New Mobility Study:

Considerations for the UTSA Downtown Campus and Community

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Executive Summary

This New Mobility Study addresses rapid technological changes in transportation and communication technology, tailored to the context of downtown San Antonio. Graduate students at the University of Texas at San Antonio in Urban and Regional Planning reviewed the existing context of the UTSA Downtown Campus area in light of new mobility concepts, leveraging recent research to guide ideas for the location's future. Students performed field studies, integrated urban planning concepts, and recommended potential transportation solutions under the guidance of their professor. This study offers recommendations regarding public transit, bicycling, curb utilization, e-scooter and pedestrian modes that can inform the university and city's next steps for the area. The UTSA team suggests the city, university, and local partners should view both existing policies and new proposals through an equity perspective.

Existing conditions reflect past planning for driving cars for most trips, but with a well-connected street grid and generous right-of-way that could support advancements for other modes. Student researchers measured streetscape noise levels averaging 36 decibels along pedestrian-oriented sections of Houston Street. Bus transit speed averaged 16 mph on the Via 100 Primo, comparable to automotive speeds. Non-motorized pedestrian traffic (115 per hour) and bicycle traffic (11 per hour) on South Flores is substantial, despite limited infrastructure. Opportunities include leveraging new mobility options to use the street space to improve access while decreasing crashes. Risks include a decline in downtown's vibrancy and equity from failure to anticipate challenges, such as people using autonomous vehicles to live further from their workplaces and schools, and jobs such as truck and taxi drivers being replaced.

Some key recommendations of this study include:

- Prioritize existing public transit services as a key for mobility for all.
- Rapidly build bicycle infrastructure to sustainably and safely support growth in the area.
- Reconsider curb utilization to begin planning for a more shared, autonomous future.
- E-scooter and pedestrian interactions require urgent attention, focusing on sidewalk improvements and micromobility policy improvements.

Maintaining and improving pedestrian access is key for the downtown San Antonio area and should be central in any new mobility initiative. As the city advances with new mobility approaches, community-engaged research can help anticipate challenges and create better mobility for all.

Introduction

Defining New Mobility

Since about 2010, innovation and popularization in smartphones, global positioning systems, and automation in transportation services have led to what some call new mobility, an umbrella term that encompasses "new travel options—technology-enabled, on-demand, shared" (Seattle Department of Transportation 2017, 6). Emerging research reflects rapid technological innovation in transportation as more broad than individual new modes. Ride-hailing is positioned as part of a "new mobility ecosystem" (Brown 2019, 91), where transportation modes are positioned to work in specialized niches cooperatively, rather than as a single choice in a competitive market for travel. The opportunity for new mobility is to leverage technology to provide mobility options for people that fit their needs, providing most of the advantages of car ownership—such as near-constant availability, access to urban and rural destinations, and minimal cost—while avoiding many of the disadvantages such as cost, air emissions, and safety. However, transportation agencies are struggling to align policies to rapid commercial innovation.

Table 1. New mobility as a dynamic set of options. Adapted from Nelson\Nygaard 2019

Time	Transport Modes	Distinguishing Characteristic
Then	Automobile, bus, rail, walking, biking	Tend to use one mode and rarely switch
Now	+bike share, e-scooters, car share, ride-hailing	Mobile phone allows more options, but each tool has own app
Future	+ microtransit, autonomous vehicles, shuttles, and rapid transit	Mobility-as-a-service seamlessly integrates travel options and payment

In San Antonio, people can take a VIA bus to work, knowing that Uber or Lyft are an option if they miss the bus. Swell Cycle, the non-profit docked bike sharing system, provides access to museums, trails and downtown destinations, while dockless (or free-floating') electric scooters are options to connect nearly everywhere else. However, the city is working to find the right balance of regulations on parking and use of e-scooters, particularly in historic and pedestrian-dominated areas (Selcraig 2019). The University of San Antonio (UTSA) Downtown campus literally and figuratively connects the central business district to the Westside community and beyond, and the current Master Plan process seeks to strengthen the 'town-and-gown' link as the university's footprint expands. Although currently underway as of this writing, the Master Plan consultants, Page/, the university has released the final plan for an expanded Downtown campus, shown in Figure 1.

Figure 1. UTSA Long-Term Plan draft from final draft Master Plan (Page/ 2019).

Major planned changes are envisioned at the following locations noted in the figure: 1. Improved Bill Miller Plaza, 2. Buena Vista Pavilion, 3. Medina Promenade, 4. San Pedro Creek Culture Park, 5. Pedestrianized Frio Street, 6. Cattleman's Square Housing, 7. Continental Hotel Housing.

Study Purpose

This New Mobility Study evaluates current transportation conditions near the UTSA Downtown campus within the context of technological innovations, community needs, and growth—particularly considering increased density and new residents as the campus expands. The timing of this study is key, with the City of San Antonio's new guidance for emerging travel modes and curb space management, and several development projects underway. This study will provide ideas and recommendations for planning, but it is not itself a plan—public engagement and policy analysis did not fit within the time and scope of this unsponsored, semester-long class project. Just considering micromobility—commonly including bike share and e-scooter services—big issues include defining the policy process, caps on the number of vehicles, service areas, parking locations, fees, and equipment and operational requirements (Shaheen and Cohen 2019). Without comprehensively covering all of the topics, this study's results should be useful in the near-term to support new mobility planning near the Downtown campus, and as a reference for future studies as well.

Overview of Study

The next section covers background and existing conditions, leveraging students' data collection in the field and knowledge of the area to inform this study. The Analysis section identifies opportunities and risks related to new mobility that planners, policymakers, and public members should consider. Ideas and Actions relate to transportation modes, and communicate students' thinking about what could be rational, equitable, and sustainable ways forward. The final section summarizes these ideas with specific recommendations.

Background and Existing Conditions

Growth and Equity

The findings of the research for this section are concentrated within the boundaries of the Study Area. The area is approximately .3 square miles and bound by Houston St. to the North, Main Street to the East, and dissected by IH35. The map below depicts the specific area of study pertinent to this study.

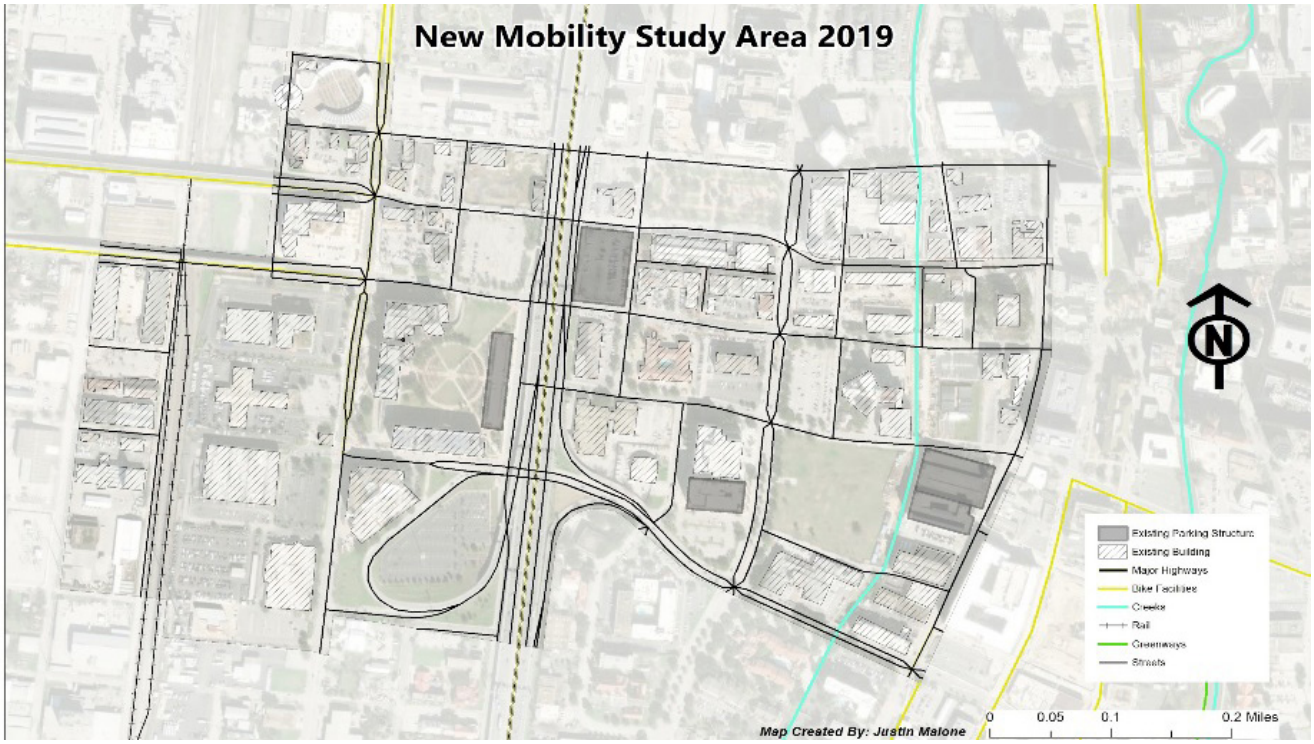


Figure 2. Study area and boundaries

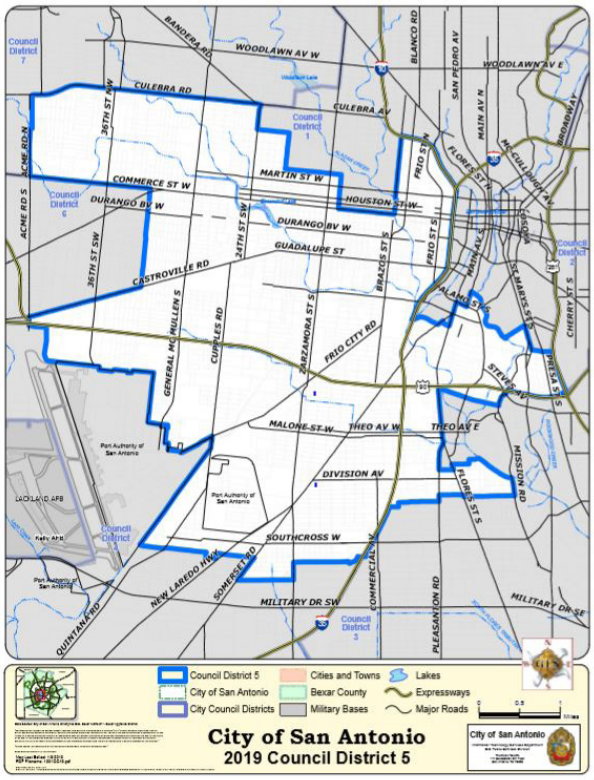


Figure 3. City of San Antonio Council District 5

As stated above, the study area and the University of Texas play a significant role in the connectivity of San Antonio's Westside communities and the City's downtown area. The proximity of the Westside communities to the Study Area presents a high probability of equity implications to the residents of these communities when any change occurs within the Study Area. For the purposes of this mobility study the Westside community is defined by the neighborhoods situated in the 22 square miles San Antonio's District 5 Council District ("District 5 - I Love San Antonio", 2019).

The Westside community of District 5 is one of San Antonio's most established and culturally rich areas in the City. Unfortunately, due to various historical factors an exodus of residents has continuously threatened the area (City Council & Gonzales, Shirley, 2019) , leaving the community and its residents dependent and in some cases susceptible to any significant changes of the neighboring downtown area.

Growth Projections

The current population of the Westside community encompassing and surrounding the Study Area is approximated at 150,091, and only 1% growth rate between 2010 – 2016 (“District 5 - I Love San Antonio”, 2019). The graph below forecasts the area’s projected population to be approximately 200,000 by the year 2020, by 2025 a population forecast of 280,000 and by 2030 more than 350,000.

