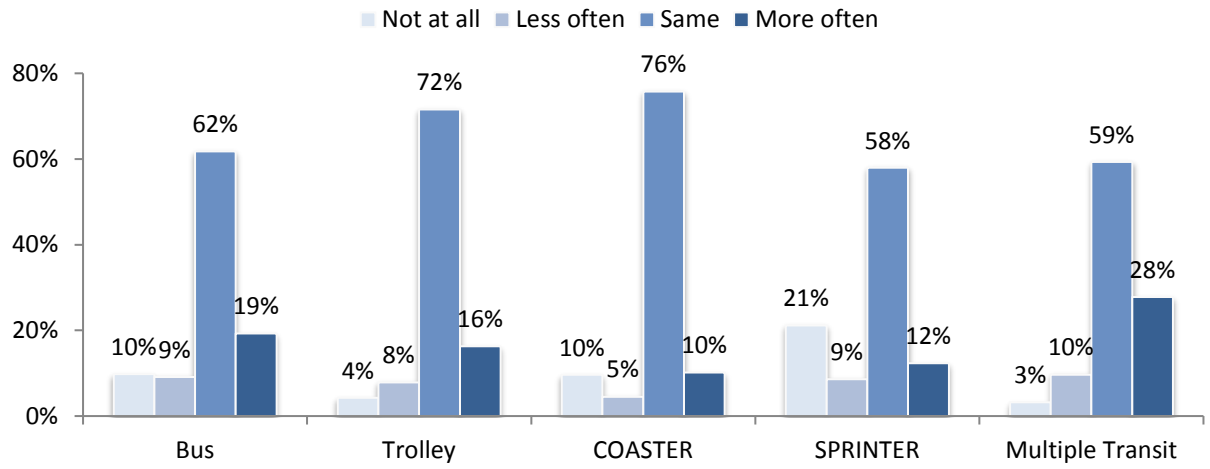
4.2 Expected Changes in Transit Frequency of Use

The cost of attracting new riders is generally considered to be more expensive than the cost of retaining current riders. Accordingly, it is beneficial to understand riders' intentions to continue to ride, as well as reasons why they may not continue to ride in the future. This will help guide refinement of services to maximize retention.

Survey questions regarding expected changes of ride frequency were only presented to respondents who indicate that their primary mode is some type of public transit (bus, Trolley, COASTER, SPRINTER) or those who said they have used some type of public transit at least once in the last year. Each respondent was

asked if they anticipate riding more, the same, less or not at all for the mode they currently use or used in the last year. If they have used multiple public transit modes, they were asked about public transit in general. For example, if the respondent only used the Trolley, they were asked if they will ride the Trolley more, the same, less or not at all next year.

Figure 17: Likelihood to Ride in the Next Year

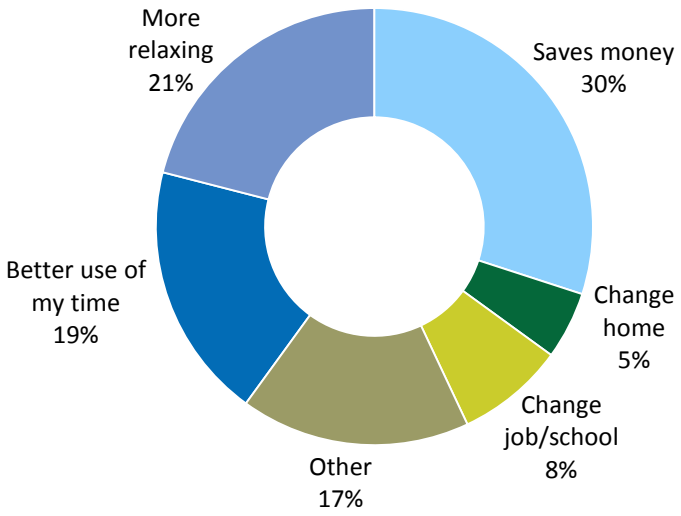


More than half of transit users expect no change in their transit use in the next year with the COASTER having the greatest stability (76% no change), followed by the Trolley (72%), bus (62%) and SPRINTER (58%). Those who use more than one type of public transit are the most likely to say they will use public transit more often in the upcoming year with 28 percent indicating they will ride more often compared to 13 percent indicating that they will ride less often or not at all. At the other end of the spectrum, 30 percent of SPRINTER users expect to ride less or not at all, compared to 12 percent that expect to ride more. Bus riders are evenly balanced with 19 percent saying they will ride more, and an equal percentage saying they will ride less or not at all. The Trolley is trending slightly positive with 16 percent more compared to 12 percent less/not at all, and the COASTER is trending slightly negative with 10 percent more compared to 15% less/not at all.

The demographics and other descriptive variables were reviewed to determine if there were particular segments that were more likely to reduce or quit riding in the next year and the results were mostly consistent across all of these variables. However, as income increases people become more likely to maintain their current riding level. This is not a positive or negative, as both the likelihood of riding more often and the likelihood of riding less often decreases with income.

Another potential finding of interest relates solely to the COASTER where those with short trips in terms of both minutes and miles, particularly those with less than $60,000 household income are much more likely to quit riding in the next year. This may indicate that short-trip pricing for the COASTER may not be competitive with driving and parking.

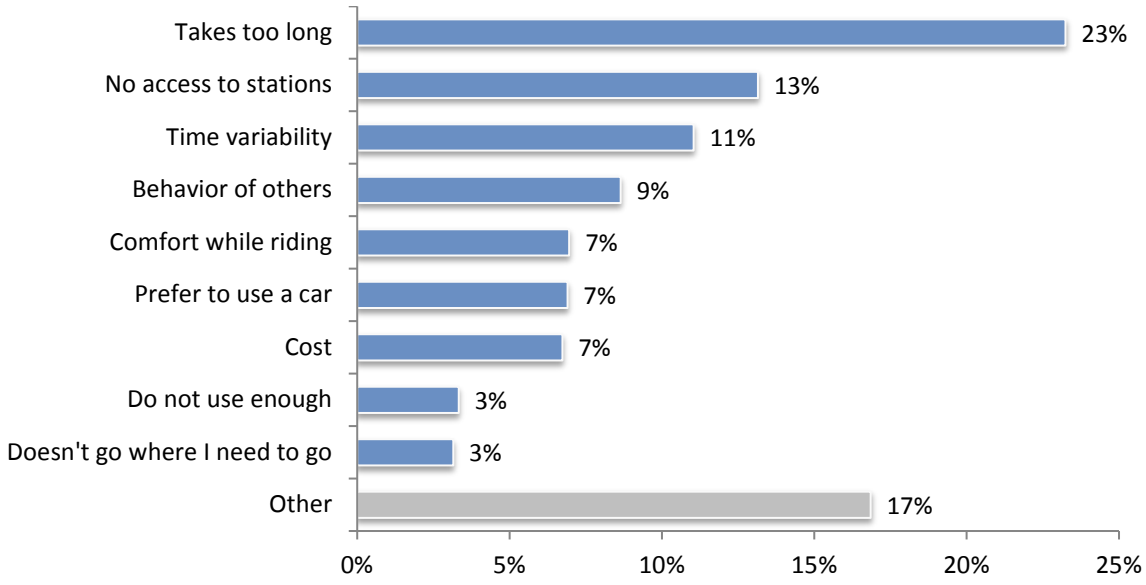
Figure 18: Reasons to Ride More Often



Saving money is the most frequently cited reason for using public transit more often at 30 percent. Others indicate that they expect to ride more because it is more relaxing (21%) and they could better use their time compared to driving (19%). Only a small proportion say they will ride more often because they moved to a new home or job/school where riding is now feasible. Other responses (17%) consist of a variety of reasons which make up less than three percent individually. Some of the most common 'other' responses as a reason to ride more often include:

- *More places or specific places now reachable by transit*
- *Care for the environment*
- *Avoid traffic or parking problems*
- *No car available*

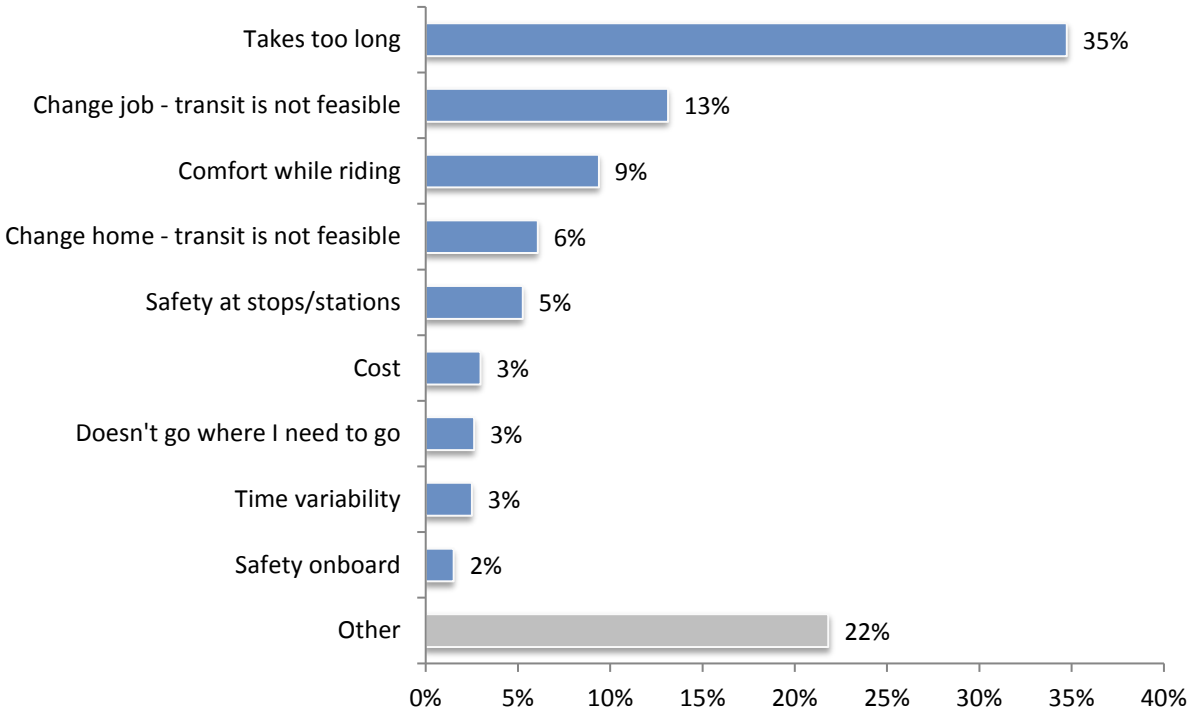
Figure 19: Reasons to Ride Less Often



Although the average home to work trip distance is similar for both SOV drivers and public transit users, the average travel time for transit users is significantly longer at 47 minutes, compared to 26 minutes for SOV drivers. This explains why taking too long is by far cited as the top reason to ride public transit less often at 23 percent. This is followed at a much lower level by lack of access to transit stations (13%), and excessive variability in trip time (11%).

Behavior of other transit passengers was also mentioned by nine percent as deterrence to riding, followed by personal comfort while riding, cost, and preference to use a personal vehicle, at seven percent each. Other responses (17%) include a variety of reasons, with each unique response accounting for less than three percent.

Figure 20: Reasons to Stop Riding



Similar to the top reason for riding less, long travel time, at 35 percent is the most frequently cited factor for stopping the use of public transit entirely. Much smaller proportions of riders reported quitting due to changing job locations (13%), or moving to a new home (6%) where riding transit will no longer be feasible.

Compared to the reasons for riding less often, safety at stops/stations and onboard is more likely to be cited as a factor for not continuing to ride at seven percent combined vs two percent for riding less.

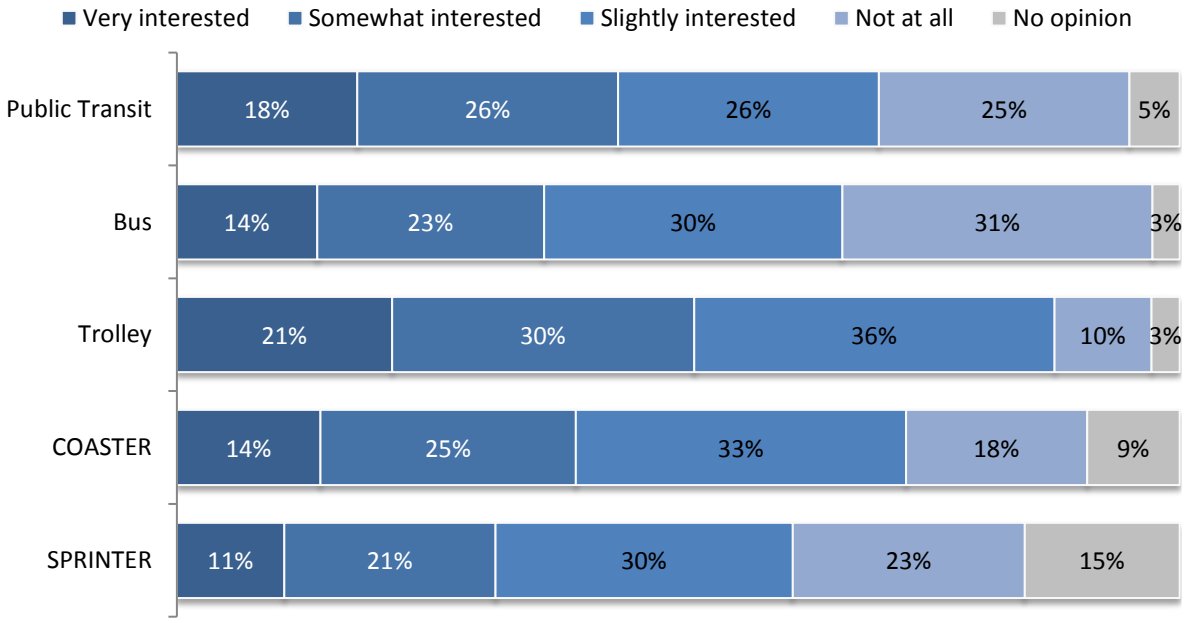
As is the case in other transit studies, the majority of anticipated lost riders plan to switch to a private vehicle (84%) for their commute as soon as they stop riding public transit. Only a small proportion (10%) said they intend to carpool/vanpool for their commute.

4.3 Interests and Obstacles of Riding Public Transit

Non-riders (who have not used any type of public transit since the last year) and infrequent riders (who have used transit in the last year, but less than three times per week) represent the largest groups of San Diego Region residents at 43 and 49 percent respectively. This part of the report focuses on these two potential rider segments to help determine which steps are most likely to influence them to try or to increase their use of public transit.

These potential riders were presented with questions that gauged their interest in increasing their transit use frequency, and if there were any obstacles that would keep them from riding.

Figure 21: Level of Interest in Increasing the Frequency of Use or Starting to Ride[5]



One quarter (25%) of all infrequent and non-riders indicated that they are not interested in starting or increasing their use of any kind of public transit. For those who said that they are at least slightly interested (70%), they were then asked whether they are slightly, somewhat, or very interested for continuing to ride each transit mode.

The Trolley has the greatest level of interest with the level of 'very,' 'somewhat,' and 'slightly' interested being higher for the Trolley than for any other public transit mode.

At 56 percent, infrequent riders are significantly more likely than non-riders (31%) to be somewhat or very interested in increasing their frequency of use.

[5] The chart labeled "public transit" includes current infrequent riders who were asked if they are interested in riding more often, and non-riders who were asked if they were interested in starting to ride.

Table 4: Demographic Breakout of Residents Expressing a Strong or Moderate Interest in Starting or Increasing Transit Use

Variable	Bus	Trolley	Coaster	Sprinter
Age				
18-29	45%	53%	43%	39%
30-44	37%	54%	45%	37%
45-59	32%	51%	39%	30%
60+	30%	47%	31%	19%
Income				
Less than $30,000	42%	46%	37%	37%
$30,000 - $59,999	39%	52%	40%	34%
$60,000 - $99,999	36%	50%	39%	32%
$100,000 - $149,999	34%	57%	41%	32%
$150,000 or more	29%	51%	43%	24%
Employment Status				
Employed	38%	52%	44%	35%
Not employed	35%	50%	34%	26%
Car Availability				
Always	34%	51%	39%	30%
Sometimes	47%	58%	43%	45%
Rarely	46%	49%	43%	32%
Never	56%	47%	32%	21%
Transit Stop Near Home				
Yes	39%	52%	40%	31%
No	31%	51%	41%	33%
MSA				
Central	46%	62%	35%	23%
East	32%	56%	27%	27%
North City	38%	58%	39%	27%
Northeast	33%	38%	50%	53%
Northwest	27%	33%	61%	40%
South	41%	53%	29%	26%

Overall, the level of interest in increasing transit use follows the transit services that are accessible from each MSA. The Central and South MSAs result in the highest interest in bus services compared to other MSAs. The Central and North City MSAs show the greatest interest in continuing or starting to ride the Trolley, while the Northwest and Northeast MSAs have the most interest in both the COASTER and the SPRINTER.