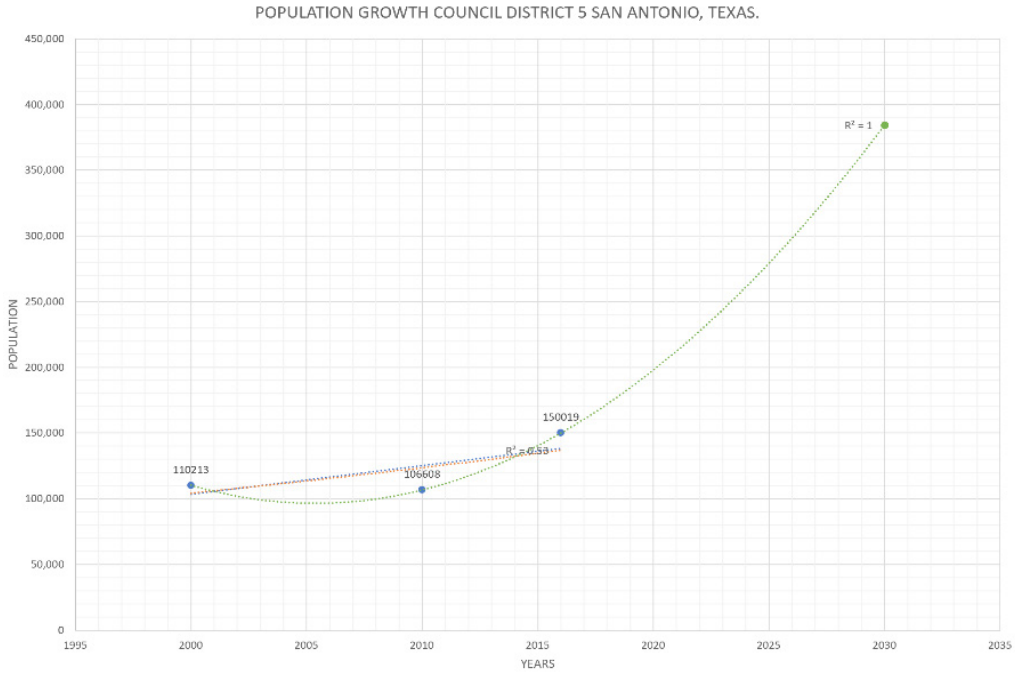


Figure 4. District 5 Forecasted Populations

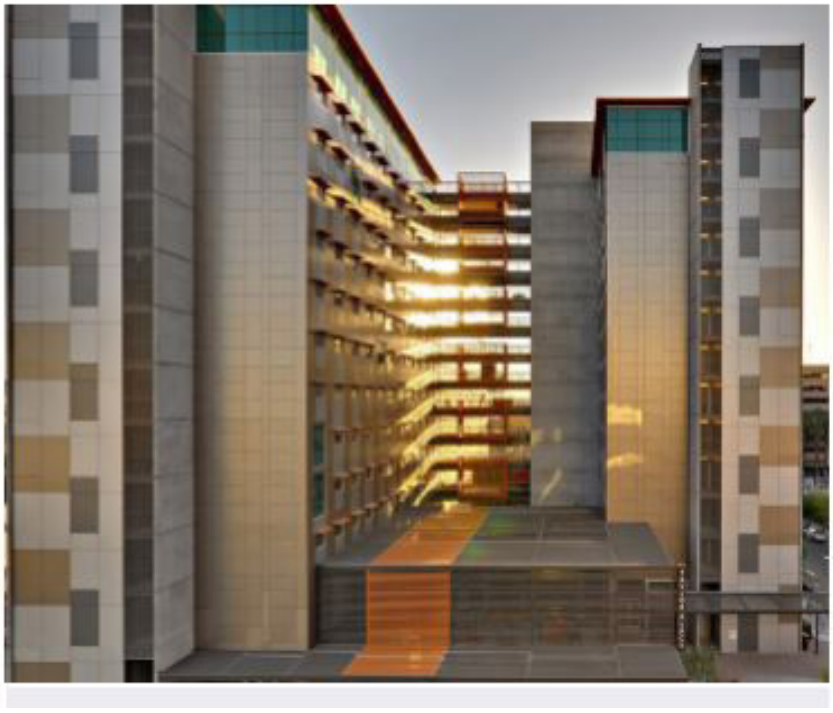


Figure 5. Rendering of Cattleman Housing

Although the current area growth rate is substantially low, the forthcoming anticipated expansion plans of the University of Texas at San Antonio's downtown campus is [sure] to cause a significant impact to the area population, the definitive numbers of such population are impossible to project. However, the University has projected to matriculate 10,000 ("UTSA Master Plan", 2019) and an increase of 13,000 students between UTSA's two campuses within the first 10 years (Malik & Torralva, 2019). In addition, to the student additions, the University plans to add 1,500 beds and approximately 600,000 square feet of student housing ("Cattleman's Square", 2019). Prior to the addition of student housing, no University provided student housing was present in the area. The addition of student housing, projected students and faculty, and likelihood of new business generated by the University's Master Plan is sure to influence the stagnant 1% growth rate.

Equity Implications

Figure 4. District 5 Forecasted Populations

Because of the immediate causation effect between the Westside community and the activity of the Study Area, equity implications must be considered in all plans, initiatives, and actions within the Study Area. This section will explore some possible equity implications that should be considered when planning for the Study Area, whether planning for mobility or other. Although the Study Area's growth rate projection is low, the planned UTSA expansion and improvements are likely to increase the area population and several equity implications, such as displacement and gentrification are likely to occur. In an effort to mitigate these implications, this research will identify potential equity implications to be considered as planning initiatives move forward.

Figure 7. Art depicting 'Mi Barrio No Se Vende' (My Barrio is Not for Sale, Source: Lupito's Photography)

As the University expansion takes shape and the area demographic changes, the introduction of individuals who may afford increasing rents, the existing affordable housing stock of the Westside community may diminish, and the area's cultural identity may be jeopardized. The City of San Antonio is a richly cultural city and the City's Westside is undoubtedly the heart of this cultural essence. Murals, colorful art installation, and annual cultural events and celebrations all add to the character of the City. However, the City's cultural richness stems from the long-established neighborhoods that surround downtown and the study area; particular attention and care in planning to preserve this identity is not only essential to the area, but to the City in its entirety.

The proximity and expansion of the UTSA campus to incorporate more of the Study Area presents the opportunity to matriculate a growing number of students from the Westside community. However, the opportunity appears to be missed by current relationships and matriculation rates. UTSA's first generation student population is 45% of its undergraduate student population and 45% of its graduate student population ("Institutional Research", 2019). UTSA is also currently represented as a "Hispanic Serving Institution" by the Hispanic Association of Colleges and Universities ("Hispanic Association of Colleges and Universities - HSIs", 2019). However, UTSA currently only has an enrollment of 941 students who identified as residents of zip codes within the Study Area ("UTSA Master Plan", 2019). Although UTSA's Hispanic Serving Institution reputation has made incredible strides in the serving underrepresented communities, it is missing a great opportunity to become a "Hispanic Thriving Institution", one which could be achieved by strengthening the relationships with the Westside community.

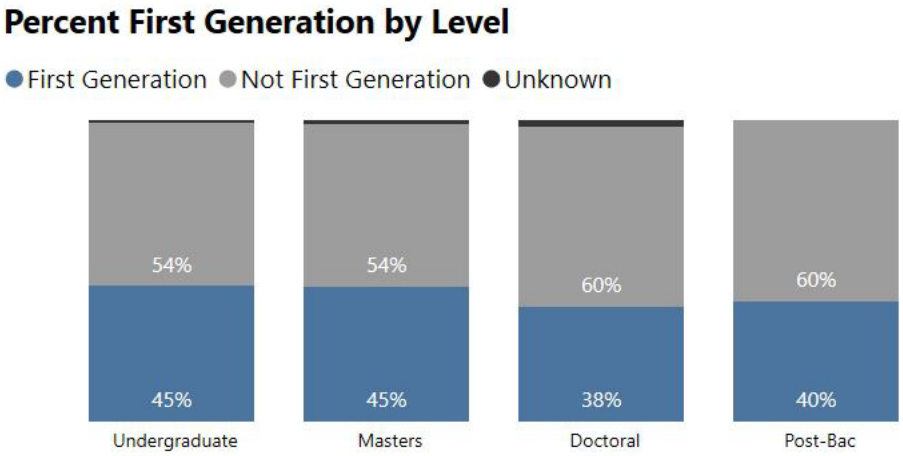


Figure 8. UTSA Students percent first generation (Source: UTSA Institutional Research)

In addition to existing residents, the City's significant homeless population, most who reside in or around the Study Area may also be displaced. Resources, services and two shelters are currently located within .5 miles of the Study Area to serve the area's homeless population. Future planning should consider the existing efforts in place to serve this population and include attention to improve the quality of life for all and not displace to other areas of the City.

Figure 9. People experiencing homelessness in San Antonio (Source: San Antonio Current)

As the UTSA expansion readies to move from plans to reality, the potential equity implications continue beyond displacement and gentrification to basic connectivity. Both physical and digital infrastructure within the Study Area should continue to be considered and improved upon.

The Westside community and the Study Area is physically segregated by the railroad tracks to the immediate west of the UTSA downtown campus and by interstate highway systems dissecting the main downtown area. The physical connection between the Westside and the Study Area are essential to establishing community and cultural ties to one another. Strengthening such bonds may spillover into University matriculation, infrastructure improvements, and cultural retention.

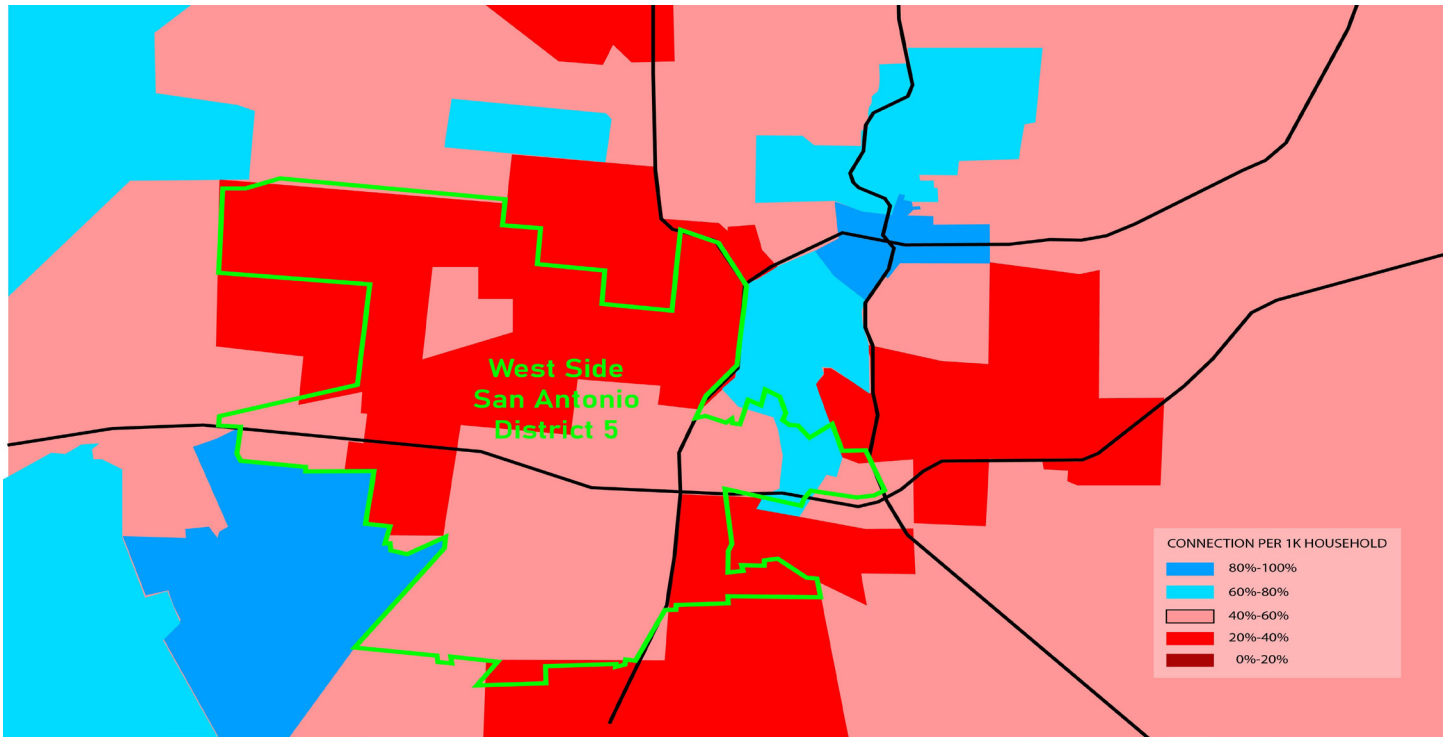


Figure 10. Household Internet Access (Source: Digital Inclusion Alliance)

Figure 11. Existing Transportation Network (Source: UTSA Master Plan)

In addition to the necessary repair to the Study Area's physical infrastructure, the current state of the area's digital infrastructure must also be evaluated. Increased move to new mobility may limit those individuals with limited availability to digital technology. Unfortunately, a great digital divide hinders any significant progress to equity. The map demonstrates the stark contrast in the digital broadband access across four census tracts situated within the Study Area ("Digital Inclusion Alliance – San Antonio", 2019). Without sufficient access to broadband access the area population is substantially disadvantaged, including those towards integrating new mobility.