In addition, there is a higher proportion of residents under the age of 45 that are somewhat or very interested in each of the different public transit modes than for those who are 45 or older. Employed residents are also slightly more likely to be somewhat or very interested than unemployed residents.

Table 5: Obstacles to Riding Public Transit More Often (Multiple Responses)

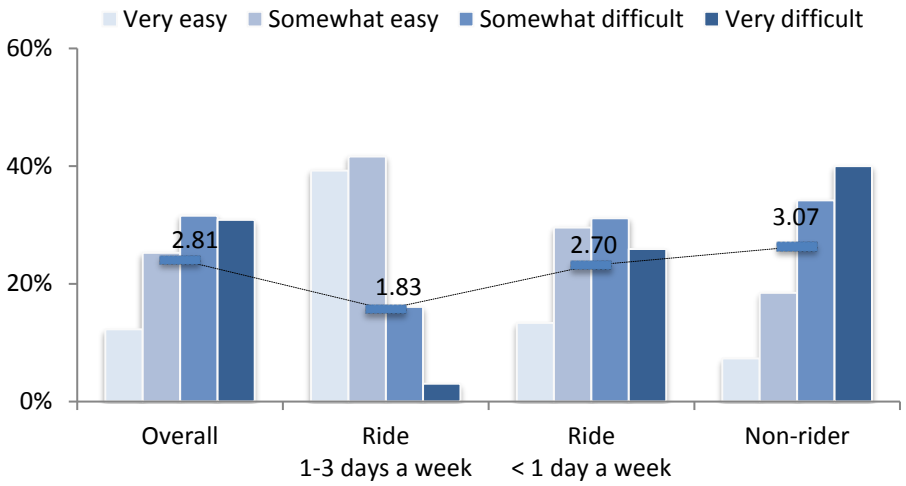
Obstacles	Percent
System not complete enough/not in my area/can't reach destination	45%
Public transit is too slow	39%
Have other errands I need to do that require a car	38%
Can't get to/from stops or stations by walking	33%
Services run too infrequently	25%
Not comfortable with other riders/people at stations	23%
Public transit travel time is too unreliable	22%
Services don't run early/late enough	20%
Need to drop-off/pick up kids	15%
Cost is too high compared to driving	15%
Need car for work trips during the day	15%
Do not want to drive to transit station	14%
Not enough weekend service	12%
Employer does not offer flexible arrival or departure times	10%
Transit station does not have enough parking	7%

For residents who use public transit less than three days a week or not at all, there are five primary barriers for increasing their transit use which often involves transit access, travel time, flexibility, span and discomfort with other riders. The top obstacle is poor access to transit services with 45 percent of respondents indicating that the transit system is not large enough or complete enough to reach their home and/or destination. In addition, 33 percent indicate limited access to stops/stations by walking.

Travel time is the second most cited barrier with 39 percent saying transit is too slow, 25 percent saying service runs too infrequently, and 22 percent saying that the travel time is too unreliable. This is followed by a perceived lack of flexibility with 38 percent indicating that they need their car to run errands, and 15 percent each saying they need their car for midday trips and to pick up and drop off kids.

With regard to service span 20 percent indicate that public transit doesn't run early or late enough and 12 percent say that there is not enough weekend service. Finally, 23 percent say they are not comfortable with riders or people at the stations. All other factors were 15 percent or less.

Figure 22: Perceived Difficulty Level of Planning Transit Trips



In addition to the specific obstacles that deter public transit use, the same group of infrequent and non-riders was asked to rate the difficulty of planning transit trips for any type of public transit. Overall, this group rated transit trip planning to be relatively challenging with 62 percent saying that it is somewhat or very difficult. Converting the difficulty rating from words to numbers with one being very easy and 4 being very difficult, the average level of difficulty is 2.81 which is near the level of somewhat difficult.

As might be expected, the perceived difficulty of planning a transit trip is inversely related to transit use frequency. Those who ride one to three days a week reported a 1.83 average score (somewhat easy). As the ride frequency decreases to less than once a week, the average score increases to 2.70 (somewhat difficult). Among the non-riders, the difficulty rating goes up to 3.07 (somewhat difficult). Given that transit trip planning is perceived to be at least somewhat difficult, any efforts that will help make it easier for inexperienced riders is likely to help trial riding.

4.4 Impact of Transit Technologies on the Likelihood of Transit Use

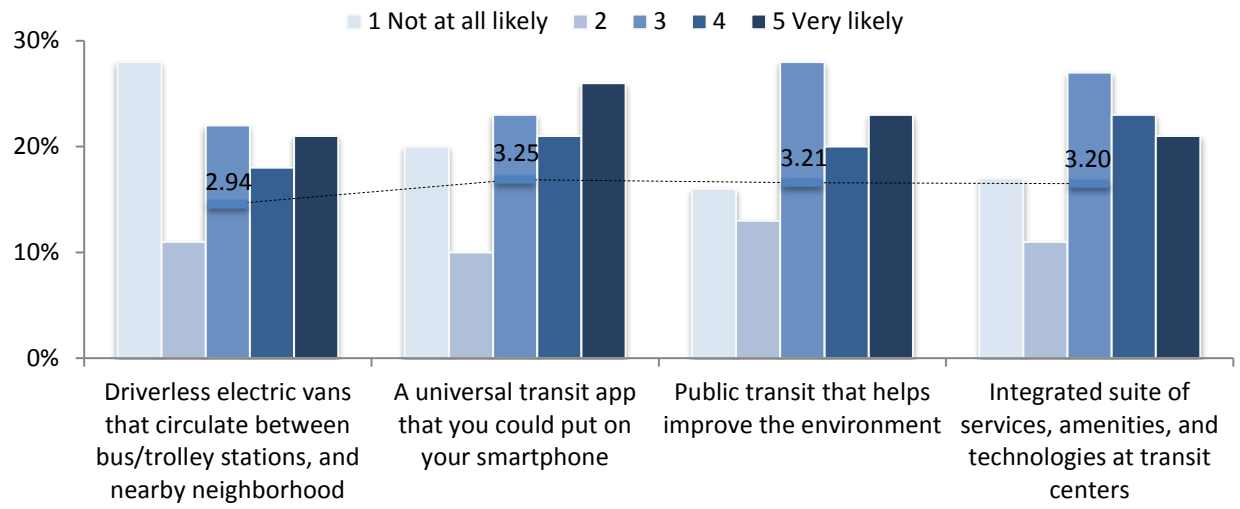
SANDAG's bold new vision to transform the way people and goods travel in San Diego region involves using innovative transportation systems to get people to their destination more quickly, reduce the reliance on personal vehicles, and meet the state's environmental goals. One of the key strategies as highlighted in the 5 Big Moves is to create viable and compelling transit alternatives to driving. Since the strategies are primarily conceptual at the time of the release of this report, SANDAG continues to reach out to the community for ideas and feedback for the region's collective vision for the future.

Four alternative transit services with innovative technologies were presented on the survey instrument. The full description for each option is provided below:

- Driverless electric vans that circulate between Trolley stations, bus stations, and nearby neighborhoods (each trip would cost $1 and vans would be equipped with security cameras and emergency summons buttons)
- A universal transit app that you could put on your smartphone that would be linked to an account that could be prepaid or tied to a credit card to pay as you go for most or all regional transit options, including: bus, Trolley, COASTER, SPRINTER, ridesharing and bike-sharing and the ability to see real-time arrivals and help plan out trips
- Public transit in San Diego is working to dramatically reduce carbon emissions with all-electric Trolleys and moving towards zero-emission bus fleets. With gas-burning cars producing a pound of carbon dioxide per mile, how much more likely are you to consider riding public transit, knowing that it helps improve the environment
- Providing an integrated suite of services, amenities and technologies at high frequency transit stations including: bikeshare, carshare, on-demand pick-up and drop-off, and amenities like dry cleaning, grocery pickup, daycare, storage lockers, and food/retail shops

Although these alternatives are hypothetical and may not be available at the moment, all respondents were asked to indicate if the alternative were implemented, how likely they would be to use or increase their use of public transit using a five-point scale where one is not at all likely, and five is very likely.

Figure 23: Likelihood to Start or Increase Public Transit by Transit Technologies



Based on the positive ratings for the likelihood of increasing transit use (score of four or five), the top choice is the statement regarding a universal transit app for smartphones with 48 percent of residents providing a score of four or five for this service enhancement. Statements regarding an integrated suite of services/amenities, and public transit that helps improve the environment fare almost equally in terms of positively impacting the transit use with 44 and 43 percent respectively, providing a rating of four or five.

Driverless electric vans emerge as the least impactful alternative with only 39 percent of residents giving a positive score. It is unknown if this low rating was due to not being motivated by having better access to major public transit stations, or because of distrust of driverless vehicles.

Table 6: Average Likelihood to Start or Increase Public Transit by Characteristics of Residents

Variable	Driverless electric vans that circulate between bus/Trolley stations, and nearby neighborhood	A universal transit app that you could put on your smartphone	Public transit that helps improve the environment	Integrated suite of services, amenities, and technologies at transit centers
Frequency of Use				
3+ days/wk	3.62	3.86	4.15 +	3.87
1-3 days/wk	3.67	3.95 +	4.02 +	3.97 +
< 1 day/wk	3.08	3.50	3.35	3.33
Non-riders	2.58 -	2.80	2.79	2.85
MSA				
Northwest	2.86	3.29	3.20	3.15
Northeast	2.81	3.05	3.04	3.07
North City	3.05	3.33	3.25	3.25
Central	3.14	3.52	3.47	3.46
South	3.01	3.17	3.26	3.22
East	2.66 -	3.01	2.95	2.96
Car Availability				
Always	2.88	3.20	3.12	3.15
Sometimes	3.20	3.44	3.50	3.43
Rarely	3.27	3.50	3.63	3.41
Never	3.17	3.35	3.71	3.41
Age				
18-29	3.30	3.57	3.57	3.50
30-44	3.11	3.46	3.34	3.42
45-59	2.80	3.17	3.02	3.12
60+	2.44 -	2.67 -	2.79 -	2.65 -
Income				
Less than $30,000	2.94	3.17	3.34	3.18
$30,000 - $59,999	3.08	3.41	3.38	3.35
$60,000 - $99,999	2.90	3.27	3.18	3.22
$100,000 - $149,999	2.95	3.22	3.05	3.17
$150,000 or more	2.92	3.24	3.01	3.08
Employment Status				
employed	3.08	3.44	3.29	3.35
not employed	2.72	2.95	3.07	2.97

Note: "+" denotes a high average score and "-" denotes a low average score

Across all new technological alternatives, non-riders and those who always have a car available (essentially the same group), provided the lowest average ratings reflecting their lower level of interest in public transit overall. Conversely, residents that ride public transit at least once a week provided higher ratings for all four options than those who ride less than once a week, or not at all.

Age is also a significant factor in assessing the impact on transit ridership. For all four innovative options, the average impact on transit ridership rating is highest for the youngest age group and declines consistently with each increase in age category.

The ratings also show a correspondence to the different MSAs with Central, North City and South MSAs which have higher density transit services providing higher average ratings for all four innovative options than the less concentrated Northwest, Northeast and East MSAs. The sole exception is the Northwest MSA which rates the universal transit app higher than the South MSA.

CHAPTER 5 – STATED PREFERENCE SURVEY RESULTS

The primary purpose of the stated preference (SP) survey is to estimate the influential factors of travel mode choice given various transportation attributes, and to identify the differences across multiple socio-demographic segments in the San Diego region. To meet the objective, the stated preference survey was designed using five hypothetical scenarios with selected transportation attributes, such as travel time and cost. Participants were asked to select one mode choice based on different combinations of these attribute values which require trading offs of incentives in some categories and disincentives in other categories. A sample trade-off table is displayed in Table 7.

Table 7: Sample SP Survey Trade-Off Table

	COASTER	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	X mins	X mins	NA	NA	X mins
Total door to door travel time (minutes)	X mins	X mins	X mins	X mins	X mins
Total trip time varies less than (minutes)	X mins	X mins	X mins	X mins	X mins
Travel cost (includes parking and tolls)	$X	$X	$X	$X	$X
Frequency of service	every X mins	every X mins	NA	NA	every X mins
Number of transfers	X	X	NA	NA	X
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection	☐	☐	☐	☐	☐

"NA" means not applicable to this alternative.

*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."

**"Access Time to Transit" includes time to park and walk to transit station

***Costs include gas, parking, tolls, insurance, repairs, and car payment

Discrete choice models which are typically used to estimate travel mode choice probabilities are established based on the data obtained from the SP survey. There are several different discrete choice models that can be employed and for this study conditional logit modeling was selected as the best option because it would be most effective in showing variation based on the desired parameters. Although there are three survey sample groups, the logit model incorporates survey responses only from the general public survey panel and SANDAG samples because they more closely represent the general population. While the MTS sample was applied throughout this report, it was excluded from the SP analysis because it is highly likely to have a higher proportion of transit riders which might bias mode choice toward public transit. While weighting could potentially correct for this, the weighted results produce a higher level of variability, reducing accuracy and making the findings less useful. Although weighting increases variability for the statistical

methodology employed for the conditional logit analysis, it does not have the same impact on regular cross tabulation analysis.

Using a "personal car" as the base travel mode, the logit model represents the decision to switch to a different travel mode or to retain the existing choice. The majority of stated preference survey results are summarized using the value-of-time (VOT) estimates based on mode choice models for the tradeoff between transit and a personal car. VOT is an estimate of what travelers would be willing to pay to save time on a particular trip. If travelers would pay $1 to reduce their travel time by six minutes, then they have a VOT of $10 per hour. By selecting the mode choice in the SP scenarios, residents reveal their willingness to pay for travel time savings. The underlying motivation for VOT is that total time is limited so travel time saved may be used for other activities.

In addition to VOT, the SP results are reported with the Alternative-Specific-Constants (ASC). The logical factors that are included in the model do not capture 100 percent of the criteria that individuals use to assess the relative value of different travel modes. The ASC explains additional variation in the ratings for each individual mode and captures respondents' attitudes and perceptions towards each transit mode that are not specifically captured in the model. For example, even after accounting for cost, travel time, comfort and reliability, most people have an additional preference for trains over buses. The ASC helps capture this preference that is not explained by the logical variables. Because the ASC addresses variation that cannot be explained by the logical variables, it is often referred to as the "error term." By comparing the level of VOT and ASC among different socio-demographic segments, the SP results can be used to identify the target audiences that are most likely to be receptive to public transit marketing.

5.1. Model Estimation and Results

For the SP questions, respondents have to choose one out of four potential travel modes. In selected zip codes where it is feasible to use the COASTER, there were five potential modes, but only a random selection of four were presented in each scenario. In other words, in zip codes where the use of the COASTER is feasible, the COASTER may be one of the four travel modes presented. In other zip codes where use of the COASTER is not feasible, the COASTER would not be presented as an option. The conditional logit model assumes that the utility of each mode for each respondent is given by the linear combination of the coefficients as shown in Table 8, multiplied by the value of the attribute and added up over all attributes, plus the Alternative-Specific Constant (ASC). The utility refers to the absolute value measurement made by residents in their mode choice decision based on travel time, cost, access time, frequency of services, and all other specified attributes. The model assumes that the respondent chooses a travel mode that maximizes their utility and all error terms are independently and identically distributed.