Specific attention will be necessary to address the long-fragmented area in order to right a long-standing harm inflicted on the area. The longevity of the forthcoming University expansion will be dependent on the area's connectivity both physical and digital.

Proactive Measures

While the foregoing growth and equity implications must be continuously considered in planning strategy and initiatives, both UTSA and the City of San Antonio have developed and implemented some proactive measures to address some of these considerations.

As the UTSA campus plans to expand, there appears to be some foresight on the University's behalf as it has included proactive measures to address possible equity implications. In September 2019, the University opened doors to its Westside Community Center, a partnership initiative with the National Association for Latino Asset Builders that will be focused on ("Westside Community Partnerships Initiative", 2019):

- economic prosperity;
- educational excellence;
- community-based research,
- sustainable partnerships and advocacy; and
- community-campus engagement

Figure 12. Source: Digital Inclusion Alliance

Additionally, the City of San Antonio appears to acknowledge the significant history of combatting its homeless issues and has in the same respect made significant strides. As mentioned above, a large majority of the City's homeless population reside in and near the vicinity of the Study Area. However, since the introduction of temporary housing shelters, and wrap-around services campus, like Haven for Hope the downtown homeless population has decreased by 80% (Dimmick, 2019) and the City continues to address this issue. Most recently, the San Antonio City Council has voted to approve the hiring of a consulting firm to develop a homeless strategic plan (Dimmick, 2019).

The development of such plan is essential in preserving the integrity of all residents, including those of the downtown homeless population and any forthcoming changes to the Study Area should be considered and incorporated therein. Continued foresight by the University and the City will be essential to developing equitable and sustainable planning efforts within the Study Area.

Streetscape Sound

The city of San Antonio is working towards an active and a sustainable downtown. However, the current streetscapes in downtown are weak that would reinforce the network to fulfill the smart city vision for San Antonio. The standard for noise is set as 70dB. When conducting an analysis, the different areas are divided into categories from residential, active sport, auditoriums, hotels, agriculture and undeveloped land depending on the category the decibels in noise ranges but after passing the standard of 70 decibels, it would be considered that the users would experience discomfort (Meyer 2017).

Streetscape sound elements could influence streetscape design for its improvement. Streetscape sound studies were conducted in three locations along downtowns most active street which is Houston Street. Houston Street is such a critical street considering its components of commercial establishments such as the Majestic Theater a historical theater that is part of San Antonio's identity, as well as other local restaurants that attract activity. Houston Street is also part of the route towards the Alamo, which is the strongest tourist attraction in the city.

Figure 13. Location Map Diagram of Houston Street developed by: Jose Antonio Herrera and Genesis Eng

The three locations that sound studies were conducted from was in front of the Majestic Theater following that was in front of a popular juice bar called Revolucion lastly at the intersection of Houston street and Alamo Plaza. The sound tools that were utilized to measure the sound was through a cellphone app called Decibel X , and Apple voice memos to record audio. The units for sound was measured by decibels. Before sampling the sound some of the observations were noticed such as that there was not a lot of materials that noise could absorb to but rather bounce off. The materials were generally hard surfaces for instance the pavement and facades were storefronts or some kind of brick or concrete. There were minimum planters spaced out along certain blocks throughout Houston Street. The buildings heights are in average 8 floors high and the street is a two-way totaling a width of 25 feet. Each location was recorded 5 minutes on a late morning around 11am to noon on Friday.

Figure 14. First location along Houston Street diagram. Developed by Jose Antonio Herrera and Genesis Eng.

Figure 15. Second location along Houston Street. Diagram developed by Jose Antonio Herrera and Genesis Eng.

Figure 16. Third location along Houston Street diagram. Developed by Jose Antonio Herrera and Genesis Eng.

The first location in front of the Majestic Theater there was low pedestrian activity and the noise level was 30 decibels which was not loud at all that could correlate to the low pedestrian activity. People were mostly inside the restaurants and offices. The average was 33.9 decibels, the max reached to 36.4 decibels and its peak was 39.4 decibels. All these values were within the 30's and is not considered a disturbed noise. The biggest noise contributor was the car traffic passing by that was a mix of vehicles that included trucks and buses. The second location was in front of Revolucion a prominent juice bar in downtown next to Walgreens and across it La Panaderia, a local restaurant. Taking into consideration those three destinations there was more pedestrian activity in this block and there was more streetscape design integrated that made the space suitable for pedestrians and outdoor activity. Revolucion extended its seating area to the sidewalk that has created an atmosphere that enhances the outdoor activity. There was a couple of customers in that area having private conversation and some reading a book.

Also, there was a man singing on the sidewalk for street entertainment in addition to the pedestrian traffic and nearby remodeling construction was in progress. All these contributors are represented in the sound studies where the decibels are much higher in comparison to the first location. The sound was measured at 35 decibels. However, the average was 34.6 decibels, its max was 43.7 decibels and its peak reached 50.9 decibels. The surroundings have stimulated the activity as well as the streetscape design. The last location was in the intersection of Houston Street with Alamo Plaza the streetscape becomes more historical and the commercial components are geared towards tourists. This location had the highest sound because of the pedestrian's concentration in Alamo Plaza to visit the Alamo walking from Houston Street. In addition to the car traffic, buses were circulating to a close by bus stop at this intersection and there were heavy equipment construction trucks passing by as well. The sound was measured at 41 decibels and its average was 39.3 decibels. The max was 47.5 decibels and the peak reached 51.7 decibels. This location had the most pedestrian activity, and highest in noise levels due to the attractor destinations and facilitation of streetscape design.

Streetscape sound studies, such as this one of Houston Street can guide future design streetscape strategies to analyze livability related to transportation. As shown in this study sound is influenced by activity a critical issue in developing a highly active downtown that in this case San Antonio is working towards. If these low sound pockets are addressed and can impulse improvements in the streetscape design such as implementing wider sidewalks, landscaping that could soften the space creating a friendly and passive atmosphere to stroll and engage that would potentially attract more pedestrian flow that would be extremely helpful for urban designers and planners to achieve San Antonio's vision.

E-Scooters and Pedestrian Access

In the summer of 2018 E-scooters were introduced to the San Antonio market. Immediately there was concern as the City of San Antonio had prepared for the use of bicycles for mobility and not for E-scooters. There was an unfamiliarity with E-scooters, and they were labeled as more of a children's toy, than for use in transportation for adults. The City of San Antonio decided to not ban -scooters at their arrival but instead sought to collaborate and work with companies to best manage the situation. After an initial period, the City Council of San Antonio on May 30, 2019 began the Request for Proposal process to better manage E-Scooters and issues that they are now aware of in dealing with the mobility devices (CCDO, 2019)

E-scooters have the same design as regular scooters with two wheels and a standing platform. E-scooters have an electric motor which engages when the scooter is pushed to take off. E-Scooters generally reach a maximum of 15-20 miles per hour (Hopper, 2019) On most E-scooters, speed is controlled by your right thumb and your left hand controls the brake to slow down or stop.

Figure 17. Bird E-Scooter

Figure 18. Figure 2: E-Scooter blocking pedestrian sidewalk traffic on Dolorosa St.

Currently e-scooters block pedestrian traffic and accessibility due to not being parked in designated locations or appropriately. They also travel too fast to be driven on sidewalks, causing safety concerns for pedestrians. The city does require for e-scooters to be driven on the road but with traffic moving above 30 mph this can create safety issues for e-scooters riders as well (Bird, 2019). Some roads in downtown San Antonio with brick pavers are not the ideal surface for the small wheels of e-scooters to be rode on and maintain stability.

Pedestrian Access

Recently UTSA downtown has begun to construct cross walks to connect the Monterrey Building to the Campus across Frio Street, and parking surfaces across Buena Vista Street. While these changes are being made to accommodate proposed construction for new buildings in the future, they do not meet the needs of the present in an appropriate manner.

While the previous crosswalk considered accessibility and was on access with the entry to the Monterrey building, the new crosswalk is located next to the access for vehicles. So, while cars do stop at the crosswalk when flashing for pedestrians, you still must watch out for cars turning and those lined up at the exit, the area also needs to be re-graded as it ponds with water after rainfalls. The regrade issue also brings the question if the slope meets accessibility requirements. Your walk to the Monterrey building also now takes you across the parking lot to get to the entrance of the building. When looking at future masterplans, UTSA anticipates this area becoming a path to new buildings, which will line Frio Street across the existing campus. While those changes are possibly years away, it creates a potential safety hazard for students presently.

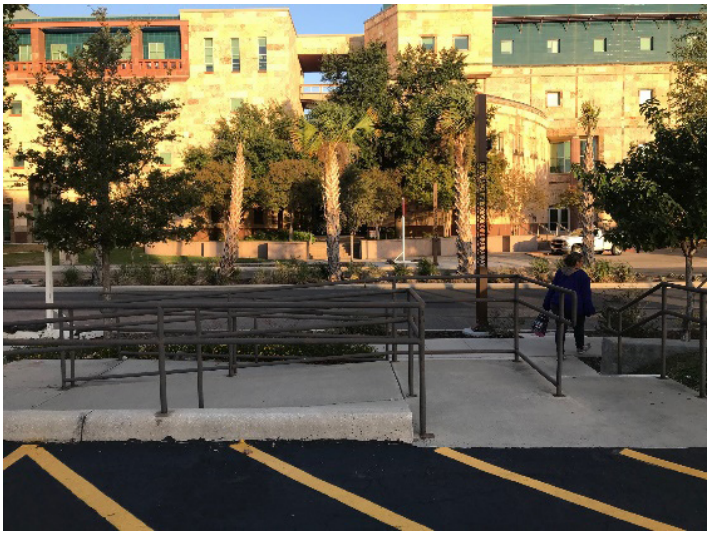


Figure 19. Previous crosswalk location at Frio St

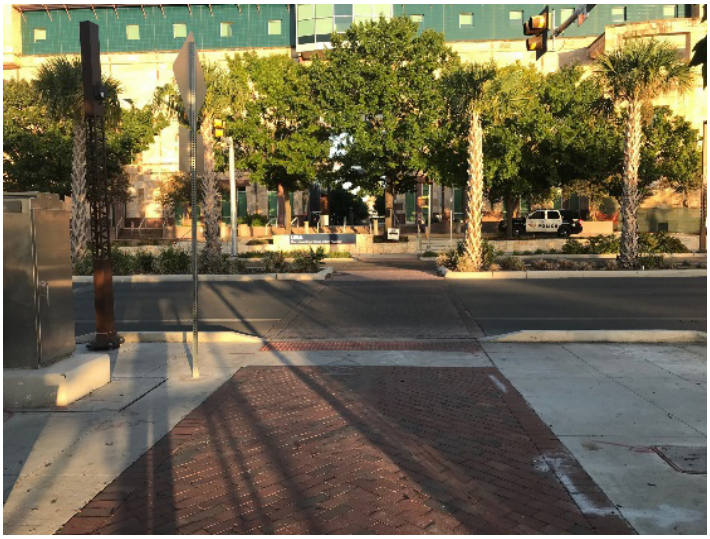


Figure 20. New crosswalk at Frio St

The new UTSA downtown expansion will be constructed along Dolorosa Street between Santa Rosa and Flores streets. Currently the area is under construction due to the San Pedro Creek Expansion underway. The existing Dolorosa Street is 40’ in width with three lanes of traffic heading one way. During a walk of the area we saw that due to construction, traffic is currently being diverted to one lane of traffic near San Pedro Creek. Along Dolorosa, sidewalks range from 12’ in width near San Pedro creek, to nearly 10’ in width after crossing Santa Rosa, and 6’ near the current UTSA parking lots under I-10.