Table 8: Overall Model Estimation Results[6]

SP Choice Model	Description	Coefficient Value	Standard Error	t-test	p-value
ASC_BUS	Error Term – Bus	-0.6212	0.0376	-16.5094	0.0000
ASC_SHARED	Error Term – Shared ride	-1.5854	0.0301	-52.6532	0.0000
ASC_TRAIN	Error Term – COASTER	-0.3776	0.0596	-6.3331	0.0000
ASC_TROLLEY	Error Term – Trolley/SPRINTER	-0.3702	0.0432	-8.5623	0.0000
B_ACTT	Coefficient – Access Time	-0.0104	0.0029	-3.5894	0.0003
B_BUS_ACC_BIKE	Coefficient – Access to Bus Stop by Bike	-0.2249	0.0426	-5.2782	0.0000
B_COST	Coefficient – Travel Cost	-0.0563	0.0025	-22.8582	0.0000
B_HE	Coefficient – Frequency of Service	-0.0068	0.0006	-11.6446	0.0000
B_TIME	Coefficient – Travel Time	-0.0145	0.0006	-22.9884	0.0000
B_TROLLEY_ACC_BIKE	Coefficient – Access to Trolley Station by Bike	-0.2020	0.0407	-4.9598	0.0000
B_TVAR	Coefficient – Time Variability	-0.0077	0.0007	-10.9644	0.0000

Only statistically significant attributes where the p-value is less than 0.05 were used in the model to estimate results, meaning that with a p-value of 0.05 there is only a five percent chance that the variable is not significant. Since the highest p-value in the variables used in the model was 0.0003, this indicates that all of the variable coefficients specified in the model are valid at an extremely high confidence level. Unfortunately, several of the original variables being tested in the SP questions did not have a significant impact on results at 0.05 confidence level. These included access mode, number of transfers, and transit features (amenities). Since these variables did not produce a significantly measurable impact on mode choice, these variables were excluded from the analysis.

Note that the values of the estimated coefficients are not a measure of comparative importance between the different variables. However, since all coefficient values are negative, they are equivalent with having a negative impact on overall utility when variables such as trip time and cost increase. For example, higher cost of a personal car lowers its utility which decreases the likelihood for this travel mode to be selected.

Although the individual variable coefficient cannot be directly compared as a measure of relative importance, they can be used to produce the estimated market share by travel mode. In addition, the time and cost variables can be used to calculate the Value of Time (VOT) by dividing time by cost. Using the results in Table 8, the VOT per minute is calculated as 0.257 (B_TIME/B_COST or -0.0145/ -0.0563 which equals to 0.257). Converting from minutes to hours, this equates to about $15 per hour ($0.257 * 60 minutes). This result is reasonable [7] and consistent [8] with professional literature on the subject for national studies, and is within the recommended $10 to $17 per hour in 2015 dollars for all-purpose trips made

[6] For the Stated Preference analysis the Trolley and Sprinter were combined because they are similar and together, they provide broader coverage for feedback from a larger portion of the region. For simplicity the two services will be referred to solely as "Trolley."

[7] Small, D. B. (2005). Valuing Time and Reliability: Assessing the Evidence from Road Pricing Demonstrations. *Transport. Research A, Vol. 39*, 279-293.

[8] Kaan Ozbay, O. Y.-T.-V. (2006). *Theoretical Derivation of Value of Travel Time and Demand Elasticity: Evidence from NJ Turnpike Toll Road.* Washington, DC: Transportation Research Board 85th Annual Meeting, TRB.

locally.[9] Overall, the model shows that residents are largely influenced by the alternative option (i.e. car) and the attribute values (time, cost, variability, frequency) are relatively less important.

Table 9: Average Choice Probabilities

Mode Choice	Mean	Standard Error	Lower Limit	Upper Limit
Train	0.2310	0.0009	0.2293	0.2328
Bus	0.1989	0.0012	0.1966	0.2012
Shared	0.0817	0.0005	0.0806	0.0827
Trolley	0.2849	0.0016	0.2817	0.2882
Personal Car	0.4415	0.0023	0.4370	0.4460

Another useful type of analysis involves calculating the average choice probability for each travel mode which is shown in Table 9 under the column labelled "Mean." Note that these probabilities are the result of designing the SP scenarios with the objective of making non-car options to be roughly equally desirable as a personal car. This is needed to secure meaningful scores for the attributes. If more realistic values were used instead, the result would approximate the current travel mode market share, but the model would not produce sufficient information to provide meaningful results. For instance, the mean value of 0.4415 for personal car can be interpreted as 44 percent chance of "personal car" being selected as a travel mode within the context of the hypothetical SP scenarios.

Each value of average choice probability by itself does not directly provide any actionable findings. However, the baseline average choice probabilities can be used as a benchmark to compare with new estimates derived from some policy experiments, such as increasing car costs or reducing transit headways. The impacts of such policy experiments can be measured by observing the changing values between the base and the new estimates. These experiments will be discussed in the Sensitivity Analysis section at the end of this chapter.

5.2. Analysis of Results

The potential transit rider market in the San Diego region is not homogenous. Travel needs and preferences vary based on a variety of factors. There are people who place a higher value on time spent driving while others place a higher value on the relative cost of a transit trip compared to driving alone.[10] For this reason, several model estimations were developed by incorporating demographic or geographic variables to increase the explanatory power of the model, and to help identify subgroups that behave differently from the broad averages. In addition to VOT, the results include the construction of confidence intervals to gauge the variation of VOT across the various subgroups.

[9] Office of the Secretary of Transportation. (2016). *Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis.* Washington, DC: U.S. Department of Transportation.

[10] Collier, R. N. (1994). Commuting Stress, Ridesharing, and Gender: Analysis from the 1993 State of the Commute Study in Southern California. *Transportation Research Record 1433*, 170-176.

5.2.1 Socio-Economic Variables

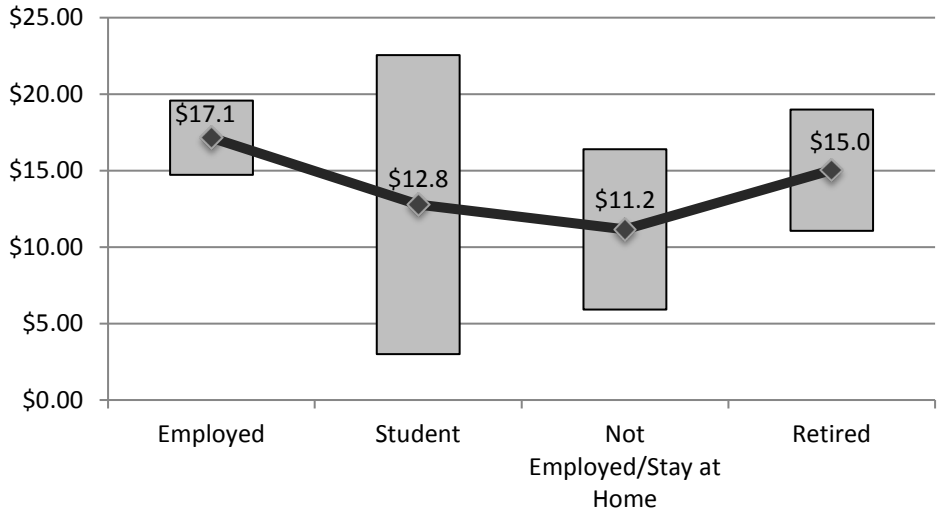
VOT in the San Diego region tends to increase with household income and is generally lower for unemployed/stay-at-home individuals, indicating that employed residents tend to have a greater willingness-to-pay for time savings. Table 10 shows how the VOT varies across different demographic groups and includes lower and upper limits based on a 95 percent confidence level.

Table 10: Value of Time by Socio-Economic Variables

Variables		Survey Count	VOT ($$/Hr)	Standard Error	Lower Limit	Upper Limit
Income	Less than $30,000	751	$7.8	$1.9	$4.1	$11.6
	$30,000 - $59,999	998	$11.6	$1.8	$8.1	$15.1
	$60,000 - $99,999	1053	$15.5	$1.8	$11.9	$19.1
	$100,000 - $149,999	729	$18.2	$2.3	$13.8	$22.6
	$150,000 or more	627	$24.9	$3.1	$18.9	$30.9
Employment Status	Employed	2579	$17.1	$1.2	$14.7	$19.6
	Student	226	$12.8	$5.0	$3.0	$22.6
	Not Employed/Stay at Home	591	$11.2	$2.7	$5.9	$16.4
	Retired	1053	$15.0	$2.0	$11.1	$19.0
Distance from/to Work	< 8 Miles	736	$12.9	$2.0	$9.0	$16.7
	8-15 Miles	821	$24.2	$3.7	$16.9	$31.5
	> 15 Miles	806	$18.8	$3.1	$12.7	$24.9
Travel time from/to Work	< 20	808	$13.9	$1.9	$10.3	$17.6
	20-30	906	$19.2	$2.7	$13.9	$24.5
	> 30	649	$24.4	$4.2	$16.1	$32.7

Figure 24 shows the VOT by employment and student status with lower and upper limits in graphical form.

Figure 24: VOT Variation by Employment Status



As can be seen by the length of the bar for student VOT in Figure 24, the smaller sample size for student respondents produces a relatively large range from $3.0 per hour to $22.6 per hour. Accordingly, although students have at least a directionally lower value of time than employed residents, the difference is not significantly different.

Figure 25 shows the relative impact of different transit modes by employment status. The ASC values are monetized so that they closely represent how much each individual needs to be compensated to increase the chance of switching from a car to public transit. The monetized ASC value is calculated by dividing the ASC coefficient for each transit mode by the coefficient for cost. Note that the ASC values can also be interpreted as the individual's attitude or perception which is not captured by the variables that are specified in the model, such as travel time and cost.

Showing how the ASC estimates vary by employment status reveals that if all the logical variable levels are the same across the different demographic groups, students are the most receptive to using public transit. The negative monetary values for students for all three transit modes reflect a generally positive attitude towards transit, if all other factors used in the model remain the same.

Figure 25: Alternative-Specific Constants by Employment Status

VOT also increases with travel time to/from work or school. Note that commute travel time in Table 10 is derived from the respondent's actual responses to the survey, not the travel time presented in the SP scenarios. While the relationship of VOT and travel time to/from work or school is directly proportionate, this is not the case with travel distance. The VOT for trips of more than 15 miles, while higher than the VOT for trips less than eight miles, is lower than trips that are between eight and 15 miles. Since the relationship is stronger with trip time than trip distance, any improvements in trip travel time should be emphasized when communicating with potential riders.

Figure 26 shows the relative level of resistance by income category for each public transit mode. This indicates that there is an increased resistance to riding the bus as income increases, starting at about $4 for those with income below $30,000 and increasing with each income category to about $20 for those with an income of $150,000 or higher.

Figure 26: Alternative-Specific Constants by Income

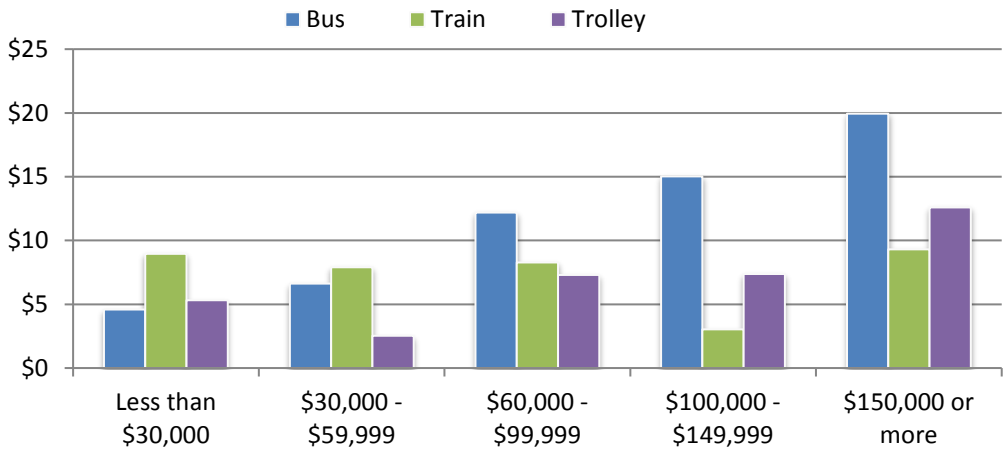


Table 11: Transit Average Probability by Income

Income Category	Train	Bus	Trolley
Less than $30,000	20%	29%	30%
$30,000 - $59,999	21%	24%	32%
$60,000 - $99,999	24%	19%	29%
$100,000 - $149,999	26%	14%	28%
$150,000 or more	25%	12%	23%

The likelihood of choosing bus as a travel mode is highest in the lowest income category of less than $30,000 at 29 percent. It decreases with each higher income category to a low of 12 percent for those in the highest income category of $150,000 or more. The likelihood of choosing the Trolley follows the same directional pattern as the bus, but only decreases from 30 percent for the under $30,000 group to 23 percent for the $150,000 or more group. Selection of train as a travel mode is actually positively correlated to income with a 20 percent share for those with less than $30,000 income and increasing slightly to 26 percent for those with an income of $100,000-$149,000 and 25 percent for those with $150,000 or more income. This finding is in line with Bhat at al. (2006)[11], who found that individuals from high income households are more likely to use rail transit than the bus or non-motorized travel modes.

5.2.2 Gender and Age

Using gender as the segmentation for the logit model shows that male travelers are slightly higher in VOT compared to their female counterparts. As the result, male travelers also have higher ASCs for public transit usage. This means that female travelers are somewhat more open than men to consider changing from driving alone to using public transit.

Table 12: Value of Time by Gender and Age

Variables		Survey Count	VOT ($$/Hr)	Standard Error	Lower Limit	Upper Limit
Gender	Male	2,206	$16.2	$1.4	$13.4	$19.0
	Female	2,155	$14.4	$1.2	$12.0	$16.8
Age	18-29	778	$13.0	$2.3	$8.4	$17.5
	30-44	1,115	$14.6	$1.7	$11.2	$18.0
	45-59	1,073	$18.7	$2.0	$14.7	$22.7
	60+	1,434	$14.9	$1.6	$11.7	$18.1

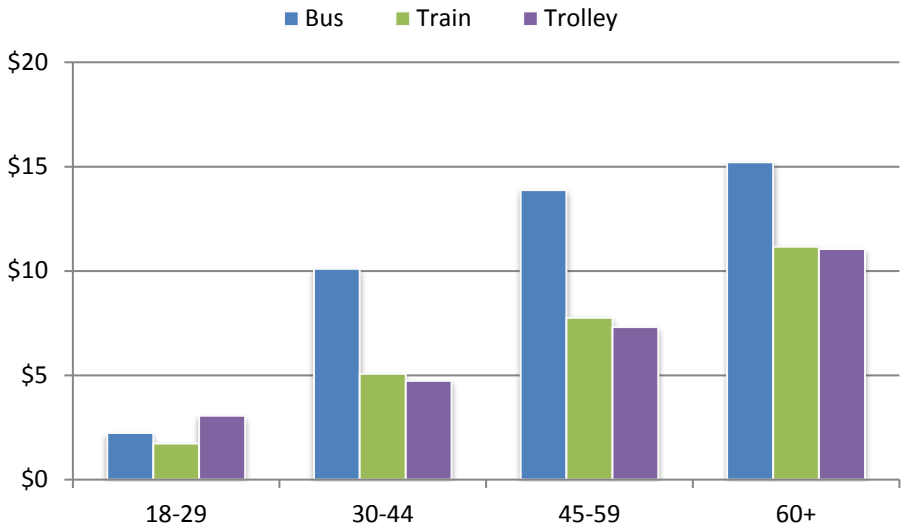
For the youngest age group (18-29 years old), the VOT is consistent with the student VOT ($12.8) at $13 per hour. The VOT increases with age in the 30-44 age group ($14.6) and 45-59 ($18.7) as incomes generally

[11] Bhat, C. S. (2006). The Impact of Stop-Making & Travel Time Reliability on Commute Mode Choice. *Transportation Research Part B. 40*, 709-730.

rise with age. This trend is reversed with the oldest age group of 60+, which has a lower VOT than those in the 45-59 year-old category.

The ASC values increase with age. Individuals from the age of 18-29 years old are the most receptive to using public transit as a mode of travel. All three transit alternatives within this age group are perceived almost equally from $2 to $3. The resistance to use public transit goes up as age increases likely reflecting higher income levels in the prime working age groups and lower income and relative intransience of those 60 or older. Among the three transit modes, bus experiences the greatest increase in the ASC level with age. Although the 60+ age group has a lower VOT than those 30-59 it has a higher ASC for the bus. Similarly, the average choice probability of personal automobile usage for 60+ years old is the highest among all other age groups.

Figure 27: Alternative-Specific Constants by Age



5.2.3 Major Statistical Areas (MSAs)

There are two distinct VOT estimates for the different SANDAG MSAs. The higher range for the Northwest, North City, and Central MSAs averages $18 per hour, which is higher than overall regional average of $15 per hour. The Northeast and South MSAs have a lower VOT averaging approximately $11 per hour. The average for the East MSA is above the regional average of $15 per hour, but due to higher variability in this MSA, it does not fit cleanly with other higher VOT MSAs.

Figure 28: VOT Variation by MSA

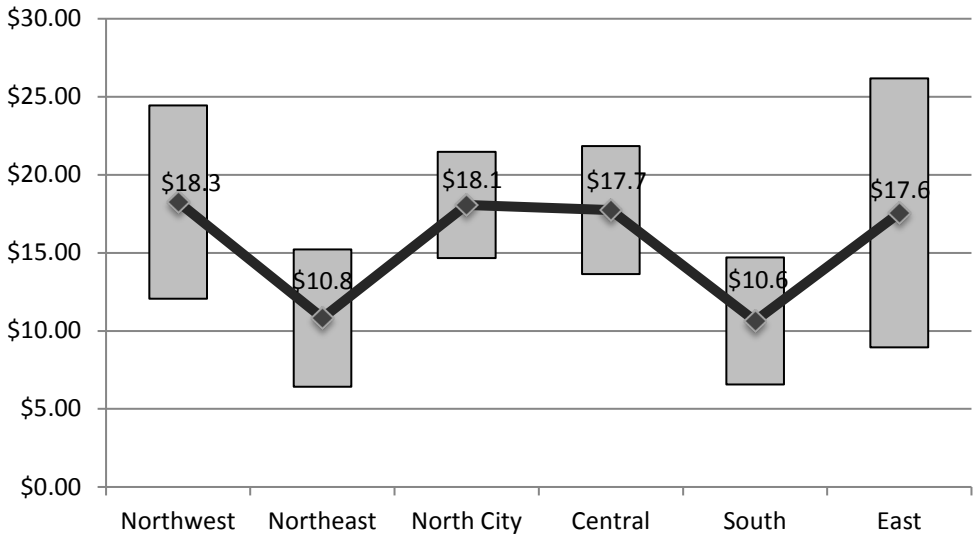
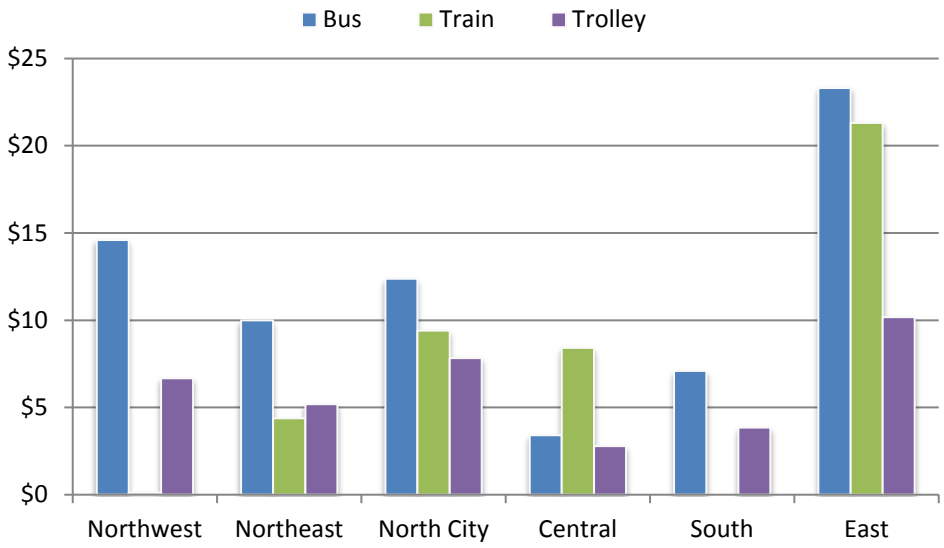


Figure 29: Alternative-Specific Constants by MSA



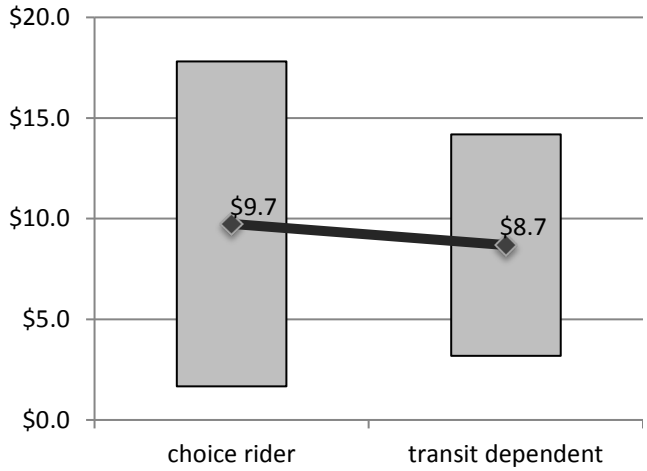
The low ASC values for bus and the Trolley for residents in the Central MSA show an increased willingness to ride the bus and the Trolley, reflecting the increased access to transit in this MSA. The South MSA ranks second for the bus and Trolley. Conversely, the highest resistance to using public transit is in the East MSA. While the western ends of the East MSA, such as the City of Santee and El Cajon, have access to transit because of their proximity to the MTS transit stops (which explain the much lower ASC for the Trolley), the rest of East MSA is built around isolated communities, suburban/rural areas where transit options are limited, making driving more feasible.

For the train, the lowest ASC values are observed in the Northwest and the Northeast MSAs.[12] Since COASTER primarily serves the Northwest, the resistance to use the train is nearly neutral or close to $0 at $0.13. The resistance to use Trolley or SPRINTER in these two regions is generally low, but not as low as observed in the Central and South MSAs.

5.2.4 Transit Dependent Riders and Choice Riders

In this report, dependent and choice riders are defined using two survey variables: primary travel mode and car availability. Survey respondents are identified as dependent riders if their primary travel mode is transit (i.e. bus, Trolley, COASTER, SPRINTER) and their access to a personal automobile is rarely or never. Conversely, choice riders are those whose primary travel mode is transit and their access to a personal automobile is always or sometimes.

Figure 30: VOT Variation by Transit Riders

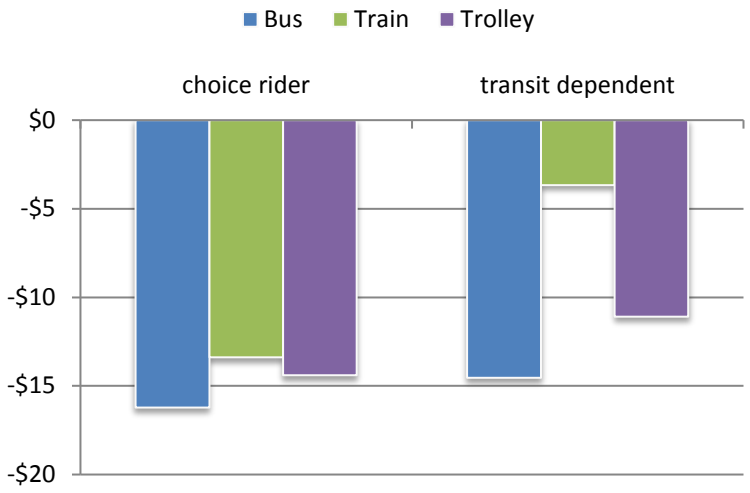


The VOT for both choice riders and dependent riders are low relative to the regional average ($15) at $8.7 to $9.7 per hour indicating a lower value of time for all transit riders, even if they are choice riders.

[12] The lack of a visible value for train in the Northwest MSA does not indicate a lack of survey data. There is a significant amount data for this value, but the average ASC value for these records is close to zero ($0.13), indicating very low resistance to using the train and hence not showing as a visible bar in the chart.

All ASC values for transit riders have negative values because these two groups are already using public transit and clearly have a relatively positive attitude towards public transit. However, the magnitude of the train ASC is different between choice and dependent riders. Choice riders place a higher value on the train as a travel mode compared to transit dependent riders. This is in line with choice riders having higher incomes which make train travel more feasible, and choice riders already have a higher mode share for train than transit dependent riders.

Figure 31: Alternative-Specific Constants by Transit Riders



The values of average choice probability indicate that choice riders are more equally likely to use the different public transit services, while transit-dependent riders are more likely to use the bus. This is line with income levels and access to a vehicle where higher incomes and having a car make riding the train much easier.

5.3. Sensitivity Analysis

Sensitivity analysis is used to assess the potential impact of different changes in services and costs. It employs different "what-if" scenarios to examine how the mode choice probability changes with variation of inputs in the logit model. Based on model outputs from the previous section, the three factors most likely to influence mode choice are cost, travel time and access time.

Table 13: Cost Sensitivity Analysis

Change of Cost		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Cost	-10%	23.6%	19.8%	8.1%	28.4%	44.1%
Train Cost	+10%	22.6%	19.9%	8.2%	28.6%	44.2%
Bus Cost	-10%	23.0%	20.2%	8.1%	28.4%	44.0%
Bus Cost	+10%	23.2%	19.5%	8.2%	28.6%	44.3%
Shared Cost	-10%	23.0%	19.7%	8.9%	28.3%	43.8%
Shared Cost	+10%	23.2%	20.0%	7.5%	28.7%	44.4%
Trolley Cost	-10%	23.0%	19.8%	8.1%	28.9%	43.9%
Trolley Cost	+10%	23.2%	20.0%	8.2%	28.1%	44.4%
Car Cost	-10%	22.7%	19.4%	8.0%	27.8%	45.7%
Car Cost	+10%	23.5%	20.4%	8.4%	29.2%	42.6%

The cost sensitivity shown in Table 13 presents changes in travel mode average probability with 10 percent increases and decreases in travel costs by mode. As noted in the beginning of this chapter, the variable levels in the stated preference scenarios were deliberately selected to produce mode shares as close to each other as possible. They are not intended to represent actual mode shares under current market conditions. However, the changes of average choice probability resulting from the cost variations are still meaningful, providing the level of change that could be anticipated based on the cost changes to the different travel modes.

Travelers using a personal automobile are more sensitive to changes in the cost of car travel than to cost changes for other modes. After raising the cost of car travel by 10 percent, the choice probability for car decreases by 1.5 percentage points, with a positive shift to the Trolley of 0.7 points, followed by bus, train, and shared rides (+0.5, +0.4, and +0.2 percentage points respectively). Reducing costs by 10 percent for the different transit options has only a limited impact on increasing the choice probability for these options with increases of 0.5, 0.4, 0.3 percentage points for the train, Trolley and bus, and 0.7 points for shared rides.

Table 14: Travel Time Sensitivity Analysis

Change of Travel Time		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Travel Time	-10%	24.0%	19.8%	8.1%	28.4%	44.0%
Train Travel Time	+10%	22.2%	20.0%	8.2%	28.6%	44.3%
Bus Travel Time	-10%	22.9%	21.0%	8.1%	28.1%	43.6%
Bus Travel Time	+10%	23.3%	18.9%	8.3%	28.8%	44.6%
Shared Travel Time	-10%	23.0%	19.8%	8.4%	28.4%	44.0%
Shared Travel Time	+10%	23.2%	19.9%	7.9%	28.6%	44.3%
Trolley Travel Time	-10%	22.8%	19.6%	8.0%	29.7%	43.5%
Trolley Travel Time	+10%	23.4%	20.2%	8.3%	27.3%	44.8%
Car Travel Time	-10%	22.8%	19.6%	8.0%	28.0%	45.2%
Car Travel Time	+10%	23.4%	20.2%	8.3%	29.0%	43.1%

All travel modes, with the exception of Shared Rides, show a similar sensitivity to a 10 percent reduction in travel time. With a 10 percent reduction in travel time the Trolley choice probability increases by 1.2 percentage points, followed by personal automobile and bus by 1.1 points, and train by 0.9 points. The 10 percent reduction of travel time for shared rides only increases the choice probability by 0.2 points. From another perspective, a 10 percent increase in travel time by car results in a 1.0 percentage point drop in the choice probability of driving, and increases the probabilities for the Trolley, train, bus and shared rides by 0.5, 0.3, 0.3 and 0.1 points respectively.

Table 15: Access Time Sensitivity Analysis

Change of Access Time	Average Choice Probability		
	Train	Bus	Trolley
Base	23.1%	19.9%	28.5%
-10%	23.3%	20.0%	28.8%
-30%	23.8%	20.4%	29.3%
-50%	24.2%	20.7%	29.9%
+10%	22.9%	19.7%	28.2%
+30%	22.4%	19.4%	27.7%
+50%	22.0%	19.1%	27.2%

The Trolley is the most sensitive travel mode to access time. However, even a 50 percent reduction in access time only increases the Trolley choice probability by 1.4 percentage points, and a 50 percent increase in access time has only a 1.3-point reduction in the Trolley's choice probability. The impact is less for the train with an increase of 1.1 points for a 50 percent reduction in access time and a decrease of 1.1 points for a 50 percent increase in access time. The bus has the lowest sensitivity to access time with 50 percent decreases and increases having a 0.8-point impact in both directions.

All of the previous sensitivity tests were conducted with one attribute being examined at a time. Unfortunately, no changes in a single variable were sufficient to produce a significant shift in choice probabilities towards public transit. It is possible, however, by concurrently changing multiple parameters to increase transit share. Some of the factors are not under control of the agencies (cost of gas, congestion impact on travel time), and those that are within the agencies' control have significant costs. The following sensitivity analysis reflects changes in multiple attributes to determine which combinations of attributes and attribute change levels are required to achieve at least a five-percentage point increase in one or more public transit mode choice probabilities.

Table 16: Sensitivity Analysis with Multiple Attributes

Changes			**Cumulative Average Choice Probability**				
			Train	**Bus**	**Shared**	**Trolley**	**Car**
Base			23.1%	19.9%	8.2%	28.5%	44.1%
Internal Factor Transit Cost	-10%	AND	23.4%	20.1%	8.1%	28.7%	43.7%
Transit Travel Time	-20%	AND	24.2%	21.4%	7.5%	30.2%	41.1%
Transit Access Time	-10%	AND	24.3%	21.5%	7.5%	30.4%	40.8%
Transit Frequency of Service	-10%	AND	24.9%	21.6%	7.4%	30.6%	40.4%
Transit Time Variability	-10%	AND	25.0%	21.9%	7.3%	30.8%	40.0%
External Factor							
Car/Shared Ride Cost	+20%	AND	26.1%	23.1%	6.5%	32.5%	37.4%
Car/Shared Ride Travel Time	+20%		26.7%	23.9%	6.3%	33.5%	35.6%
Net Change from Base			+3.6%	+4.0%	-1.9%	+5.0%	-8.5%

Note: the average choice probability for each mode is cumulative from base value

There are seven attributes applied in the experiment – five of which are under the control of the public agencies to a certain extent, and two external factors affecting mode choice. The five transit attributes are enumerated below along with sample implementation measures.

1. Transit cost – fare type and cost adjustment
2. Transit travel time – route alignments, express services, signal coordination, bus lanes
3. Transit access time – stop and station proximity, improved transit connections, first/last mile services, land use policies
4. Transit frequency of service – transit headway
5. Transit time variability – delay control, real-time stop information

The effect of each attribute on the choice probability is set to be cumulative. Initially, transit cost was reduced by 10 percent which increased the public transit choice probability. Transit travel time was then reduced by 20 percent in addition to the reduction in transit cost. This further increased the public transit choice probability. The remaining attributes below travel time are subsequently added on top of the previous attribute to produce the cumulative effect on the choice probabilities. Finally, the computation stops when one of the public transit choice probabilities (in this case the Trolley) reaches a five percent increase from the base choice probability.

The results show that the combined change in attributes have the greatest effect on driving alone with the shift spread across different public transit modes with the greatest impact on the Trolley.

Collectively, public transit choice probabilities have an increase of 12.6 percent when all conditions across the attributes are met. It is important to recognize that all sensitivity analyses make use of the what-if scenarios without considering project costs associated with the changes. Whether or not implementation of the changes is worth the ridership increase is a subject for another future study.