Figure 21. Existing parking lot where new UTSA SDC and NCSS school will be located

Figure 22. San Pedro Creek expansion where new UTSA SDC and NCSS school will be located

Figure 23. Sidewalk near where new UTSA SDC and NCSS school will be located

Figure 24. Sidewalk approaching Dolorosa and Santa Rosa Crossing

An approximate 8-minute walk from where the new UTSA downtown expansion will be located to the existing UTSA downtown campus reveals a few noticeable issues. Beginning with the existing pedestrian infrastructure, we see that some of the walkways are a combination of concrete, brick paving and pebbled paving. Some of the paving, mostly the brick, needs repair; this is not only a tripping hazard for pedestrians that are walking but those in handicap wheelchairs or scooters. E-Scooters were also seen blocking the path at a few locations and parking for bicycles was located in front of a popular restaurant patio, which may not be the prime location for those enjoying a meal on the patio. A stretch of Dolorosa also allows for parking along the curb, which could create a hazard for pedestrians who avoid the crosswalks, as they may not see cars traveling down Dolorosa due to cars parked along the curb.

Figure 25. Crosswalk at Dolorosa crossing Santa Rosa

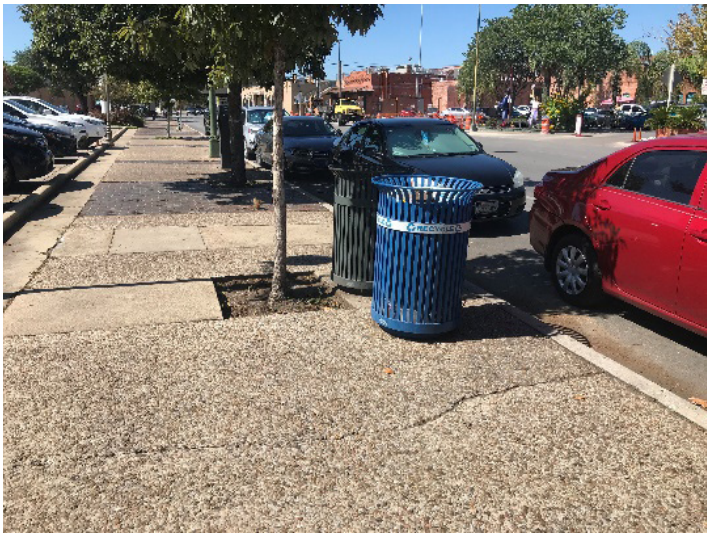


Figure 26. Sidewalk along Dolorosa heading toward San Saba

Figure 27. Bicycle rental station in front of restaurant patio

Figure 28. E-Scooter in path of pedestrian walkway

Public Transit

The existing road infrastructure in the research area only allows one method of transit to operate currently – VIA's bus services. VIA has one Transit Center located on the corner of W. Commerce and N. Frio St which provides limited parking, enclosed waiting areas with restrooms, and staff to assist customers with information. Because transit centers are used as major transfer stations, there are multiple VIA Bus lines that operate throughout the research area.

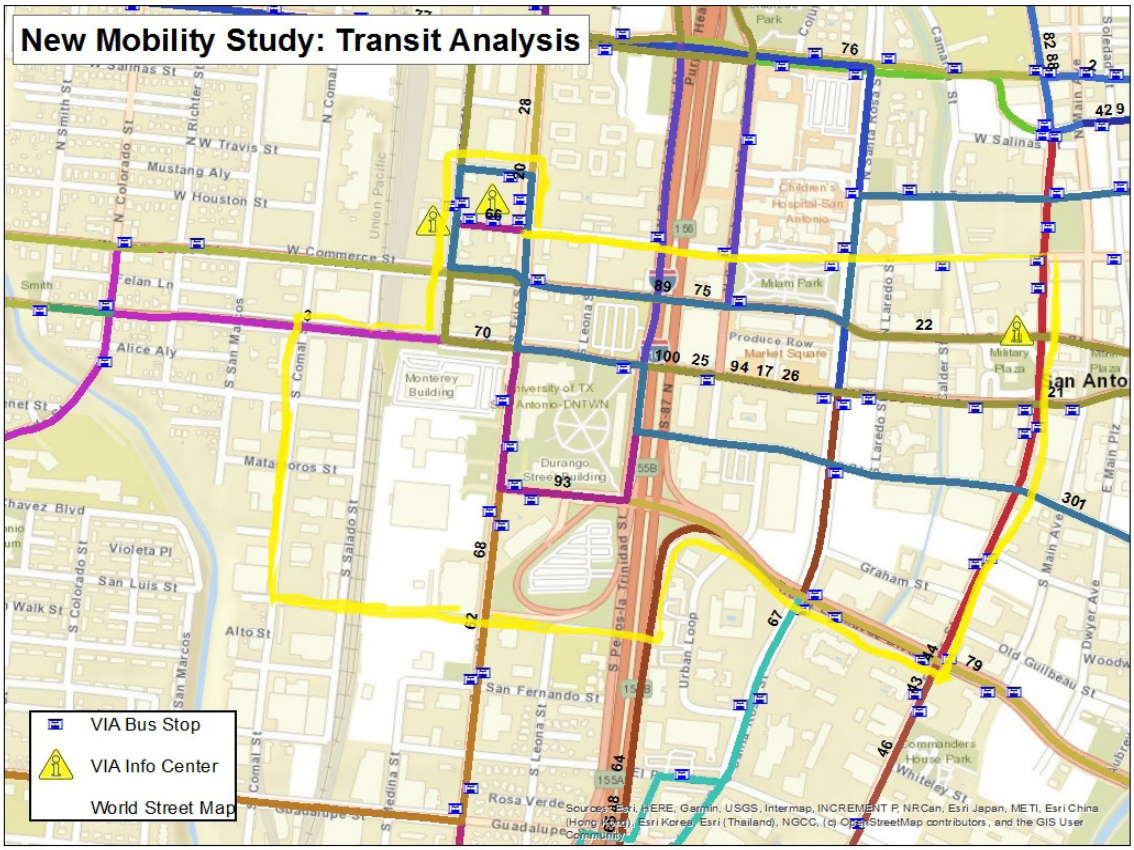


Figure 29. Map of Bus Lines & Stops in Research Area

Examples of Bus Infrastructure

Figure 30. Examples of Bus Stop with Infrastructure

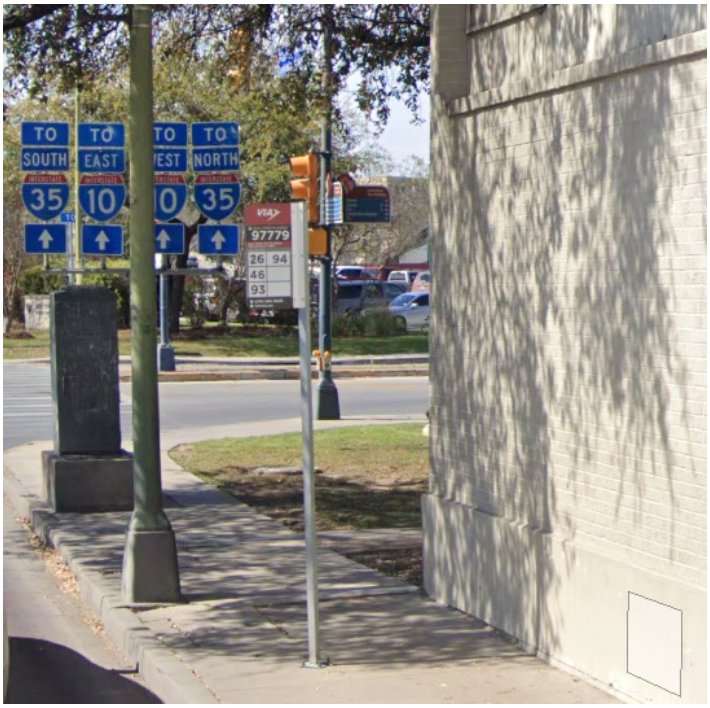


Figure 31. Example of Bus Stop without Infrastructure

Bus Service & Fees

Bus fees vary anywhere from $1.30 to $2.60, depending on the type of service line you are, and $.90 for children. Passes are available for the day, a week, a month, or even a semester for students.

Figure 32: VIA's Proposed Advanced Rapid Transit Corridors (Image Source: VIA)

Future Transit Services

In 2019 VIA established their VIA Reimagined Plan which emphasizes 3 big changes to their transit system: Better Bus System, Advanced Rapid Transit, and Smart Transit. The most impactful to the research area will be the addition of an advanced rapid transit network. VIA has proposed 6 ART corridors, 2 of which will operate within the research area.