5.4. Conclusion

This stated preference (SP) study explores various model estimates to identify differences in travel mode choice given many transportation attributes in the San Diego region. The model results are measured using the value-of-time (VOT), alternative-specific constants (ASC), and the changing average choice probability derived from the sensitivity tests.

A conditional logit model was employed to recognize the key factors influencing mode choice. The initial model identified some parameters that were not statistically significant in the determination of mode choice. These include access mode, number of transfers, and transit features (amenities). Accordingly, these parameters were omitted from the subsequent logit models.

Using statistically significant parameters, the VOT and ASC are segmented into four parts: socio-economic variables, major statistical areas, gender and age, as well as rider types. The result suggests that individuals with lower incomes have a lower VOT and are more likely to take the bus while more affluent individuals have higher a VOT and are more likely to take the train, suggesting a positive image of travel by train and a negative impression of travel by bus among affluent residents. Northeast and South MSAs generally have lower VOTs than other MSAs due to lower socio-economic levels as measured by income and employment status.

Women and 18-29 year-olds are more amenable to the use of public transit than other demographic groups based on their lower VOTs and ASC values. Although the VOTs of choice riders and transit dependent riders are similar, the choice riders are more likely to use the train than other transit modes in line with the higher income levels of choice riders compared to transit dependent riders.

The sensitivity analysis shows that improving single attribute such as travel time or cost has a negligible impact on the likelihood of choosing alternative travel modes.

The transit attributes used in the experiment includes cost, travel time, access time, frequency of service, and time variability. In order to achieve a minimum five percent increase in any transit mode, the study found that all transit attributes need to be reduced by 10-20 percent while car cost and travel time attribute values are assumed to increase by 20 percent.

APPENDICES

Appendix A: Methodology

There were two phases of the data collection efforts. Phase one which was conducted from October 7 to December 6, 2018 utilized online survey panel with a target sample of 2,500 surveys from the general public. Survey responses were closely monitored so that they were balanced throughout by MSAs, gender and age. There was a total of 2,839 surveys completed during this phase.

In the second phase, the survey sample was obtained from two sources; the SANDAG household travel survey and MTS email lists. Email invitations were sent out in three waves during the second phase, and surveys were completed from February 18 through March 13, 2019. Because the goal was to increase the number of responses from transit riders, there were no specific demographic targets established for this phase. Comparing the survey results with phase one (which represents the general public), it was determined that the SANDAG email list produced results that were closer to the general public, phase one results, while the MTS email list was oriented more towards transit riders. Overall, there were 1,557 and 477 surveys completed from the SANDAG and MTS pools respectively.

Appendix A.1 Sampling Methodology

The sampling plan was developed to result in a statistically valid sample with a minimum of 3,750 surveys, which included a base sample of the general public of at least 2,500 surveys and an oversample of infrequent riders of at least 1,250 surveys. Census data is used to build the sampling plan and was obtained from the American Community Survey. Because there are two transit districts, the sampling plan is stratified by MSAs (four MSAs in the MTS district and two for NCTD), where each MSA shows a distribution of census population by age group.

Table 17: SANDAG Population by MSA and Age (Count)

MSA	18-29	30-44	45-59	60+	Total
Central	128,152	133,958	97,009	86,370	445,489
East	77,941	90,538	96,437	94,933	359,849
North City	147,511	171,844	150,666	141,506	611,526
Northeast	86,938	102,328	99,530	93,178	381,973
Northwest	81,909	89,326	91,622	93,799	356,655
South	98,273	108,101	96,472	85,499	388,345
Total	**620,724**	**696,093**	**631,736**	**595,285**	**2,543,838**

Prior to developing the sampling plan, a list of zip codes with assigned geographical MSA was provided by SANDAG. Using these zip codes, the census data was queried accordingly and a table of population counts arranged by MSA and age groups is produced. This table is the base for allocating the target sample to each MSA and age combination.

Table 18: SANDAG Population by MSA and Age (Percent)

MSA	18-29	30-44	45-59	60+	Total
Central	29%	30%	22%	19%	100%
East	22%	25%	27%	26%	100%
North City	24%	28%	25%	23%	100%
Northeast	23%	27%	26%	24%	100%
Northwest	23%	25%	26%	26%	100%
South	25%	28%	25%	22%	100%
Total	**24%**	**27%**	**25%**	**23%**	**100%**

The targeted 3,750 surveys were divided by the six MSAs to produce a sample target for each MSA of 625 surveys. Within each MSA, the 625 surveys were then distributed across four age group categories based on the census population proportion for each MSA and age group combination. This is reflected in the target sampling plan in Table 19.

Table 19: Sampling Plan Targets

MSA	18-29	30-44	45-59	60+	Total
Central	180	188	136	121	625
East	135	157	167	165	625
North City	151	176	154	145	625
Northeast	142	167	163	152	625
Northwest	144	157	161	164	625
South	158	174	155	138	625
Total	**910**	**1,019**	**936**	**885**	**3,750**

Despite the challenge of accurately targeting individuals with a specific age or their transit use frequency in the online survey platform, the actual data collection attempts to achieve a reasonable distribution of completed surveys by MSA and age. Overall, the total collected surveys of 4,873 far exceeded the total target sample of 3,750, yielding statistical precision of ± 1.4% at a 95% confidence interval. All but one of the age group categories exceed the age category exceeded the target, with the exception of the 18-29, year old category, which was 92 percent of target. Similarly, all but one of the MSA targets were achieved, with the exception of the Northeast MSA, which was 97 percent of the target.

Table 20: Surveys Collected & Statistical Precision

MSA	18-29	30-44	45-59	60+	Total	Statistical Precision (@95% CI)
Central	161	328	273	370	1,132	± 2.9%
East	106	159	156	227	648	± 3.8%
North City	170	268	281	387	1,106	± 2.9%
Northeast	123	137	161	188	609	± 4.0%
Northwest	91	140	159	257	647	± 3.8%
South	189	208	159	175	731	± 3.6%
Total	**840**	**1,240**	**1,189**	**1,604**	**4,873**	**± 1.4%**

Due to an invalid or a missing response for the age group question (one percent of total surveys), some survey records are omitted from the table of collected surveys although the survey information remains complete and was included in the analysis. The statistical precision for each MSA is within ± 4% at the 95% confidence level.

Out of 4,873 completed surveys, 4,396 (90%) were obtained from the general public samples, including samples from the online panel and those obtained from the previous SANDAG travel survey email list. The general public results exceed the minimum requirement of 2,500 surveys. Similarly, the 2,068 completed surveys for infrequent riders exceed the minimum requirement of 1,250 surveys. The statistical precision levels for the general public sample and the infrequent riders are ± 1.5% and ± 2.2% respectively at a 95% confidence interval.

Appendix A.2 Data Weighting Methodology

Survey data was weighted to ensure that the final results are representative of the target population (i.e. MSA and age) within each trip mode share in San Diego region. The trip mode distribution used in the weight development is obtained from SANDAG's Activity Based Model (ABM) which includes all intra- and inter-household travels. The weighted survey data significantly increases the share of carpooling and decreases the proportion of driving alone since the ABM data which is based on a typical household travel survey consists of all trip modes while the survey question of this study asks for an individual's primary travel mode.

Table 21: Mode Cross-Walk between ABM and Survey Category

Cross-Walk	ABM Category	Survey Category
Drive Alone	Drive Alone Non-Toll	Drive Alone
	Drive Alone Toll Eligible	Motorcycle
		Zipcar
		Rental Car
Carpool	Shared Ride 2 Non-Toll	Carpool
	Shared Ride 2 Toll Eligible	TNC
	Shared Ride 3 Non-Toll	Taxi
	Shared Ride 3 Toll Eligible	
Public Transit	Kiss and Ride to Transit - Local Bus and Premium Transit	Bus
	Kiss and Ride to Transit - Local Bus Only	Trolley
	Kiss and Ride to Transit - Premium Transit Only	COASTER
	Park and Ride to Transit - Local Bus and Premium Transit	SPRINTER
	Park and Ride to Transit - Local Bus Only	Paratransit
	Park and Ride to Transit - Premium Transit Only	Amtrak
	Walk to Transit - Local Bus and Premium Transit	Shuttle
	Walk to Transit - Local Bus Only	
	Walk to Transit - Premium Transit Only	
Walk	Walk	Walk
		Scooter
		Wheelchair
Bicycle	Bicycle	Bicycle

Prior to developing the weights, a mode choice cross-walk was created to classify the differing mode labels of the ABM and the survey question into a similar group. Using the cross-walk, the ABM mode share based on person trips was calculated for each MSA and age segmentation. After the mode shares are known, the total population of the respective MSA and age is distributed in proportion to each mode share. Finally, the weights were produced by dividing the population share with the completed surveys for each MSA, age, and mode combinations.

Table 22: Weights Worksheet

MSA	Age	Mode	Person Trips	Mode Share	Population	Survey Count	Weight ('00)
Central	18-29	Bike	3,942	2.6%	3,957	2	19.7829
Central	18-29	Carpool	54,157	35.9%	54,357	27	20.1323
Central	18-29	Drive Alone	65,970	43.8%	66,214	81	8.1746
Central	18-29	Transit	11,749	7.8%	11,792	48	2.4568
Central	18-29	Walk	14,840	9.9%	14,895	3	49.6496
Central	30-44	Bike	3,340	1.8%	2,417	9	2.6855
Central	30-44	Carpool	68,119	36.8%	49,294	35	14.0840
Central	30-44	Drive Alone	91,425	49.4%	66,159	195	3.3928
Central	30-44	Transit	7,397	4.0%	5,353	74	0.7234
Central	30-44	Walk	14,835	8.0%	10,735	15	7.1568
Central	45-59	Bike	1,643	1.1%	1,085	3	3.6152
Central	45-59	Carpool	39,806	27.1%	26,277	30	8.7589
Central	45-59	Drive Alone	86,726	59.0%	57,249	165	3.4697
Central	45-59	Transit	5,308	3.6%	3,504	61	0.5744
Central	45-59	Walk	13,474	9.2%	8,894	14	6.3532
Central	60+	Bike	1,446	1.1%	990	5	1.9804
Central	60+	Carpool	35,754	28.3%	24,483	46	5.3225
Central	60+	Drive Alone	68,170	54.0%	46,681	197	2.3696
Central	60+	Transit	2,769	2.2%	1,896	103	0.1841
Central	60+	Walk	17,990	14.3%	12,319	19	6.4837
East	18-29	Carpool	44,499	45.7%	41,610	22	18.9135
East	18-29	Drive Alone	48,920	50.2%	45,744	61	7.4990
East	18-29	Transit	4,047	4.2%	3,784	20	1.8921
East	18-29	Bike+Walk	4,921	4.8%	4,601	3	15.3383
East	30-44	Bike	547	0.4%	385	1	3.8451
East	30-44	Carpool	53,948	41.9%	37,922	29	13.0766
East	30-44	Drive Alone	68,861	53.5%	48,405	108	4.4820
East	30-44	Transit	2,106	1.6%	1,480	19	0.7792
East	30-44	Walk	3,337	2.6%	2,346	2	11.7286
East	45-59	Carpool	39,260	30.4%	28,327	21	13.4889
East	45-59	Drive Alone	88,020	68.2%	63,508	107	5.9353
East	45-59	Transit	1,714	1.3%	1,237	27	0.4580
East	45-59	Bike+Walk	4,665	3.5%	3,366	1	33.6587

MSA	Age	Mode	Person Trips	Mode Share	Population	Survey Count	Weight ('00)
East	60+	Bike	447	0.4%	334	2	1.6706
East	60+	Carpool	41,819	32.9%	31,258	39	8.0148
East	60+	Drive Alone	77,878	61.3%	58,210	161	3.6155
East	60+	Transit	1,019	0.8%	762	24	0.3174
East	60+	Walk	5,846	4.6%	4,370	1	43.6960
North City	18-29	Bike	1,708	1.0%	1,802	1	18.0158
North City	18-29	Carpool	61,238	37.1%	64,593	26	24.8435
North City	18-29	Drive Alone	86,712	52.5%	91,463	106	8.6286
North City	18-29	Transit	7,265	4.4%	7,663	27	2.8382
North City	18-29	Walk	8,301	5.0%	8,756	10	8.7558
North City	30-44	Bike	2,791	1.3%	2,152	5	4.3044
North City	30-44	Carpool	82,918	37.2%	63,940	41	15.5951
North City	30-44	Drive Alone	125,681	56.4%	96,915	203	4.7741
North City	30-44	Transit	4,369	2.0%	3,369	15	2.2460
North City	30-44	Walk	7,090	3.2%	5,467	4	13.6681
North City	45-59	Bike	1,667	0.8%	1,217	6	2.0281
North City	45-59	Carpool	55,490	26.9%	40,505	28	14.4662
North City	45-59	Drive Alone	139,816	67.7%	102,060	212	4.8141
North City	45-59	Transit	2,807	1.4%	2,049	31	0.6610
North City	45-59	Walk	6,624	3.2%	4,835	4	12.0881
North City	60+	Bike	1,641	0.8%	1,165	8	1.4560
North City	60+	Carpool	59,560	29.9%	42,277	63	6.7107
North City	60+	Drive Alone	125,553	63.0%	89,121	268	3.3254
North City	60+	Transit	1,827	0.9%	1,297	40	0.3242
North City	60+	Walk	10,772	5.4%	7,646	8	9.5578
Northeast	18-29	Carpool	35,882	42.5%	42,788	25	17.1151
Northeast	18-29	Drive Alone	43,748	51.8%	52,168	72	7.2455
Northeast	18-29	Transit	4,891	5.8%	5,832	21	2.7773
Northeast	18-29	Bike+Walk	5,565	6.2%	6,636	5	13.2720
Northeast	30-44	Carpool	43,136	39.9%	40,878	27	15.1398
Northeast	30-44	Drive Alone	59,039	54.7%	55,948	93	6.0159
Northeast	30-44	Transit	1,633	1.5%	1,548	13	1.1904
Northeast	30-44	Bike+Walk	4,173	3.9%	3,955	4	9.8863
Northeast	45-59	Bike	382	0.4%	350	2	1.7510
Northeast	45-59	Carpool	28,486	26.2%	26,115	28	9.3269
Northeast	45-59	Drive Alone	74,335	68.5%	68,149	118	5.7753
Northeast	45-59	Transit	1,323	1.2%	1,213	11	1.1026
Northeast	45-59	Walk	4,039	3.7%	3,703	2	18.5143
Northeast	60+	Bike	304	0.3%	269	1	2.6911
Northeast	60+	Carpool	33,917	32.2%	30,024	49	6.1273
Northeast	60+	Drive Alone	65,058	61.8%	57,590	130	4.4300
Northeast	60+	Transit	786	0.7%	696	6	1.1596

MSA	Age	Mode	Person Trips	Mode Share	Population	Survey Count	Weight ('00)
Northeast	60+	Walk	5,195	4.9%	4,599	2	22.9935
Northwest	18-29	Carpool	29,023	34.3%	33,888	19	17.8360
Northwest	18-29	Drive Alone	46,501	55.0%	54,296	60	9.0494
Northwest	18-29	Transit	3,026	3.6%	3,533	10	3.5333
Northwest	18-29	Bike+Walk	5,975	7.1%	6,977	2	34.8831
Northwest	30-44	Bike	1,419	1.5%	1,367	3	4.5572
Northwest	30-44	Carpool	33,509	36.1%	32,285	17	18.9910
Northwest	30-44	Drive Alone	54,084	58.3%	52,108	109	4.7805
Northwest	30-44	Transit	1,477	1.6%	1,423	10	1.4230
Northwest	30-44	Walk	2,224	2.4%	2,143	1	21.4274
Northwest	45-59	Carpool	22,407	23.3%	21,376	17	12.5741
Northwest	45-59	Drive Alone	68,496	71.3%	65,344	122	5.3561
Northwest	45-59	Transit	1,255	1.3%	1,197	19	0.6301
Northwest	45-59	Bike+Walk	3,883	4.0%	3,704	1	37.0434
Northwest	60+	Bike	1,217	1.2%	1,155	1	11.5472
Northwest	60+	Carpool	28,836	29.2%	27,360	53	5.1623
Northwest	60+	Drive Alone	63,488	64.2%	60,239	170	3.5435
Northwest	60+	Transit	820	0.8%	778	30	0.2593
Northwest	60+	Walk	4,497	4.5%	4,267	3	14.2229
South	18-29	Bike	604	0.7%	814	2	4.0720
South	18-29	Carpool	40,760	45.1%	54,958	26	21.1379
South	18-29	Drive Alone	37,321	41.3%	50,322	125	4.0257
South	18-29	Transit	6,208	6.9%	8,371	33	2.5365
South	18-29	Walk	5,439	6.0%	7,334	3	24.4455
South	30-44	Bike	781	0.7%	783	3	2.6089
South	30-44	Carpool	47,315	43.9%	47,417	29	16.3505
South	30-44	Drive Alone	53,065	49.2%	53,179	151	3.5218
South	30-44	Transit	3,078	2.9%	3,085	23	1.3411
South	30-44	Walk	3,630	3.4%	3,638	2	18.1890
South	45-59	Bike	603	0.6%	564	2	2.8207
South	45-59	Carpool	32,332	31.4%	30,248	18	16.8044
South	45-59	Drive Alone	63,157	61.2%	59,086	108	5.4709
South	45-59	Transit	2,570	2.5%	2,404	28	0.8587
South	45-59	Walk	4,457	4.3%	4,170	3	13.8990
South	60+	Bike	487	0.6%	532	2	2.6603
South	60+	Carpool	26,283	33.6%	28,715	21	13.6739
South	60+	Drive Alone	44,823	57.3%	48,971	126	3.8866
South	60+	Transit	1,401	1.8%	1,531	22	0.6958
South	60+	Walk	5,263	6.7%	5,750	4	14.3751

Appendix B: Survey Instrument

San Diego County Travel Survey

The San Diego Association of Governments would like your feedback to help improve travel in San Diego County. The survey takes 10 minutes to complete, and we appreciate your support by providing information that will help keep the County moving.

Screening

1 [Q1xZipCode] What is your home zip code? *

Alert:

"Your zip code is not listed in San Diego County. Click OK to confirm your response or Cancel to correct it."

---

2 [Q2xEmploymentStatus] Which of the following best describes your work and school status? *

- ○ Employed, full-time
- ○ Employed, part-time
- ○ Stay at home parent or caregiver (full-time)
- ○ Retired
- ○ Full-time student and not working
- ○ Full-time student and working
- ○ Unemployed and not seeking employment
- ○ Unemployed and seeking employment
- ○ Disabled and do not work

---

3 [Q3xEmployedStudent] Do you commute to work or school at least three times a week? *

Only answer this question if the following conditions are met:

(Q2xEmploymentStatus == 1) or (Q2xEmploymentStatus == 2) or (Q2xEmploymentStatus == 5) or (Q2xEmploymentStatus == 6)

- ○ Yes, work only
- ○ Yes, school only
- ○ Yes, both
- ○ No, my work is home-based
- ○ No, telework/telecommute
- ○ No, my school is online only
- ○ No, commute two days or less

---

4 [Q4xTripMiles] When you commute from home to work or school, about how many miles is your trip one-way? * (Please select your longest trip)

Only answer this question if the following conditions are met:
Q3xEmployedStudent > 0 and Q3xEmployedStudent < 4

---

5 [Q5xTripMinutes] And about how many minutes does this trip take from home to work or school? * (Please select your longest trip)

Only answer this question if the following conditions are met:
Q3xEmployedStudent > 0 and Q3xEmployedStudent < 4

Alert:

Based on your responses regarding travel distance and travel time, your speed is higher than 80 mph. If your response is correct, click OK to confirm your responses and to proceed to the next questions. Otherwise, click Cancel to correct your travel distance or travel time.

---

6 [Q6xTransitForm] What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? *

(If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip)

- ○ Drive alone (auto/truck/van/SUV)
- ○ Carpool (ride together with 1 other person)
- ○ Carpool (ride together with 2 to 4 other people)
- ○ Vanpool (ride together with 5 or more people)
- ○ Bus (MTS, NCTD)
- ○ Trolley
- ○ COASTER
- ○ SPRINTER
- ○ Motorcycle/Moped/Motorized scooter
- ○ Bicycle
- ○ Walk/Run
- ○ On-demand ride services such as Uber or Lyft
- ○ On-demand pooled rideshare services like Lyft Line, UberPOOL, or Waze Carpool
- ○ Zipcar
- ○ Paratransit
- ○ Other _____

---

7 [Q7xVehicleAccess] How would you describe your access to a personal vehicle, do you have access... ? *

- ○ Always
- ○ Sometimes
- ○ Rarely
- ○ Never

---

8 [CurrentElectric] Do you currently drive a plug-in electric vehicle? *

Only answer this question if the following conditions are met:
(Q7xVehicleAccess == 1 or Q7xVehicleAccess == 2 or Q7xVehicleAccess == 3) and (Q6xTransitForm > 4 and Q6xTransitForm < 9)

- ○ Yes
- ○ No

---

9 [ConsiderElectric] How likely would you be to consider a plug-in electric vehicle if transit stations had charging stations that charged for electricity? *

Only answer this question if the following conditions are met:
(Q6xTransitForm > 4 and Q6xTransitForm < 9) and (Q7xVehicleAccess == 4 or CurrentElectric == "N")

- ○ Very likely
- ○ Somewhat likely
- ○ Not very likely
- ○ Not at all likely

---

10 [Q7BxAnyTransit] In the last year, have you used any kind of public transit; BUS, TROLLEY, COASTER, or SPRINTER for any kind of trip in San Diego County, even if only once? *

Only answer this question if the following conditions are met:
Q6xTransitForm < 5 or Q6xTransitForm > 8

- ○ Yes
- ○ No
- ○ Not sure

---

11 [Q8xBusPastYr] In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was NOT 'Bus (MTS, NCTD)' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip))

-------- or Scenario 2 --------

Answer was 'Yes' at question '15 [Q7BxAnyTransit]' (In the last year, have you used any kind of public transit; BUS, TROLLEY, COASTER, or SPRINTER for any kind of trip in San Diego County, even if only once?)

- ○ Yes
- ○ No
- ○ Not sure

---

12 [Q9xTrolleyPastYr] In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was NOT 'Trolley' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip))

-------- or Scenario 2 --------

Answer was 'Yes' at question '15 [Q7BxAnyTransit]' (In the last year, have you used any kind of public transit; BUS, TROLLEY, COASTER, or SPRINTER for any kind of trip in San Diego County, even if only once?)

- ○ Yes
- ○ No
- ○ Not sure

---

13 [Q10xCoasterPastYr] In the last year, have you used the COASTER for any trips in the San Diego region, even if only once? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was NOT 'COASTER' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip))

-------- or Scenario 2 --------

Answer was 'Yes' at question '15 [Q7BxAnyTransit]' (In the last year, have you used any kind of public transit; BUS, TROLLEY, COASTER, or SPRINTER for any kind of trip in San Diego County, even if only once?)

- ○ Yes
- ○ No
- ○ Not sure

---

14 [Q11xSprinterPastYr] In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was NOT 'SPRINTER' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip))

-------- or Scenario 2 --------

Answer was 'Yes' at question '15 [Q7BxAnyTransit]' (In the last year, have you used any kind of public transit; BUS, TROLLEY, COASTER, or SPRINTER for any kind of trip in San Diego County, even if only once?)

- ○ Yes
- ○ No
- ○ Not sure

---

14 [Q12xBusWeekly] Do you generally ride the BUS at least once per week or less often? *

Only answer this question if the following conditions are met:

Q8xBusPastYr == 1 or Q6xTransitForm == 5

- ○ At least once a week
- ○ Less often

---

15 [Q13xBusDaily] In a typical week, how many days do you ride the BUS? *

Only answer this question if the following conditions are met:

Q12xBusWeekly == 1

- ○ One
- ○ Two
- ○ Three
- ○ Four
- ○ Five
- ○ Six
- ○ Seven

---

16 [Q14xBusLessOften] How often do you ride the BUS? *

Only answer this question if the following conditions are met:

Q12xBusWeekly == 2

- ○ 2 to 3 days per month
- ○ One day per month
- ○ One day every two months
- ○ Less often than one day every two months

---

17 [Q15xTrolleyWeekly] Do you generally ride the TROLLEY at least once per week or less often? *

Only answer this question if the following conditions are met:
Q9xTrolleyPastYr == 1 or Q6xTransitForm == 6

- ○ At least once a week
- ○ Less often

---

18 [Q16xTrolleyDaily] In a typical week, how many days do you ride the TROLLEY? *

Only answer this question if the following conditions are met:
Q15xTrolleyWeekly == 1

- ○ One
- ○ Two
- ○ Three
- ○ Four
- ○ Five
- ○ Six
- ○ Seven

---

19 [Q17xTrolleyLessOften] How often do you ride the TROLLEY? *

Only answer this question if the following conditions are met:
Q15xTrolleyWeekly == 2

- ○ 2 to 3 days per month
- ○ One day per month
- ○ One day every two months
- ○ Less often than one day every two months

---

20 [Q18xCoasterWeekly] Do you generally ride the COASTER at least once per week or less often?

Only answer this question if the following conditions are met:
Q10xCoasterPastYr == 1 or Q6xTransitForm == 7

- ○ At least once a week
- ○ Less often

---

21 [Q19xCoasterDaily] In a typical week, how many days do you ride the COASTER? *

Only answer this question if the following conditions are met:
Q18xCoasterWeekly == 1

- ○ One
- ○ Two
- ○ Three
- ○ Four
- ○ Five
- ○ Six
- ○ Seven

---

22 [Q20xCoasterLessOften] How often do you ride the COASTER? *

Only answer this question if the following conditions are met:
Q18xCoasterWeekly == 2

- ○ 2 to 3 days per month
- ○ One day per month
- ○ One day every two months
- ○ Less often than one day every two months

---

23 [Q21xSprinterWeekly] Do you generally ride the SPRINTER at least once per week or less often? *

Only answer this question if the following conditions are met:
Q11xSprinterPastYr == 1 or Q6xTransitForm == 8

- ○ At least once a week
- ○ Less often

---

24 [Q22xSprinterDaily] In a typical week, how many days do you ride the SPRINTER? *

Only answer this question if the following conditions are met:
Q21xSprinterWeekly == 1

- ○ One
- ○ Two
- ○ Three
- ○ Four
- ○ Five
- ○ Six
- ○ Seven

---

25 [Q23xSprinterLessOft] How often do you ride the SPRINTER? *

Only answer this question if the following conditions are met:
Q21xSprinterWeekly == 2

- ○ 2 to 3 days per month
- ○ One day per month
- ○ One day every two months
- ○ Less often than one day every two months

---

26 [Q24xQ28xArray]

Following is a short list of reasons people might choose to use transit over driving. For each one, please indicate with regard to your decision if it is a major reason, a minor reason, or not a reason for deciding to use transit. *

Only answer this question if the following conditions are met:
(Q7xVehicleAccess == 1) and (Q13xBusDaily > 2 or Q16xTrolleyDaily > 2 or Q19xCoasterDaily > 2 or Q22xSprinterDaily > 2)

	Major Reason	Minor Reason	Not a Reason
It reduces the stress of my commute	○	○	○
It makes me feel more connected to the community	○	○	○
It provides me with free time to read, or relax	○	○	○
It is less expensive than driving and parking	○	○	○
There is free and ample parking available at transit stations	○	○	○
I receive a discount transit pass from my employer	○	○	○
It helps the environment	○	○	○

27 [Q29xOnlyBus] Do you think in the next year that you will ride the bus... ? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'Bus (MTS, NCTD)' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip)) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

-------- or Scenario 2 --------

Answer was 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

- ○ More often
- ○ About the same
- ○ Less often
- ○ Not at all

---

28 [Q30xOnlyTrolley] Do you think in the next year that you will ride the Trolley... ? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'Trolley' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip)) and Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

-------- or Scenario 2 --------

Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

- ○ More often
- ○ About the same
- ○ Less often
- ○ Not at all

---

29 [Q31xOnlyCoaster] Do you think in the next year that you will ride the COASTER... ? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'COASTER' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip)) and Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

-------- or Scenario 2 --------

Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

- ○ More often
- ○ About the same
- ○ Less often
- ○ Not at all

---

30 [Q32xOnlySprinter] Do you think in the next year that you will ride the SPRINTER... ? *

Only answer this question if the following conditions are met:

-------- Scenario 1 --------

Answer was 'SPRINTER' at question '11 [Q6xTransitForm]' (What form of transportation do you use most often when commuting in the San Diego region, or making other trips if you don't commute? (If you use multiple forms of transportation to make a trip, select the one that you use for the longest part of the trip)) and Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?)

-------- or Scenario 2 --------

Answer was NOT 'Yes' at question '16 [Q8xBusPastYr]' (In the last year, have you used an MTS or NCTD BUS for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '17 [Q9xTrolleyPastYr]' (In the last year, have you used a TROLLEY for any trips in the San Diego region, even if only once?) and Answer was NOT 'Yes' at question '18 [Q10xCoasterPastYr]' (In the last year, have you used the COASTER for any trips in the San Diego region, even if only once?) and Answer was 'Yes' at question '19 [Q11xSprinterPastYr]' (In the last year, have you used the SPRINTER rail line for any trips in the San Diego region, even if only once?)

- ○ More often
- ○ About the same
- ○ Less often
- ○ Not at all

---

31 [Q33xMultipleModes] Do you think in the next year that you will be using public transit... ? *

Only answer this question if the following conditions are met:

((Q6xTransitForm.NAOK > 4 and Q6xTransitForm.NAOK < 9) and (Q8xBusPastYr.NAOK == 1 or Q9xTrolleyPastYr.NAOK == 1 or Q10xCoasterPastYr.NAOK == 1 or Q11xSprinterPastYr.NAOK == 1)) or (Q8xBusPastYr.NAOK == 1 and (Q9xTrolleyPastYr.NAOK == 1 or Q10xCoasterPastYr.NAOK == 1 or Q11xSprinterPastYr.NAOK == 1)) or (Q9xTrolleyPastYr.NAOK == 1 and (Q8xBusPastYr.NAOK == 1 or Q10xCoasterPastYr.NAOK == 1 or Q11xSprinterPastYr.NAOK == 1)) or (Q10xCoasterPastYr.NAOK == 1 and (Q8xBusPastYr.NAOK == 1 or Q9xTrolleyPastYr.NAOK == 1 or Q11xSprinterPastYr.NAOK == 1)) or (Q11xSprinterPastYr.NAOK == 1 and (Q8xBusPastYr.NAOK == 1 or Q9xTrolleyPastYr.NAOK == 1 or Q10xCoasterPastYr.NAOK == 1))

- ○ More often
- ○ About the same
- ○ Less often
- ○ Not at all

---

32 [Q34xWhichMore] Which type(s) of public transit do you think you will ride more often? *

Only answer this question if the following conditions are met:
Q33xMultipleModes == 1

Please choose all that apply:

- ☐ Bus
- ☐ Trolley
- ☐ The COASTER
- ☐ The SPRINTER

---

33 [Q35xWhyMore] Why do you think you will ride more often? *

Only answer this question if the following conditions are met:
Q29xOnlyBus == 1 or Q30xOnlyTrolley == 1 or Q31xOnlyCoaster == 1 or Q32xOnlySprinter == 1 or Q33xMultipleModes == 1

- ○ Better use of my time
- ○ More relaxing
- ○ Saves money
- ○ Moving home to a location where riding is feasible
- ○ Changing jobs/school to a location where riding is feasible
- ○ Other (please specify):

---

34 [Q36xWhichLess] Which type of public transit do you think you will ride less often? *

Only answer this question if the following conditions are met:
Q33xMultipleModes == 3

Please choose all that apply:

☐ Bus
☐ Trolley
☐ The COASTER
☐ The SPRINTER

---

35 [Q37xWhyLess] Why do you think you will ride less often? *

Only answer this question if the following conditions are met:
Q29xOnlyBus == 3 or Q30xOnlyTrolley == 3 or Q31xOnlyCoaster == 3 or Q32xOnlySprinter == 3 or Q33xMultipleModes == 3

○ It takes too long
○ No access to a transit station
○ Too much variability in trip time
○ Behavior of other riders
○ Safety at stops/stations
○ Safety onboard
○ Personal comfort while riding (seats/temperature/smooth ride)
○ Cost
○ Other

---

36 [Q38xAfterQuitting] How will you commute after you stop riding? *

Only answer this question if the following conditions are met:
Q29xOnlyBus == 4 or Q30xOnlyTrolley == 4 or Q31xOnlyCoaster == 4 or Q32xOnlySprinter == 4 or Q33xMultipleModes == 4

○ Using my car/buying a car and driving alone
○ Carpooling/vanpooling
○ Walking/biking
○ Other (please specify):

---

37 [Q39xWhyQuit] Why do you think you will stop riding? *

Only answer this question if the following conditions are met:
Q29xOnlyBus == 4 or Q30xOnlyTrolley == 4 or Q31xOnlyCoaster == 4 or Q32xOnlySprinter == 4 or Q33xMultipleModes == 4

- ○ Changing jobs and transit will not be feasible
- ○ Changing home location and transit will not be feasible
- ○ It takes too long
- ○ Too much variability in trip time
- ○ Behavior of other riders
- ○ Safety at stops/stations
- ○ Safety onboard
- ○ Personal comfort while riding (seats/temperature/smooth ride)
- ○ Cost
- ○ Other

---

38 [AnyInterest] How interested are you in starting to use, or increasing your use of any kind of public transit, such as the TROLLEY, MTS or NCTD BUSES, the COASTER, or the SPRINTER? *

Only answer this question if the following conditions are met:
(((is_empty(Q13xBusDaily) or (Q13xBusDaily <= "2")))) && (((is_empty(Q16xTrolleyDaily) or (Q16xTrolleyDaily <= "2")))) && (((is_empty(Q19xCoasterDaily) or (Q19xCoasterDaily <= "2")))) && (((is_empty(Q22xSprinterDaily) or (Q22xSprinterDaily <= "2"))))

- ○ Very interested
- ○ Somewhat interested
- ○ Slightly interested
- ○ Not at all interested
- ○ No opinion

---

39 [Q40xIncreaseBus] How interested are you in increasing the frequency with which you ride the BUS in the San Diego region?