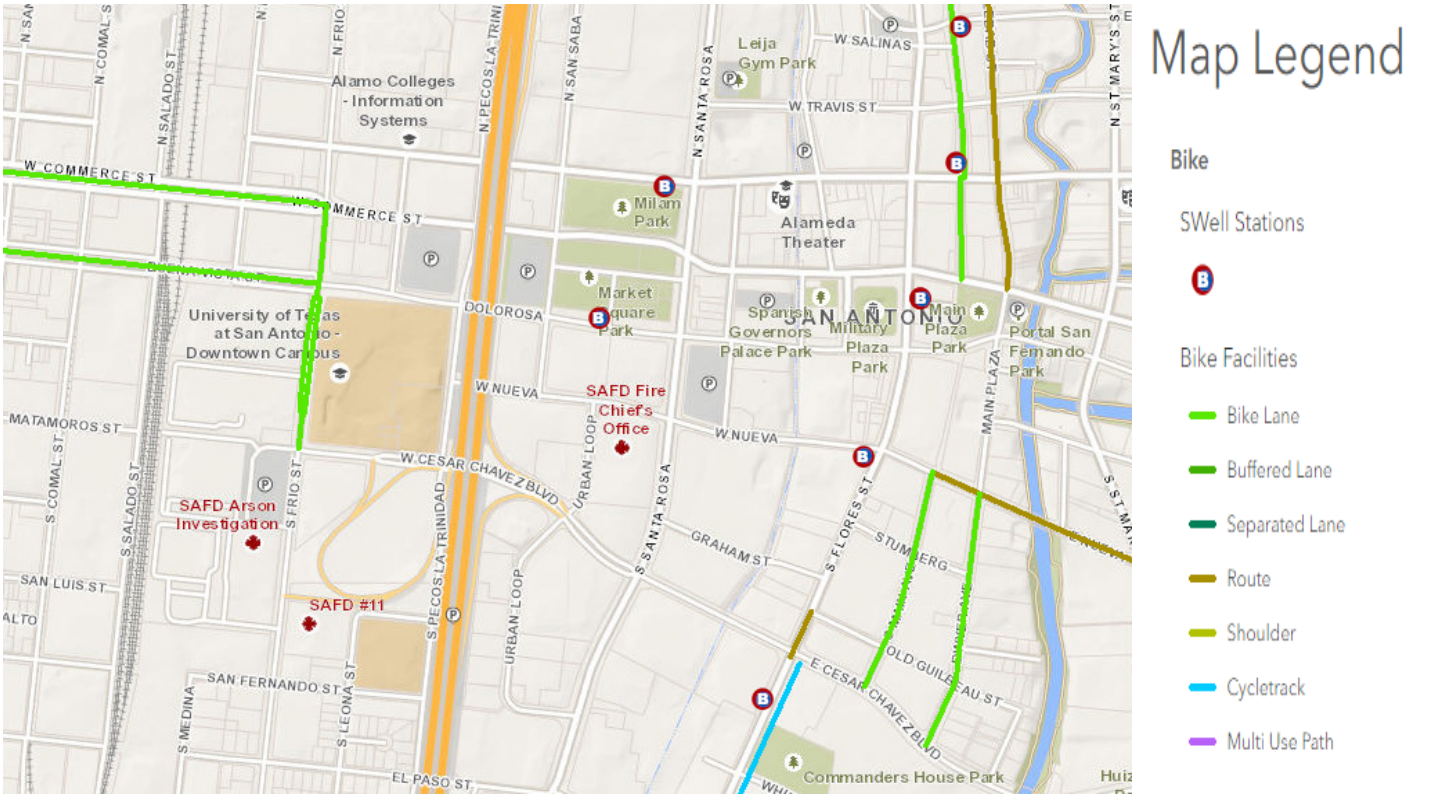


Figure 33. Bicycle Facilities Map retrieved from City of San Antonio Transportation and Capital Improvements website

"Networks should be thoughtfully planned to provide necessary and desired connections and access. The most successful bicycle networks enable people of all ages and abilities to safely and conveniently get where they want to go" (Schultheiss et al., 2019). In their recent work, Bikeway Selection Guide, Schultheiss et al. explain the compounded benefits that can arise from a complete connected network of bicycle infrastructure. If it is understood that the whole of a connected bicycle network is greater than the sum of its parts, where does San Antonio currently stand to take advantage of this? The map above shows the bicycle infrastructure present within our study area. Note the fragmented sections of lanes, routes, and tracks that seem to begin and end without clearly distinguishing a pattern. The amount of destinations within the study area bordering bicycle infrastructure are slim, leaving cyclists with varying degrees of safety in their commutes. The study area also is served by 3 swell cycle stations that do not abut any cycling infrastructure. The message is very unclear about where these swell cycle riders are actually supposed to ride. A bicycle count that took place on September 22, 2019 at the corner of South Flores & Dolorosa showed 54% of cyclists counted were riding on the sidewalk. Sidewalk biking is typically the outcome when cyclists deem the street to be unsafe for that purpose. Let's take a look at what the existing bicycle infrastructure looks like and start to piece together what a trip via bicycle might entail in the Alamo City.

Figure 34. Much of South Flores St. is only marked with sharrows and requires the mixing of automobiles, bikes, and scooters.

Stretches of the street network labeled as bicycle "routes" should be met with a healthy amount of skepticism when the city includes them in their bicycle facility/infrastructure counts. As the pictures denote above, no infrastructure specifically for cycling actually exists. Scooter and bike riders on streets like this will have to share the road space with automobiles, a task that many prospective bikers are unwilling to do. The majority of streets in the study area, like South Flores, are marked with speed limits of 30mph. The Bikeway Selection Guide (2019) recommends that no street with a posted limit above 20mph should accommodate shared lanes. In fact, it is recommended that at speeds of 30mph or greater, separated cycling tracks should be the only type of bicycle infrastructure used. Cyclists who do use shared lane routes are subjected to fair amount of risk. When proper cycling infrastructure does not exist, we must assume the riders are using traffic lanes on the street or the sidewalk. Both options tend to be undesirable due to the safety concerns of bike riders and pedestrians alike.

Figure 35. Bike infrastructure begins and ends seemingly randomly, leaving bike riders with limited and unfavorable decisions to make.

The infrastructure that does exist has very limited connections to other bicycle infrastructure or routes. Often bike lanes or tracks will just end, leaving the rider to make a dangerous merge into traffic. Bike riders may be pleased to see bicycle lanes begin, but the lanes can be troublesome to access. Two-way cycle tracks on one side of the street, like the one pictured on the left, pose a very dangerous scenario to cyclists. To access the cycle track from across the intersection, the rider will have to cross an opposing lane of traffic and then ride against the flow of the traffic with no buffer. On the right, riders may have to ride onto the sidewalk next to pedestrians to access the lane. Motorists might not understand what the cyclists are attempting to do causing more danger and frustration for everyone involved. Spontaneous beginnings and ends to bicycle infrastructure tend to make all road users unsure of how others will react.

Figure 36. Bicycle infrastructure may have many conflict points with vehicles. Driveways and turning vehicles pose serious risks to cyclists.

The bicycle infrastructure in place is often intersected by automobile traffic turning into driveways or parking lots. Often these turns can happen suddenly or at higher speeds, leaving bike riders and pedestrians in the blind spot. Unprotected bike lanes, like the one picture on South Frio Street, can cause discomfort and stress for riders who are within 3 feet of moving traffic. When vehicles make a right turn, they will inevitably have to cross the bike lane subjecting bike riders to further risk.

While most of the Swell Cycle stations are located in the downtown core, many stations are dispersed throughout the surrounding area. Three happen to be within our study area. The surrounding infrastructure, or lack thereof, may send some confusing signals to would-be swell cyclers. Because the bikes are generally located on the interior of the sidewalk, it may suggest that the bikes are intended for sidewalk use. The lack of bicycle infrastructure around the Swell Cycle stations also severely limits their connectedness. Users are forced to drop off the bike eventually and not having a quick route to the stations hampers their effectiveness and may discourage further use. Currently there are a few destinations of importance lacking Swell cycle stations, most notably the UTSA campus. In fact Swell Cycle stations do not exist at all west of I-10.

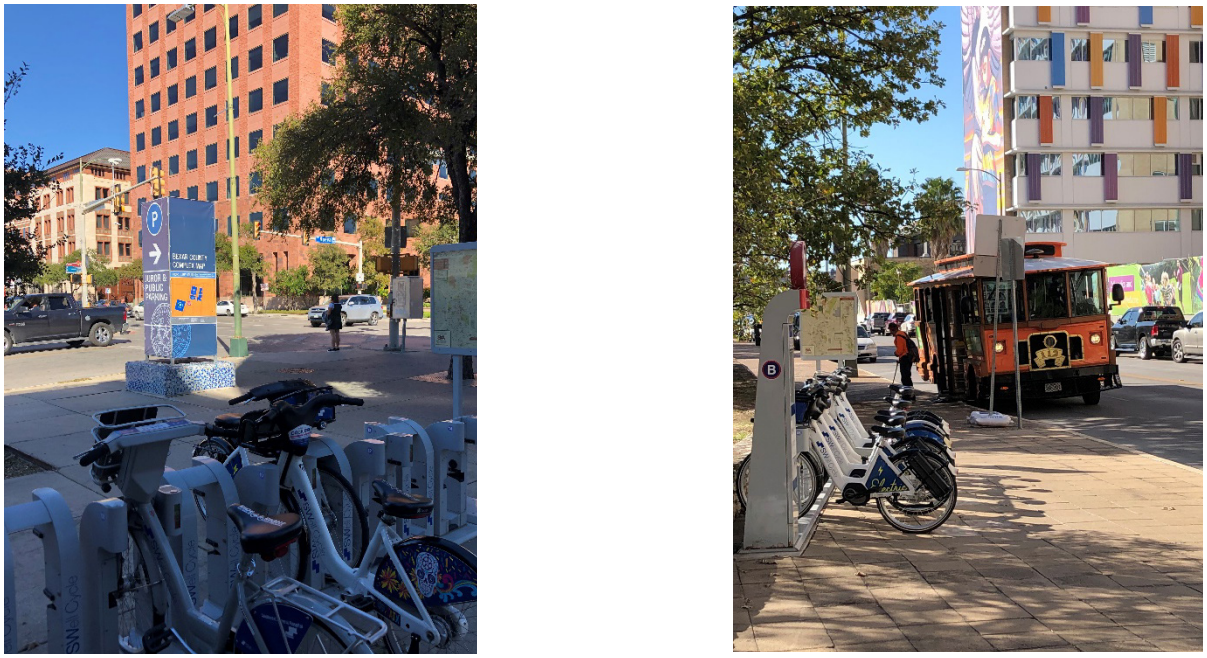


Figure 37. Swell Cycle stations located on the sidewalk with no bicycle infrastructure around them.

The existing bicycle infrastructure certainly has its flaws, but it should be reminded that the vast majority of the study area has no bicycle infrastructure at all. Most of the bike riding experience in this section of San Antonio will be spent sharing the road space with automobiles or sharing the sidewalk space with pedestrians. As of 2019, the San Antonio Bicycle Master Plan has not accomplished its goal of "Creating future road networks that encourage road connectivity" that it set in 2012.

Figure 38. Average Annual Daily Bicyclists (Current State) [Need to add some street labels for reference]

The map of bicycle traffic (average annual daily bicyclists-AADB), pictured represents the current state of bicycle ridership within the study boundary. This data was calculated via physical bicycle counts performed by UTSA students as well as data pulled from (Dadashova et al. 2018). This map reveals to us the nature of bicycle travel throughout this section of the city. The major east/west routes are Dolorosa Street and Commerce Street. The major north/south route is South Flores Street.

Figure 39. UTSA Master Plan: Downtown expansion and prominent bicycle routes needing infrastructure

UTSA's Master Plan is showcasing heavy investment and development along South Frio Street and Dolorosa Street. UTSA is advising for bicycle infrastructure to accompany these new builds. South Frio Street is especially crucial, as the campus expansion will border .3 miles of the street. With the VIA Centro Plaza to the north, and residential dwellings further north and south, South Frio Street will undoubtedly become a popular and much needed cycling route. Connection of major routes going in multiple directions will be key for students and others who will be living, working, studying, and shopping in and around downtown.