Only answer this question if the following conditions are met:
AnyInterest == 1 or AnyInterest == 2 or AnyInterest == 3

- ○ Very interested
- ○ Somewhat interested
- ○ Slightly interested
- ○ Not at all interested
- ○ No opinion

---

40 [Q41xIncreaseTrolley] How interested are you in increasing the frequency with which you ride the TROLLEY in the San Diego region? *

Only answer this question if the following conditions are met:
AnyInterest == 1 or AnyInterest == 2 or AnyInterest == 3

- ○ Very interested
- ○ Somewhat interested
- ○ Slightly interested
- ○ Not at all interested
- ○ No opinion

---

41 [Q42xIncreaseCoaster] How interested are you in increasing the frequency with which you ride the COASTER in the San Diego region? *

Only answer this question if the following conditions are met:
AnyInterest == 1 or AnyInterest == 2 or AnyInterest == 3

- ○ Very interested
- ○ Somewhat interested
- ○ Slightly interested
- ○ Not at all interested
- ○ No opinion

---

42 [Q43xIncreaseSprinter] How interested are you in increasing the frequency with which you ride the SPRINTER in the San Diego region? *

Only answer this question if the following conditions are met:
AnyInterest == 1 or AnyInterest == 2 or AnyInterest == 3

- ○ Very interested
- ○ Somewhat interested
- ○ Slightly interested
- ○ Not at all interested
- ○ No opinion

---

43 [Q44xObstacles] Are there specific reasons or obstacles that will keep you from riding public transit (more often)? *

Only answer this question if the following conditions are met:
(((is_empty(Q13xBusDaily) or (Q13xBusDaily <= "2")))) && (((is_empty(Q16xTrolleyDaily) or (Q16xTrolleyDaily <= "2")))) && (((is_empty(Q19xCoasterDaily) or (Q19xCoasterDaily <= "2")))) && (((is_empty(Q22xSprinterDaily) or (Q22xSprinterDaily <= "2"))))

- ○ Yes
- ○ No

---

44 [Q45xSelectObstacles] What are they? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '43 [Q44xObstacles]' (Are there specific reasons or obstacles that will keep you from riding transit more often?)

Please choose all that apply:

☐ System not complete enough/not in my area/can't reach destination
☐ Can't get to/from stops or stations by walking
☐ Do not want to drive to transit station
☐ Transit station does not have enough parking
☐ Public transit is too slow
☐ Public transit travel time is too unreliable
☐ Employer does not offer flexible arrival or departure times
☐ Services don't run early/late enough
☐ Services run too infrequently
☐ Not enough weekend service
☐ Need to drop-off/pick up kids
☐ Have other errands I need to do that require a car
☐ Not comfortable with other riders/people at stations
☐ Cost is too high compared to driving
☐ Need car for work trips during the day
☐ Other:

---

45 [Q46xTripDifficulty] For trips that you commonly make, how easy or difficult would it be for you to plan how to make these trips using public transit using a BUS, the TROLLEY, the COASTER, or the SPRINTER? *

Only answer this question if the following conditions are met:
(((is_empty(Q13xBusDaily.NAOK) or (Q13xBusDaily.NAOK <= "2")))) && (((is_empty(Q16xTrolleyDaily.NAOK) or (Q16xTrolleyDaily.NAOK <= "2")))) && (((is_empty(Q19xCoasterDaily.NAOK) or (Q19xCoasterDaily.NAOK <= "2")))) && (((is_empty(Q22xSprinterDaily.NAOK) or (Q22xSprinterDaily.NAOK <= "2"))))

○ Very easy
○ Somewhat easy
○ Somewhat difficult
○ Very difficult
○ Don't Know

---

46 [Q47xCloseStop] Is there a BUS, TROLLEY, COASTER, or SPRINTER stop within 15 minutes walking distance or a mile of your HOME? *

○ Yes
○ No
○ Don't know

---

47 [Q48xStopByWork] Is there a transit stop within 15 minutes walking distance or a mile of your WORKPLACE? *

Only answer this question if the following conditions are met:
Q47xCloseStop == 1 and (Q2xEmploymentStatus == 1 or Q2xEmploymentStatus == 2 or Q2xEmploymentStatus == 6)

- ○ Yes
- ○ No
- ○ Don't know

---

48 [Q49xStopBySchool] Is there a transit stop within 15 minutes walking distance or a mile of your SCHOOL? *

Only answer this question if the following conditions are met:
Q47xCloseStop == 1 and Q2xEmploymentStatus > 4 and Q2xEmploymentStatus < 7

- ○ Yes
- ○ No
- ○ Don't know

---

49 [Q50xNewServices] Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used? *

Please choose all that apply:

- ☐ Ride-hailing services, such as Lyft, Uber or Sidecar
- ☐ Ride-hailing pooled services, such as Uber-Pool, Lyft-Line, or Waze Carpool
- ☐ Car-sharing services, such as Zipcar
- ☐ Non-motorized bike-sharing, such as Discover Bike, LimeBike, Ofo, or Mobike
- ☐ Electric bike or scooter-sharing, such as LimeBike or Bird
- ☐ None of the above

---

50 [Q51xRideHailing] Thinking of public transit and ride-hailing services like Uber and Lyft, does your use of ride hailing services ... ? *

Only answer this question if the following conditions are met:
Answer was 1 at question [Q50xNewServices]' (Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used?)

- ○ Increase your use of public transit by providing better access
- ○ Decrease your use of public transit by replacing it
- ○ Have no impact on use of public transit

---

51 [Q52xCarpoolHailing] Thinking of public transit and ride-hailing pooled services like Uber-Pool, Lyft-Line, and Waze Carpool, does your use of ride hailing carpooled services ... ? *

Only answer this question if the following conditions are met:
Answer was 2 at question [Q50xNewServices]' (Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used?)

- ○ Increase your use of public transit by providing better access
- ○ Decrease your use of public transit by replacing it
- ○ Have no impact on use of public transit

---

52 [Q53xCarSharing] Thinking of public transit and car-sharing services like Zipcar, does your use of car-sharing services ... ? *

Only answer this question if the following conditions are met:
Answer was 3 at question [Q50xNewServices]' (Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used?)

- ○ Increase your use of public transit by providing better access
- ○ Decrease your use of public transit by replacing it
- ○ Have no impact on use of public transit

---

53 [Q54xBikeShare] Thinking of public transit and bike-sharing services like Discover Bike, LimeBike, Ofo, or Mobike, does your use of bike-sharing services ... ? *

Only answer this question if the following conditions are met:
Answer was 4 at question [Q50xNewServices]' (Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used?)

- ○ Increase your use of public transit by providing better access
- ○ Decrease your use of public transit by replacing it
- ○ Have no impact on use of public transit

---

54 [Q55xElectricBike] Thinking of public transit and electric bike and scooter-sharing services like Lime-E and Bird, does your use of electric bike and scooter-sharing services ... ? *

Only answer this question if the following conditions are met:
Answer was 5 at question [Q50xNewServices]' (Following is a list of some newer services that some people are using to get around. Which of the following new services have you personally tried or used?)

- ○ Increase your use of public transit by providing better access
- ○ Decrease your use of public transit by replacing it
- ○ Have no impact on use of public transit

---

55 [Q56xQ57xArray] Following is a list of services that you may have not tried or may not be available yet. For each one, please indicate if the item was available, how much more likely you would be to use or increase your use of public transit using a 5-point scale where 1 is not at all likely and 5 is very likely. *

	5 Very likely	4	3	2	1 Not at all likely
Driverless electric vans that circulate between TROLLEY stations, BUS stations, and nearby neighborhoods (each trip would cost $1 and vans would be equipped with security cameras and emergency summons buttons)	○	○	○	○	○
A Universal transit app that you could put on your smartphone that would be linked to an account that could be prepaid or tied to a credit card to pay as you go for most or all regional transit options, including: bus, Trolley, COASTER, SPRINTER, ride sharing and bike sharing and the ability to see real-time arrivals and help plan out trips	○	○	○	○	○
Public transit in San Diego is working to dramatically reduce carbon emissions with all-electric Trolleys and moving towards zero-emission bus fleets. With gas-burning cars producing a pound of carbon dioxide per mile, how much more likely are you to consider riding public transit, knowing that it helps improve the environment?	○	○	○	○	○
Providing an integrated suite of services, amenities and technologies at high frequency transit stations including: bikeshare, carshare, on-demand pick-up and drop-off, and amenities like dry cleaning, grocery pickup, daycare, storage lockers, and food/retail shops	○	○	○	○	○

---

56 [SceneIntro1]
For the following questions, imagine that you are going to make a weekday trip, traveling alone during the peak travel time to work, school, or some other activity if you do not travel to work or school. Some of the values may not accurately reflect your current travel times or costs, but assume that these are what the travel times and costs will be at some point in the future, and you would need to decide which option you prefer.
There are going to be five different scenarios; for each one, please select the option you prefer most.
Note: the access time to transit is included in the total door-to-door travel time.

Scenario 1
57 [Q58xScen1]

	Coaster	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	14 mins	9 mins	NA	NA	16 mins
Total door to door travel time (minutes)	64 mins	72 mins	15 mins	20 mins	84 mins
Total trip time varies less than (minutes)	26 mins	47 mins	30 mins	8 mins	34 mins
Travel cost (includes parking and tolls)	$7.43	$4.50	$19.08	$15.00	$4.50
Frequency of service	every 30 mins	every 10 mins	NA	NA	every 10 mins
Number of transfers	0	2	NA	NA	1
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection					

"NA" means not applicable to this alternative.
*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."
**"Access Time to Transit" includes time to park and walk to transit station
***Costs include gas, parking, tolls, insurance, repairs, and car payment

Scenario 2

58 [Q58xScen2]

	Coaster	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	14 mins	9 mins	NA	NA	16 mins
Total door to door travel time (minutes)	64 mins	72 mins	15 mins	20 mins	84 mins
Total trip time varies less than (minutes)	26 mins	47 mins	30 mins	8 mins	34 mins
Travel cost (includes parking and tolls)	$7.43	$4.50	$19.08	$15.00	$4.50
Frequency of service	every 30 mins	every 10 mins	NA	NA	every 10 mins
Number of transfers	0	2	NA	NA	1
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection					

"NA" means not applicable to this alternative.

*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."

**"Access Time to Transit" includes time to park and walk to transit station

***Costs include gas, parking, tolls, insurance, repairs, and car payment

---

Scenario 3

59 [Q59xScen3]

	Coaster	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	14 mins	9 mins	NA	NA	16 mins
Total door to door travel time (minutes)	64 mins	72 mins	15 mins	20 mins	84 mins
Total trip time varies less than (minutes)	26 mins	47 mins	30 mins	8 mins	34 mins
Travel cost (includes parking and tolls)	$7.43	$4.50	$19.08	$15.00	$4.50
Frequency of service	every 30 mins	every 10 mins	NA	NA	every 10 mins
Number of transfers	0	2	NA	NA	1
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection					

"NA" means not applicable to this alternative.

*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."

**"Access Time to Transit" includes time to park and walk to transit station

***Costs include gas, parking, tolls, insurance, repairs, and car payment

Scenario 4

60 [Q60xScen4]

	Coaster	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	14 mins	9 mins	NA	NA	16 mins
Total door to door travel time (minutes)	64 mins	72 mins	15 mins	20 mins	84 mins
Total trip time varies less than (minutes)	26 mins	47 mins	30 mins	8 mins	34 mins
Travel cost (includes parking and tolls)	$7.43	$4.50	$19.08	$15.00	$4.50
Frequency of service	every 30 mins	every 10 mins	NA	NA	every 10 mins
Number of transfers	0	2	NA	NA	1
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection					

"NA" means not applicable to this alternative.

*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."

**"Access Time to Transit" includes time to park and walk to transit station

***Costs include gas, parking, tolls, insurance, repairs, and car payment

---

Scenario 5

61 [Q61xScen5]

	Coaster	Bus	Private Car***	Shared Ride*	Trolley/SPRINTER
Access to Stop	Walk	Shared Ride	NA	NA	Shared Ride
Access Time to Transit**	14 mins	9 mins	NA	NA	16 mins
Total door to door travel time (minutes)	64 mins	72 mins	15 mins	20 mins	84 mins
Total trip time varies less than (minutes)	26 mins	47 mins	30 mins	8 mins	34 mins
Travel cost (includes parking and tolls)	$7.43	$4.50	$19.08	$15.00	$4.50
Frequency of service	every 30 mins	every 10 mins	NA	NA	every 10 mins
Number of transfers	0	2	NA	NA	1
Features	Safety officer on each train	Covered waiting areas	NA	NA	Onsite services: Amazon lockers, car care, daycare, etc.
Selection					

"NA" means not applicable to this alternative.

*"Shared Ride" means a paid commercial service like Uber, Uber-Pool, Lyft or Lyft-Line - the cost is included in the "Travel cost."

**"Access Time to Transit" includes time to park and walk to transit station

***Costs include gas, parking, tolls, insurance, repairs, and car payment

62 [DemoDisplayText] The survey is almost complete. The following two questions are to ensure that survey results are representative of the community.

---

63 [Q63xYOB] In which year were you born? *

---

64 [Q64xIncome] What is your best estimate of your total household income before taxes? *

- ○ Less than $30,000
- ○ $30,000 - $59,999
- ○ $60,000 - $99,999
- ○ $100,000 - $149,999
- ○ $150,000 or more
- ○ Don't know

---

65 [Q65xGender] Gender: *

- ○ Male
- ○ Female
- ○ Prefer not to answer

Completed surveys will be entered into a drawing for ONE of THREE $200 Amazon gift cards.
TO ENTER THE DRAWING, please provide your contact information below.
Name: _____
Phone: _____

The San Diego Association of Governments will be holding a two-hour roundtable discussion in February or March regarding public transit improvement. There will be an incentive for participating, and food and beverages will be provided. Would you be interested in participating? (You will be contacted for the details)

- ○ Yes
- ○ No

Thank you for your feedback to help improve mobility services in San Diego County!

Appendix C: Logit Model Coding Scheme

Parameter of Estimate	Description
ASC_BUS	Alternative-Specific Constant - Bus
ASC_SHARED	Alternative-Specific Constant - Shared Ride
ASC_TRAIN	Alternative-Specific Constant - Train
ASC_TROLLEY	Alternative-Specific Constant - Trolley
B_ACTT	Coefficient - Access Time
B_HE	Coefficient - Access Frequency of Service
B_TIME	Coefficient - Door-to-Door Travel Time
B_COST	Coefficient - Access Time
B_TVAR	Coefficient - Access Time
B_TRAN	Coefficient - Access Time
B_BUS_ACC_BIKE	Access to Stop by Bike - Bus
B_BUS_ACC_DRIVE	Access to Stop by Private Car - Bus
B_BUS_ACC_SHARED	Access to Stop by Shared Ride - Bus
B_BUS_ACC_WALK	Access to Stop by Walking - Bus
B_BUS_AME_CALL	Ability to Quickly Report Issues Via Text or Call - Bus
B_BUS_AME_SITE	Onsite Services: Amazon Lockers, Car Care, Daycare - Bus
B_BUS_AME_VIDEO	Video Monitoring - Bus
B_BUS_AME_WAIT	Covered Waiting Areas - Bus
B_TRAIN_ACC_BIKE	Access to Stop by Bike - Train
B_TRAIN_ACC_BUS	Access to Stop by Bus - Train
B_TRAIN_ACC_DRIVE	Access to Stop by Private Car - Train
B_TRAIN_ACC_SHARED	Access to Stop by Shared Ride - Train
B_TRAIN_ACC_WALK	Access to Stop by Walking - Train
B_TRAIN_AME_CALL	Ability to Quickly Report Issues Via Text or Call - Train
B_TRAIN_AME_EMG	Emergency Phone on Platform - Train
B_TRAIN_AME_SAFE	Safety Officer on Each Train - Train
B_TRAIN_AME_SITE	Onsite Services: Amazon Lockers, Car Care, Daycare - Train
B_TRAIN_AME_VIDEO	Video Monitoring - Train
B_TRAIN_AME_WAIT	Covered Waiting Areas - Train
B_TROLLEY_ACC_BIKE	Access to Stop by Bike - Trolley
B_TROLLEY_ACC_BUS	Access to Stop by Bus - Trolley
B_TROLLEY_ACC_DRIVE	Access to Stop by Private Car - Trolley
B_TROLLEY_ACC_SHARED	Access to Stop by Shared Ride - Trolley
B_TROLLEY_ACC_WALK	Access to Stop by Walking - Trolley
B_TROLLEY_AME_CALL	Ability to Quickly Report Issues Via Text or Call - Trolley
B_TROLLEY_AME_EMG	Emergency Phone on Platform - Trolley
B_TROLLEY_AME_SAFE	Safety Officer on Each Train - Trolley
B_TROLLEY_AME_SITE	Onsite Services: Amazon Lockers, Car Care, Daycare - Trolley
B_TROLLEY_AME_VIDEO	Video Monitoring - Trolley
B_TROLLEY_AME_WAIT	Covered Waiting Areas - Trolley

Appendix D: Preliminary Logit Model Output

Name	Value	Std err	t-test	p-value	Rob. Std err	Rob. t-test	Rob. p-value
ASC_BUS	-0.4255	0.0319	-13.3298	0.0000	0.0317	-13.4099	0.0000
ASC_SHARED	-1.6984	0.0390	-43.5507	0.0000	0.0392	-43.3813	0.0000
ASC_TRAIN	-0.2748	0.0564	-4.8733	0.0000	0.0558	-4.9260	0.0000
ASC_TROLLEY	-0.3210	0.0406	-7.8976	0.0000	0.0405	-7.9232	0.0000
B_ACTT	-0.0100	0.0036	-2.7878	0.0053	0.0036	-2.7880	0.0053
B_HE	-0.0056	0.0007	-7.6492	0.0000	0.0007	-7.6889	0.0000
B_TIME	-0.0114	0.0008	-14.8063	0.0000	0.0008	-14.5603	0.0000
B_COST	-0.0508	0.0031	-16.5106	0.0000	0.0031	-16.2107	0.0000
B_TVAR	-0.0072	0.0009	-8.4483	0.0000	0.0009	-8.4364	0.0000
B_TRAN	-0.0105	0.0164	-0.6407	0.5217	0.0164	-0.6384	0.5232
B_BUS_ACC_BIKE	-0.2614	0.0397	-6.5876	0.0000	0.0397	-6.5926	0.0000
B_BUS_ACC_DRIVE	-0.0049	0.0372	-0.1304	0.8963	0.0373	-0.1301	0.8965
B_BUS_ACC_SHARED	-0.1201	0.0388	-3.0998	0.0019	0.0388	-3.0922	0.0020
B_BUS_ACC_WALK	-0.0391	0.0374	-1.0465	0.2953	0.0373	-1.0484	0.2944
B_BUS_AME_CALL	-0.0735	0.0379	-1.9371	0.0527	0.0379	-1.9409	0.0523
B_BUS_AME_SITE	-0.1337	0.0383	-3.4937	0.0005	0.0383	-3.4867	0.0005
B_BUS_AME_VIDEO	-0.1296	0.0384	-3.3781	0.0007	0.0383	-3.3795	0.0007
B_BUS_AME_WAIT	-0.0888	0.0382	-2.3251	0.0201	0.0383	-2.3198	0.0204
B_TRAIN_ACC_BIKE	-0.1843	0.0728	-2.5322	0.0113	0.0728	-2.5326	0.0113
B_TRAIN_ACC_BUS	-0.1932	0.0708	-2.7297	0.0063	0.0705	-2.7423	0.0061
B_TRAIN_ACC_DRIVE	0.0500	0.0671	0.7449	0.4563	0.0667	0.7495	0.4535
B_TRAIN_ACC_SHARED	-0.0250	0.0681	-0.3665	0.7140	0.0680	-0.3673	0.7134
B_TRAIN_ACC_WALK	0.0777	0.0684	1.1356	0.2561	0.0676	1.1492	0.2505
B_TRAIN_AME_CALL	-0.0313	0.0767	-0.4086	0.6828	0.0761	-0.4116	0.6806
B_TRAIN_AME_EMG	0.0142	0.0773	0.1833	0.8546	0.0776	0.1825	0.8552
B_TRAIN_AME_SAFE	-0.0940	0.0766	-1.2262	0.2201	0.0761	-1.2341	0.2172
B_TRAIN_AME_SITE	-0.0855	0.0781	-1.0957	0.2732	0.0779	-1.0987	0.2719
B_TRAIN_AME_VIDEO	-0.1208	0.0775	-1.5584	0.1191	0.0767	-1.5751	0.1152
B_TRAIN_AME_WAIT	0.0427	0.0759	0.5623	0.5739	0.0753	0.5665	0.5711
B_TROLLEY_ACC_BIKE	-0.2100	0.0419	-5.0076	0.0000	0.0417	-5.0309	0.0000
B_TROLLEY_ACC_BUS	-0.1278	0.0407	-3.1381	0.0017	0.0407	-3.1427	0.0017
B_TROLLEY_ACC_DRIVE	0.0324	0.0395	0.8210	0.4116	0.0394	0.8223	0.4109
B_TROLLEY_ACC_SHARED	0.0077	0.0398	0.1943	0.8459	0.0399	0.1939	0.8462
B_TROLLEY_ACC_WALK	-0.0234	0.0398	-0.5887	0.5560	0.0398	-0.5888	0.5560
B_TROLLEY_AME_CALL	-0.1198	0.0451	-2.6539	0.0080	0.0449	-2.6650	0.0077
B_TROLLEY_AME_EMG	-0.0311	0.0446	-0.6977	0.4853	0.0447	-0.6965	0.4861
B_TROLLEY_AME_SAFE	-0.0713	0.0450	-1.5850	0.1130	0.0449	-1.5868	0.1126
B_TROLLEY_AME_SITE	0.0376	0.0436	0.8625	0.3884	0.0437	0.8603	0.3896
B_TROLLEY_AME_VIDEO	-0.0486	0.0451	-1.0760	0.2819	0.0450	-1.0782	0.2809
B_TROLLEY_AME_WAIT	-0.0879	0.0446	-1.9690	0.0489	0.0445	-1.9751	0.0483

Appendix E: Final Logit Model Output

Name	Value	Std err	t-test	p-value	Rob. Std err	Rob. t-test	Rob. p-value
ASC_BUS	-0.6212	0.0376	-16.5094	0.0000	0.0378	-16.4417	0.0000
ASC_SHARED	-1.5854	0.0301	-52.6532	0.0000	0.0303	-52.3880	0.0000
ASC_TRAIN	-0.3776	0.0596	-6.3331	0.0000	0.0590	-6.3968	0.0000
ASC_TROLLEY	-0.3702	0.0432	-8.5623	0.0000	0.0435	-8.5151	0.0000
B_ACTT	-0.0104	0.0029	-3.5894	0.0003	0.0029	-3.5643	0.0004
B_BUS_ACC_BIKE	-0.2249	0.0426	-5.2782	0.0000	0.0427	-5.2697	0.0000
B_COST	-0.0563	0.0025	-22.8582	0.0000	0.0025	-22.4549	0.0000
B_HE	-0.0068	0.0006	-11.6446	0.0000	0.0006	-11.5979	0.0000
B_TIME	-0.0145	0.0006	-22.9884	0.0000	0.0006	-22.4594	0.0000
B_TROLLEY_ACC_BIKE	-0.2020	0.0407	-4.9598	0.0000	0.0407	-4.9604	0.0000
B_TVAR	-0.0077	0.0007	-10.9644	0.0000	0.0007	-10.9185	0.0000

Appendix F: Value-of-Time Summary

Variable	Survey Count	VOT ($$/min)	Std err	t-test	p-value	Lbound	Ubound
All General Public	4,449	$0.26	$0.02	$16.39	$0.00	$0.23	$0.29
Income							
Less than $30,000	751	$0.13	$0.03	$4.11	$0.00	$0.07	$0.19
$30,000 - $59,999	998	$0.19	$0.03	$6.54	$0.00	$0.14	$0.25
$60,000 - $99,999	1,053	$0.26	$0.03	$8.43	$0.00	$0.20	$0.32
$100,000 - $149,999	729	$0.30	$0.04	$8.06	$0.00	$0.23	$0.38
$150,000 or more	627	$0.42	$0.05	$8.15	$0.00	$0.32	$0.52
Employment Status							
Employed	2,579	$0.29	$0.02	$13.87	$0.00	$0.25	$0.33
Student	226	$0.21	$0.08	$2.56	$0.01	$0.05	$0.38
Not Employed/Stay at Home	591	$0.19	$0.04	$4.17	$0.00	$0.10	$0.27
Retired	1,053	$0.25	$0.03	$7.43	$0.00	$0.18	$0.32
Trip Length from/to Work							
Short Trip	736	$0.21	$0.03	$6.58	$0.00	$0.15	$0.28
Long Trip	1,627	$0.36	$0.04	$8.90	$0.00	$0.28	$0.44
Travel time from/to Work							
< 20 mins	808	$0.23	$0.03	$7.47	$0.00	$0.17	$0.29
20-30 mins	906	$0.32	$0.04	$7.11	$0.00	$0.23	$0.41
> 30 mins	649	$0.41	$0.07	$5.74	$0.00	$0.27	$0.55
MSA							
Northwest	637	$0.30	$0.05	$5.77	$0.00	$0.20	$0.41
Northeast	605	$0.18	$0.04	$4.82	$0.00	$0.11	$0.25
North City	1,020	$0.30	$0.03	$10.39	$0.00	$0.24	$0.36
Central	909	$0.30	$0.03	$8.49	$0.00	$0.23	$0.36
South	677	$0.30	$0.03	$8.49	$0.00	$0.23	$0.36
East	601	$0.29	$0.07	$3.99	$0.00	$0.15	$0.44
Gender							
Male	2,206	$0.27	$0.02	$11.40	$0.00	$0.22	$0.32
Female	2,155	$0.24	$0.02	$11.82	$0.00	$0.20	$0.28
Age							
18-29	778	$0.22	$0.04	$5.60	$0.00	$0.14	$0.29
30-44	1,115	$0.24	$0.03	$8.42	$0.00	$0.19	$0.30
45-59	1,073	$0.31	$0.03	$9.20	$0.00	$0.25	$0.38
60+	1,434	$0.25	$0.03	$9.12	$0.00	$0.20	$0.30
Rider Type							
Choice Rider	261	$0.16	$0.07	$2.37	$0.02	$0.03	$0.30
Transit Dependent	195	$0.14	$0.05	$3.10	$0.00	$0.05	$0.24

Appendix G: Sensitivity Tests

Cost Sensitivity

Change of Cost ($$)		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Cost	-10%	23.6%	19.8%	8.1%	28.4%	44.1%
Train Cost	+10%	22.6%	19.9%	8.2%	28.6%	44.2%
Bus Cost	-10%	23.0%	20.2%	8.1%	28.4%	44.0%
Bus Cost	+10%	23.2%	19.5%	8.2%	28.6%	44.3%
Shared Cost	-10%	23.0%	19.7%	8.9%	28.3%	43.8%
Shared Cost	+10%	23.2%	20.0%	7.5%	28.7%	44.4%
Trolley Cost	-10%	23.0%	19.8%	8.1%	28.9%	43.9%
Trolley Cost	+10%	23.2%	20.0%	8.2%	28.1%	44.4%
Car Cost	-10%	22.7%	19.4%	8.0%	27.8%	45.7%
Car Cost	+10%	23.5%	20.4%	8.4%	29.2%	42.6%

Travel Time Sensitivity

Change of Travel Time (mins)		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Travel Time	-10%	24.0%	19.8%	8.1%	28.4%	44.0%
Train Travel Time	+10%	22.2%	20.0%	8.2%	28.6%	44.3%
Bus Travel Time	-10%	22.9%	21.0%	8.1%	28.1%	43.6%
Bus Travel Time	+10%	23.3%	18.9%	8.3%	28.8%	44.6%
Shared Travel Time	-10%	23.0%	19.8%	8.4%	28.4%	44.0%
Shared Travel Time	+10%	23.2%	19.9%	7.9%	28.6%	44.3%
Trolley Travel Time	-10%	22.8%	19.6%	8.0%	29.7%	43.5%
Trolley Travel Time	+10%	23.4%	20.2%	8.3%	27.3%	44.8%
Car Travel Time	-10%	22.8%	19.6%	8.0%	28.0%	45.2%
Car Travel Time	+10%	23.4%	20.2%	8.3%	29.0%	43.1%

Access Time Sensitivity

Change of Access Time (mins)		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Access Time	-10%	23.3%	19.9%	8.2%	28.5%	44.1%
Train Access Time	+10%	22.9%	19.9%	8.2%	28.5%	44.2%
Bus Access Time	-10%	23.1%	20.0%	8.2%	28.4%	44.1%
Bus Access Time	+10%	23.1%	19.7%	8.2%	28.5%	44.2%
Trolley Access Time	-10%	23.0%	19.8%	8.1%	28.8%	44.0%
Trolley Access Time	+10%	23.2%	20.0%	8.2%	28.2%	44.3%

Time Variability Sensitivity

Change of Time Variability (mins)		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Time Variability	-10%	23.3%	19.9%	8.2%	28.5%	44.1%
Train Time Variability	+10%	22.9%	19.9%	8.2%	28.5%	44.2%
Bus Time Variability	-10%	23.0%	20.3%	8.1%	28.4%	44.0%
Bus Time Variability	+10%	23.2%	19.5%	8.2%	28.6%	44.3%
Shared Time Variability	-10%	23.1%	19.9%	8.2%	28.5%	44.1%
Shared Time Variability	+10%	23.1%	19.9%	8.1%	28.5%	44.2%
Trolley Time Variability	-10%	23.0%	19.8%	8.1%	28.8%	44.0%
Trolley Time Variability	+10%	23.2%	20.0%	8.2%	28.1%	44.3%
Car Time Variability	-10%	23.0%	19.8%	8.1%	28.3%	44.5%
Car Time Variability	+10%	23.2%	20.0%	8.2%	28.6%	43.8%

Frequency of Service Sensitivity

Change of Frequency of Service (every x mins)		Average Choice Probability				
		Train	Bus	Shared	Trolley	Car
Base		23.1%	19.9%	8.2%	28.5%	44.1%
Train Frequency of Service	-10%	23.9%	19.8%	8.1%	28.4%	44.0%
Train Frequency of Service	+10%	22.4%	20.0%	8.2%	28.6%	44.3%
Bus Frequency of Service	-10%	23.0%	20.1%	8.1%	28.4%	44.0%
Bus Frequency of Service	+10%	23.2%	19.7%	8.2%	28.6%	44.3%
Trolley Frequency of Service	-10%	23.0%	19.8%	8.1%	28.8%	44.0%
Trolley Frequency of Service	+10%	23.2%	20.0%	8.2%	28.2%	44.3%