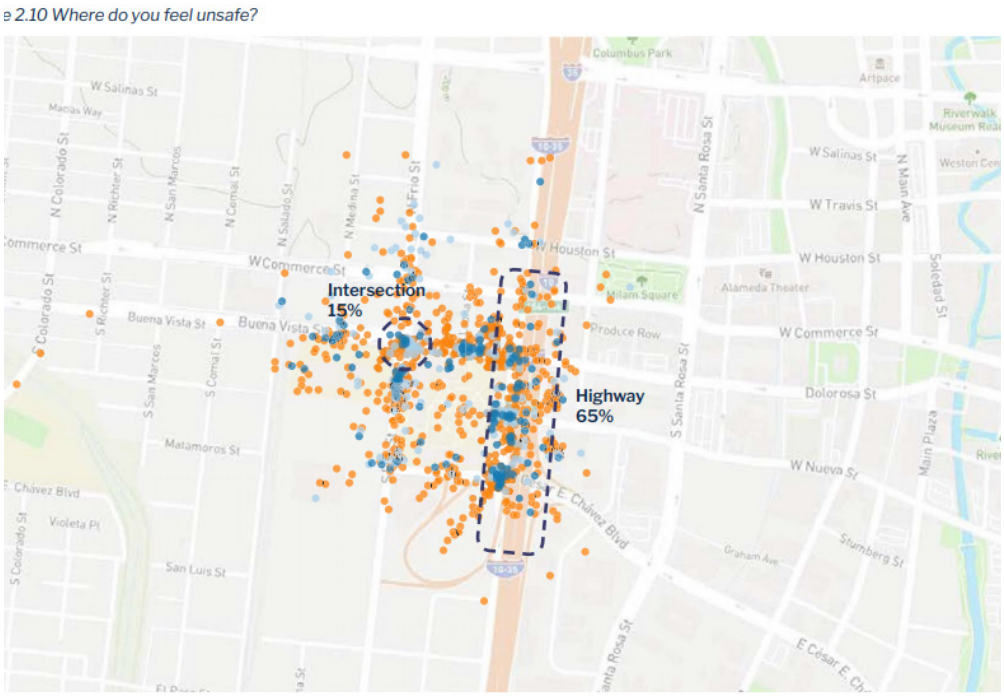


Figure 40. Where Students (Orange) and faculty (Blue) feel unsafe (Source: UTSA Master Plan)

Figure 41. Example of bicycle infrastructure under an overpass in Antwerp, Belgium

One issue that cannot be ignored is the perceived and realized safety of certain areas around campus. By far the area where most people felt the most unsafe was at the various crossings under the I-35 overpass. While the safety concerns are not specific to bicycling, they still must be addressed in this regard. Lack of visibility and fast vehicle speeds on the frontage road represent clear and visible dangers to bicyclists. Every precaution must be taken to provide for safe travel in these inconvenient areas. A complete grade separation as shown in the picture from Antwerp, Belgium would allow for the maximum amount of safety. It is not recommended that cars and bicyclists share space in such an area where high speeds are commonplace. Because every trip from the campus to downtown San Antonio will involve crossing under I-35, the focus on comfort and safety cannot be overstated.

Figure 42. Aerial view of Nueva St. and South Flores St.

Figure 43. Protected intersection design (Source: Alta Planning + Design)

After the highway underpasses, the next location people felt the most unsafe was intersections. The infrastructure at intersections must serve 2 crucial purposes. It must provide a sense of safety to all road users and it must offer connections to other directions of travel for bicycle riders. Intersections like the one pictured from Alta Planning + Design give bicycle riders a generous amount of space to maneuver, clear inherent markings on how to use the intersection, and access to all adjacent bicycle routes. This type of design ensures that no bike lanes suddenly end forcing bicyclists to merge into vehicle traffic or onto sidewalks. This can keep bicyclists completely separated from the automobile traffic and has the added benefit of space for extra vegetation and trees for shade. The city of San Antonio has signed on to a Vision Zero policy and it's time to showcase our adherence to the plan by providing infrastructure for some of the most vulnerable users of our streets.

Curb Utilization

In our current and near future, we live in an on-demand market that is increasing its popularity and use. Our challenges come as newer services arise every day. These services create a prime real estate for curb utilization. The available space will develop challenges as we rapidly emerge towards a new era of shared space for the mobile user. Challenges include access to the curb, drop-off locations, parking allocation, available space, safety, new company attraction, and traffic.

Figure 44. Curb space along Buena Vista Street near Market Square.

Curb access can include a range of issues, such as delivery drivers' needs, fire hydrant access, clear space for driveway entrance and exits, pedestrian space at crosswalks including bulb-outs, and more. As new mobility modes—including e-scooters and ride-hailing in the year 2019—increase, access for curb space will become more of a challenge.

Drop off locations are a key issue that recent research suggests may increase in demand, as shown by the growth in ride-hailing services (Brown 2019). In addition to traditional dropping-off of carpool riders and family members for school, work, and similar, automated vehicles could cause additional demand for curb space in the future (Green 2019).

Parking allocation includes both the in-street vehicle parking spaces, and space for micromobility parking, often on the sidewalk. The scope of this study did not include a parking study, but experience in the study area suggests fewer than half of the blocks include on-street vehicle parking. Parking costs vary by location. Dockless micromobility systems that include geofencing can help manage parking by restricting access where conflicts may occur—such as high pedestrian traffic areas (NACTO 2019). Some estimates suggest that automated vehicle adoption could "release fully 95% of parking spaces for other public uses" (Docherty, Marsden, and Anable 2018, 118), which could drastically change demands on curb use for parking in the future.

Available space is a challenge when different uses compete for right-of-way. Micromobility modes, such as e-scooters, currently conflict in some locations with pedestrian travel, just as bicyclists share lanes with faster motor vehicles. Further, street vendors and other uses may have rights to use curb space, which in many cases add to livability, but could conflict with transportation uses of the street space (Morales and Kettles 2009). Therefore, allocation of curb space is both a design issue for engineering and architectural experts, in addition to a political issue requiring engagement with local users of the street and elected officials.
Safety is a key issue for all transportation modes, and pedestrians are particularly vulnerable along curbs and intersections (Meyer 2016). Earlier studies of San Antonio showed that more clear space for driving does not lead to greater safety—in fact, the opposite is often true (Dumbaugh and Rae 2009; Dumbaugh and King 2018). Re-allocating street space for vulnerable road users will improve access for these modes, and narrowing lanes for vehicles, may improve overall safety outcomes.

New company attraction may be supported by improved streetscape conditions along the curb for walkability (Gilderbloom, Riggs, and Meares 2015). This logic may also extend to improvements for emerging modes, such as e-scooters and ride-hailing.

Lane congestion and traffic must be considered when making changes to the curb in a streetscape. Since intersections are often congestion pinch-points, rather than the mid-block area, special concern to manage vehicle lanes and turning lanes with pedestrian safety is needed (Meyer 2016). Street connectivity, rather than the number of lanes, is particularly important. Roads can be narrowed without significant traffic impacts, if alternative routes exist for all modes. The study area's short blocks and highly-connected street system provide resilience for daily peak traffic, in addition to traffic incidents.

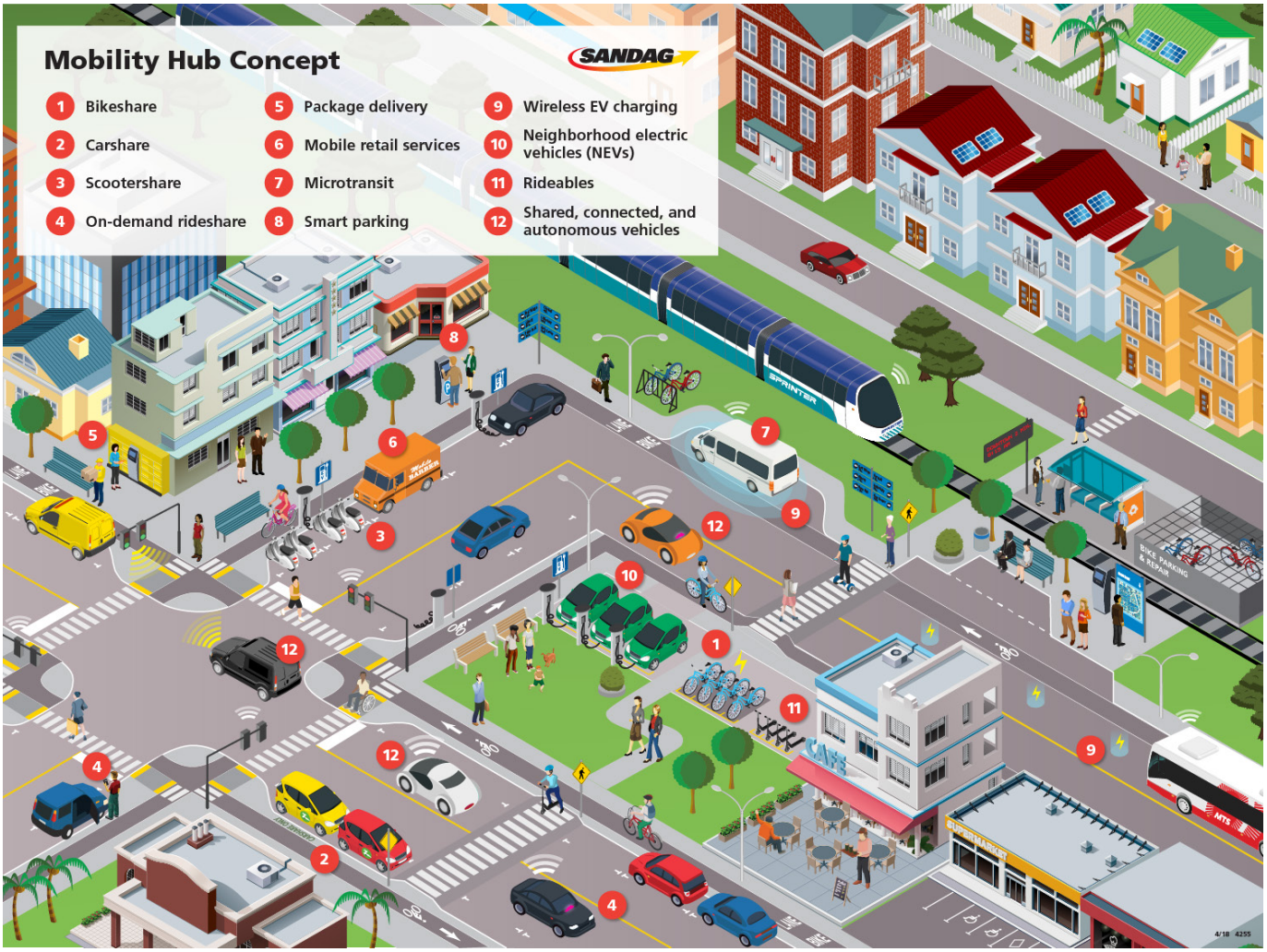


Figure 45. Mobility Hub concept (Source: SANDAG 2019)

Opportunities

New mobility concepts and technologies could potentially offer advantages to the study area, including improved safety, reduced space for parking, less consumption of foreign oil, and greater mobility independence, particularly for low-income groups. This brief section highlights some of these opportunities, tailored for the UTSA Downtown campus area.

Safety for drivers, riders, and community members stands to improve through reduced crashes from several emerging technologies. Ridehailing drivers are professionals, regardless of employment status, and they offer safe rides that could complement public transit and other services (Brown 2019). Growing population of students and young professionals could create additional opportunity for ridehailing and eventually, autonomous vehicles, to improve safety for vehicle trips for at least two reasons. First, young male drivers are the most collision-prone, and studies show carpooling can reduce likelihood of a crash (Meyer 2016). Second, ridehailing and autonomous vehicles could provide a safe option for people who may be under the influence of alcohol or other drugs.

Parking requirements are likely to be reduced in the near future, related to all of the new mobility options (e.g. autonomous vehicles, micromobility) that reduce or eliminate individual driving trips (Crute et al. 2018). Mobility-as-a-service offers on-demand trips for individuals and groups, and frees the vehicle to begin a new service trip immediately after drop-off—instead of parking. Though the university is not bound to local zoning laws, including minimum parking requirements, standard calculations may need to be revisited to avoid over-building vehicle parking. This change alone could greatly reduce the cost of development, and increase space for public use, affordable housing, and community amenities.

Foreign oil consumption could be greatly reduced under most concepts of new mobility. Electrification of the vehicle fleet, including public transit, will free local electrical markets to determine the right balance of fuels for their needs, ranging from solar and wind, to locally-produced natural gas and other options. Public and private investments in solar capacity can support this transition, such as adding solar panels on new university dormitories and at apartment complexes.

Mobility independence needs vary across social spectrums, including age and income. During the transition to new mobility options, public agencies and citizens have an opportunity to improve equity and inclusion by redefining how mobility services are defined and subsidies are channeled towards improving public value (Docherty et al. 2019). Ridehailing and micromobility are currently at the forefront regarding a balance of public good and private profit. Public and private partnerships offer an opportunity for improving mobility independence, whether through mobility services, or infrastructure. More specifically, the city and university could levy fees for private mobility service providers that subsidize access to systems for low-income individuals, increasing access to jobs, higher learning, and other opportunities. Infrastructure improvements could follow a similar model, leveraging venture capital for improvements that serve all in San Antonio. In the study area, UTSA students and local residents can have increased mobility downtown through bikeways (Schultheiss et al. 2019) for micromobility (e-scooters, bike share, etc.), and sidewalks with curb space allocated for ridehailing (Crute et al. 2018). Mobility hubs might help combine inter-modal access for as shown in the following graphic developed by the San Diego metropolitan planning organization.

Risks of New Mobility

In light of the promising opportunities of new mobility in San Antonio, there is a lot to look forward to. However, new mobility services could create new challenges or worsen existing ones. To avoid these potential pitfalls, we should consider the risks that new mobility will likely pose for San Antonio and the UTSA Downtown Campus.

Growth

An increasing population of residents and students along with the introduction of new mobility services could mean that our study area will likely experience an array of risks pertaining to growth, such as more congestion, pollution, and auto-oriented sprawl.

More people living in San Antonio will likely be followed by more vehicles on the road, which could increase congestion in our study area. In particular, autonomous vehicles could encourage an increase in travel among individuals with limited or no access to transportation (i.e. the disabled, the elderly, and children); thereby worsening congestion (Crute et al. 2018). There could also be an increase in vehicle miles traveled, including "empty vehicle miles," and demands on alternative modes of transportation, especially with regard to autonomous vehicles and ride-hailing services (Green 2019).

If autonomous vehicles make it easier for people to commute it may motivate some to live farther away from work or school; hence, prompting more students to commute, rather than live near, to UTSA Downtown Campus. This could result in sprawling development and increase greenhouses gases and pollution, which would be emitted from gas-powered vehicles that get stuck in traffic (Crute et al. 2018).

Equity

It is possible that some risks of new mobility could add to existing inequities and exclude underserved populations within our study area. We believe that such risks could have negative impacts on San Antonio's economy, housing, cultural identity, vehicle ownership/or usership, and governance.

We should take into consideration the potential risk of many vehicle operator jobs in San Antonio (i.e. bus, truck, taxi, and ride-hailing drivers) being lost to autonomous vehicles. This could displace several workers and increase San Antonio's unemployment rate. Yet, if their work opportunities do not disappear, they may still be faced with having to incorporate automated technologies into their jobs (Crute et al. 2018).

As previously mentioned, several historic and culturally significant places are located in downtown San Antonio. According to SA Tomorrow's Downtown Area Regional Center Plan, "recently developed housing is not affordable for many people already living in the Downtown Area" (City of San Antonio 2019). It is reasonable to consider that new mobility services could lead to an increase in rental rates, especially for proposed student housing at the UTSA Downtown Campus, and potentially change historic housing patterns in downtown San Antonio. Some studies have found that improved transit services will likely lead to areas having less affordable housing and social equity (Jones and Ley 2016; Moore 2015). In response, we could also witness an increasing impact of "NIMBYism" (McLeod, Scheurer and Curtis 2017).

If new mobility services are not accessible or affordable to people of different income levels and backgrounds, we could further exclude residents living on the Westside, lower-income families, and those without a credit or debit card or smart phone from paying for and accessing these services (NACTO 2019). Safety and liability concerns could deter uninsured individuals away from using some new mobility services. In 2018, "the percentage of people in San Antonio without health insurance increased to 17.1%" (Cline 2019). With this in mind, we should consider how likely it would be for those who are uninsured to use e-scooters or bike share as an alternative mode of transportation.

The City of San Antonio does not have access to data from rideshare companies like Uber and Lyft, but, as of recent, it may be receiving data from e-scooter operators to satisfy the conditions of the City's pilot program (Royall 2018). In turn, data harboring by new mobility providers could risk the protection of citizens' private data, and limit the decision-making abilities of government officials (Docherty, Marsden and Anable 2018).

Public Transit

We could see a decline in VIA ridership due to new mobility services. Given that the existing UTSA Downtown Campus is less than a mile away from its proposed expansion east of I-10/I-35, students may feel more inclined to scoot, bike, or walk to and from either campus instead of taking the bus. There is evidence that implies "on-demand ride services may replace a portion of public transit trips" (Rayle et al. 2016). However, we should be careful of relying too heavily on new mobility to meet the needs of transit-dependent populations (Crute et al. 2018).

Bicycle, Bikeshare, E-Scooter, and Pedestrian

With new mobility services, the most vulnerable road users (i.e. cyclists and pedestrians) will likely experience more stress and discomfort, resulting in serious injuries and fatalities. In fact, the first pedestrian fatality from a self-driving car occurred last year in Tempe, Arizona (Green 2019).

The average posted speed limit in our study area is 30 mph. So, it may not feel safe enough for some people to scoot, bike, or walk. It has been shown that when vehicles exceed 25 mph pedestrians and cyclists are more at risk of a crash or fatality (Schultheiss et al. 2019).

Although on-street parking is not present on most blocks within our study area, depending on how curb space is utilized in the future, cyclists could experience more conflicts with temporarily parked vehicles. Curbside loading for freight and delivery and drop-off locations for Uber and Lyft may require cyclists to ride on the sidewalk, which is not allowed in San Antonio, or merge into a travel lane to avoid being struck by opening vehicle doors, which is known as the "door zone" (Schultheiss et al. 2019).

The clutter of dockless e-scooters within our study area could get worse with the expansion of the UTSA Downtown Campus. Whether people are in a rush to get to class on time or are not aware of where to park, e-scooters could spell more problems for pedestrians, especially the elderly and those with disabilities, if more incorrectly parked scooters block sidewalk access (NACTO 2019).

Despite the micromobility options that are available in downtown San Antonio, autonomous vehicles could impact the health of residents and students alike by undermining active modes of transportation (i.e. bicycling and walking). In a sense, autonomous vehicles could encourage sedentary lifestyles (Crute et al. 2018).

Ideas and Actions

Transit

This section of the Mobility Study focuses on recommendations and ideas to transit within the Study Area. While understanding possible equity implications and forecasted growth for the Study Area and its neighboring communities, the ideas and actions within this section are recommended with interconnectivity, forward thinking, and equity in mind.

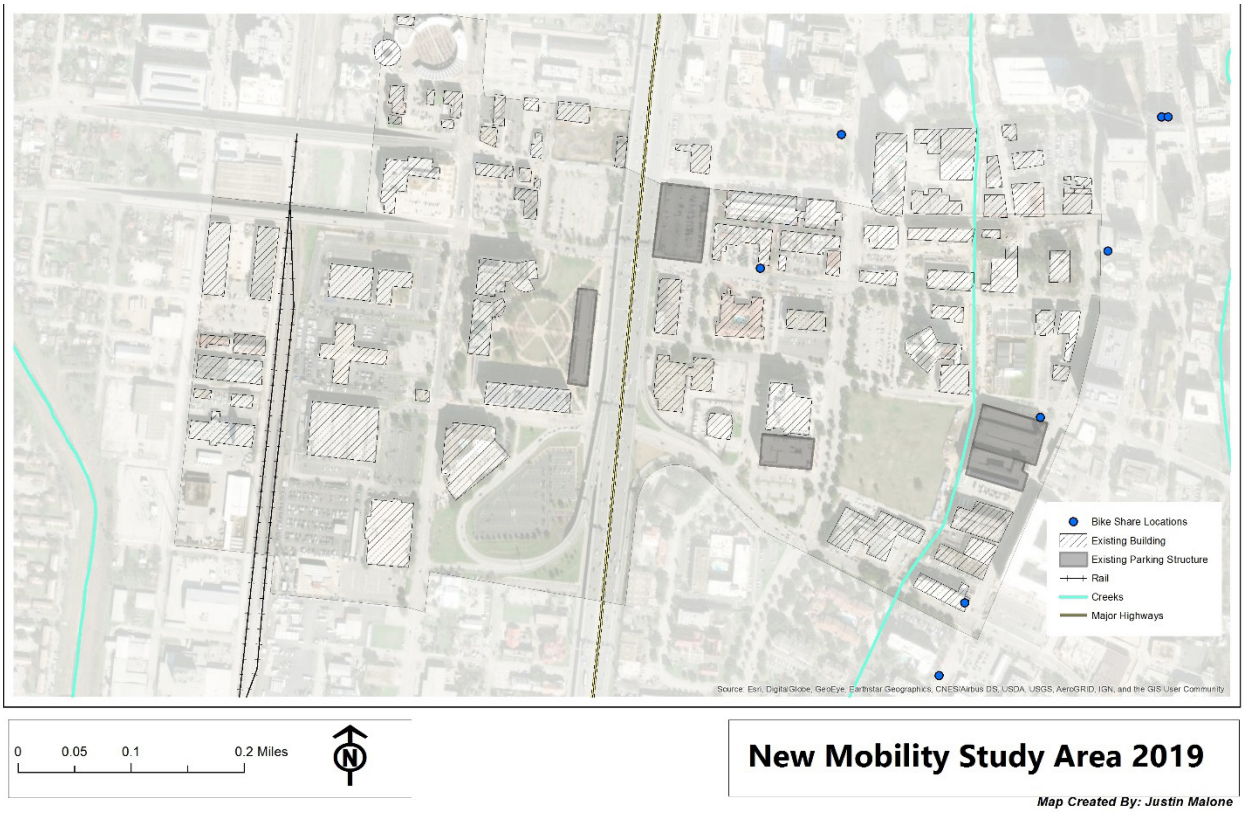
Infrastructure

Figure 46. Photos of inadequate transit infrastructure (Source: My San Antonio)

Physical

Analysis of the current transit conditions within the Study Area reveal that in order to achieve any progress in public transit within the study area, or beyond, the need for adequate infrastructure must be acknowledged, planned, and implemented. Sufficient and accessible access, ingress and egress to transit and transit related infrastructure is crucial to the progress of any transit system and for the benefit of transit users. Additionally, with the introduction of electric scooters and for the benefit of walkability and connectivity sidewalk adequate and functional conditions and access is also imperative to developing adequate transit systems for the Study Area. All which have been lacking or inadequate within the Study Area.

The City of San Antonio appears to have struggled with the manner in which it has dealt with the transportation options. In 2011, the City methodically planned for the bike share industry to enter San Antonio (Palacios, 2018). However, there continues to be a disconnect between mode and means. Within the study area, there are four bike share stations and few bike lanes, none of which are protected. Unfortunately, San Antonio's bicycle infrastructure as detailed in the Bicycling and Bikeshare section, continues inadequate and unable to support a forward moving transportation network.



Conversely, the City has responded to the electric scooter occupation in the summer of 2018 with swift action rather than the precaution it has taken with bikeshare. The City moved quickly to implement policy and management for scooters and are now working towards infrastructure needs (Jacks, 2019). The dichotomy of the two actions is glaring; the long-term planning for bikeshare infrastructure has left the City in desperate need while the swift action to scooters is also an undesirable reaction. Most recently, San Antonio's bikeshare sponsor, Southwest General Hospital has pulled significant funding from the bikeshare system, jeopardizing the systems existence; some critics note the City's flood of electric scooters to be a root cause for the decrease of funding (Palacios, 2018). Future transportation planning must consider the forward thinking needs of transportation infrastructure to avoid for reactionary planning, but at the same time not so singularly focused that progress is halted in inadequacy.

Figure 48. Photos of Swell Cycle bicycles (Source: Texas Public Radio)

Figure 49. Photos of electric scooters in San Antonio (Source: Rivard Report)

Digital

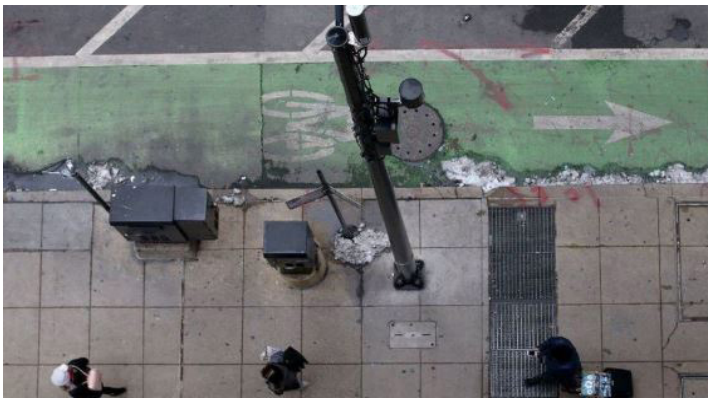


Figure 50. Photos micro cell tower (Source: Chicago Tribune)

Figure 51. Photos of Via Transit App (Source: Via Transit)

In addition to the physical infrastructure needs new mobility brings, digital infrastructure is also imperative to the success and progress of new mobility within the Study Area. As transportation continues to integrate digital capabilities and urban mobility the opportunities to restructure transit into an efficient service industry (Legacy, Ashmore, Scheure, Stone, and Curtis, 2019) become more apparent, the City of San Antonio must also continue to assist in the progression and look forward and bridge digital inequalities. As established the Study Area is quite clearly segregated by the physical boundaries of the highway, but the highway is not the only infrastructure deterrent hindering new mobility progress. Electric scooters, bike share, electric bicycles, ride hailing systems and bus transit within the Study Area all utilize and integrate some form of digital capabilities. Currently, these transit modes all accept payment, have location finders, and routes or schedules available via mobile apps and the need for quality internet access is becoming all the more necessary. Any progression in micromobility for the study area will need a clear advancement and equality of digital infrastructure.

It is the recommendation of this study that addressing the need for adequate physical and digital multi-modal infrastructure is imperative.

Bus Transit

Through the analysis of this study, Via Transit and its Via Reimagined plan, the bus system that currently serves the City of San Antonio and the Study Area could undoubtedly be improved upon. Although, Via is currently working towards improvements through its Via Reimagined plan (Via Reimagined) which focuses on three major themes: (1) better bus system, (2) advance rapid transit, and (3) smart transit. The Via Reimagined plan also identifies tangible solutions to improve the transit system frequency, advancing rapid transit with dedicated bus lanes, increasing passenger comfort with smart transit ticketing options and equipping busses with WIFI connection; however, the plan does fall short. The Via Reimagined plan does not support long range forward thinking, nor address equity. The plan does not address greenhouse gas emissions which are crucial to environmental justice and contributing to providing a clean, equitable, and healthy Study Area. The only identifiably metrics through Via Transit are (1) Ridership, (2) On-Time Performance (3) Accident Rate, (4) Customer Complaint Rate, (5) Mechanical Reliability, and (6) Cost Effectiveness (Via Transit).

Figure 52. Photos of rider waiting for bus transit (Source: Via San Antonio)

The progression and advancement of the mobility of the Study Area is heavily tied to the progression and advancement of its bus transit system and because of such more extensive plans, metrics, and follow through should be prioritized within Via Transit. Therefore, it is the recommendation of this study to continue working through the Via Reimagined themes and prioritize negating greenhouse gas emissions.

Autonomous Vehicles

A forward-thinking bus transit system should look toward not only incorporating new technologies but be a contributor to the advancement of such technology. The advancement of automated vehicles is one that should not and cannot be ignored by transportation agencies, bus transit included.

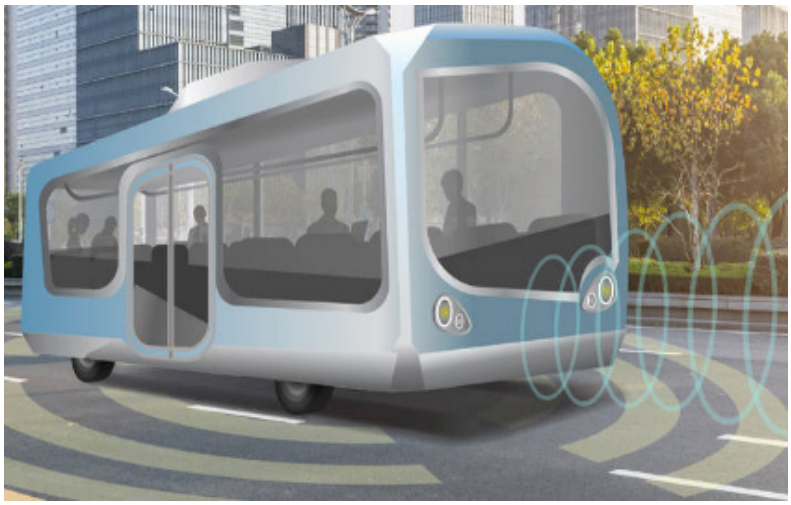


Figure 54.Rendering of automated bus (Source: Automated Bus Consortium)

The Automated Bus Consortium is an association designed to investigate the feasibility of implementing automated projects across the United States (Automated Bus Consortium). The Consortium includes transit and transportation agencies from Long Beach, Los Angeles, Michigan, Minnesota, Atlanta, and Dallas. The Consortium's pilot program also seeks to operate 75-100 full-sized busses between 2021-2022 (Automated Bus Consortium) in participating cities. San Antonio's exclusion from such programs may demonstrate a hindrance on progressive transportation. Automated vehicle technology is apparently inevitable, the extent of integration into transit is unknown, however, research, studies and advancement are clearly upon us and making progress (Legacy, Ashmore, Scheure, Stone, and Curtis, 2019).

While some theorists may find that autonomous vehicles provide for an opportunity to combat traffic congestion and parking requirements through single-passenger vehicle usership; others theorize that autonomous vehicles may influence passengers to perpetuate sprawl patterns further as autonomous vehicles provide an opportunity to travel longer distances (Legacy, Ashmore, Scheure, Stone, and Curtis, 2019). The recommendation from this study is to incorporate autonomous vehicle technology, an advancement that is clearly forthcoming, into bus transit systems to instead reverse some effects of sprawl by connecting larger numbers of passengers to the Study Area and apply curb management techniques to incorporate fluid access for autonomous busses throughout the Study Area. As Via Transit is working towards increasing dedicated bus lanes for the existing transit system (Via Reimagined), it is further the recommendation of this study to utilize this improved transit infrastructure to explore use for autonomous vehicles.

Figure 53. Rendering of how single-user autonomous vehicles may revive suburban sprawl (Source: Auto Beat Daily)

As one of the first major transport advances in approximately 70 years (Crute, Riggs, Chapin, and Stevens 2018), the possibility to integrate autonomous vehicles should be considered and evaluated in order to compete with single-passenger autonomous vehicle use.

Figure 54. Photograph of passengers boarding autonomous pod (Source: StraightsTimes)

In addition to automated bus transit, cities are also looking to the development of automated urban transport pods (Monks, 2019). The automated pods are used in smaller scale environments, such as airports or dense urban areas, which may service the study area or forthcoming university campus well. The compact nature of the vehicles would allow for fluid mobility through the campus and ideal for short distance commutes. In April 2018, Nanyang Technological University in Singapore signed an agreement to test automated pods to shuttle students throughout campus. The automated pods can carry 24 students at a time and approximately 300 students daily (Abdullah, 2018).

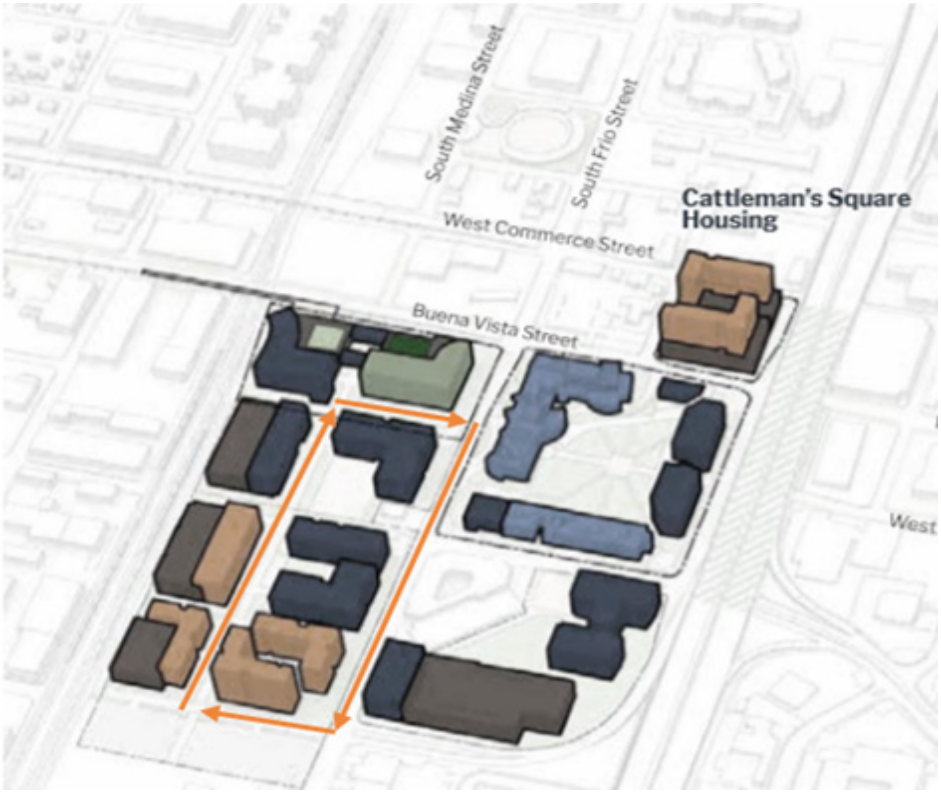


Figure 55. Proposed automated pod route over UTSA master plan rendering (Source: UTSA)

As UTSA aims to be a more connected downtown campus, the automated pods may be useful in navigating the area more seamlessly. Additionally, the advancement and availability of automated pods on a smaller, defined path maybe more readily available than fully autonomous city bus systems. It is therefore the recommendation of this study to integrate and look forward to innovative autonomous for the benefit of the University within the Study Area.

The progress, advancement and longevity of all transit within the study area, as well as city-life should be grounded in interconnectivity, be forward thinking, and working under an umbrella of equity. Transit modes within the study area should not be singularly focused, the interconnectivity of transit enhances ridership, expands routes, and engages more participants to expand their transit options. Additionally, transit plans should continuously be progressive and forward thinking, yet tangible. Achieving standard transit metrics is [great] however, the need to include climate change and progressive thinking in transit modes will secure the longevity of transit systems. As transit changes, adapts, and progresses, plans for such transitions should always be under the umbrella of equity. Equity should be a driving force behind all transit plans, especially those in the study area. In order to plan for equitable transportation, it is essential to plan beyond automobile-centered planning and explore advancing new mobility.

It is the recommendation of the study that under these central themes, infrastructure, both physical and digital, must also be enhanced, modified, and expanded to be equally accessible and equitable, and always forward thinking.

Bicycling and Bikeshare

The following map represents what the bicycle volume would look like with bicycle lanes added to all streets within the study boundary. Calculations for this model are derived from (Volker and Handy 2019). While these ridership estimates are based off the recent bicycle counts conducted and calculated, they do not take into effect much of the infill growth happening in the area. The expansion of the UTSA downtown campus, the addition of the new data science campus, and new apartments like Encore SoFlo on South Flores St. are all bringing in new people to downtown San Antonio. As new dwellings and new destinations come about, people will be traversing these short distances regularly and the car may not be the most practical method of transportation.

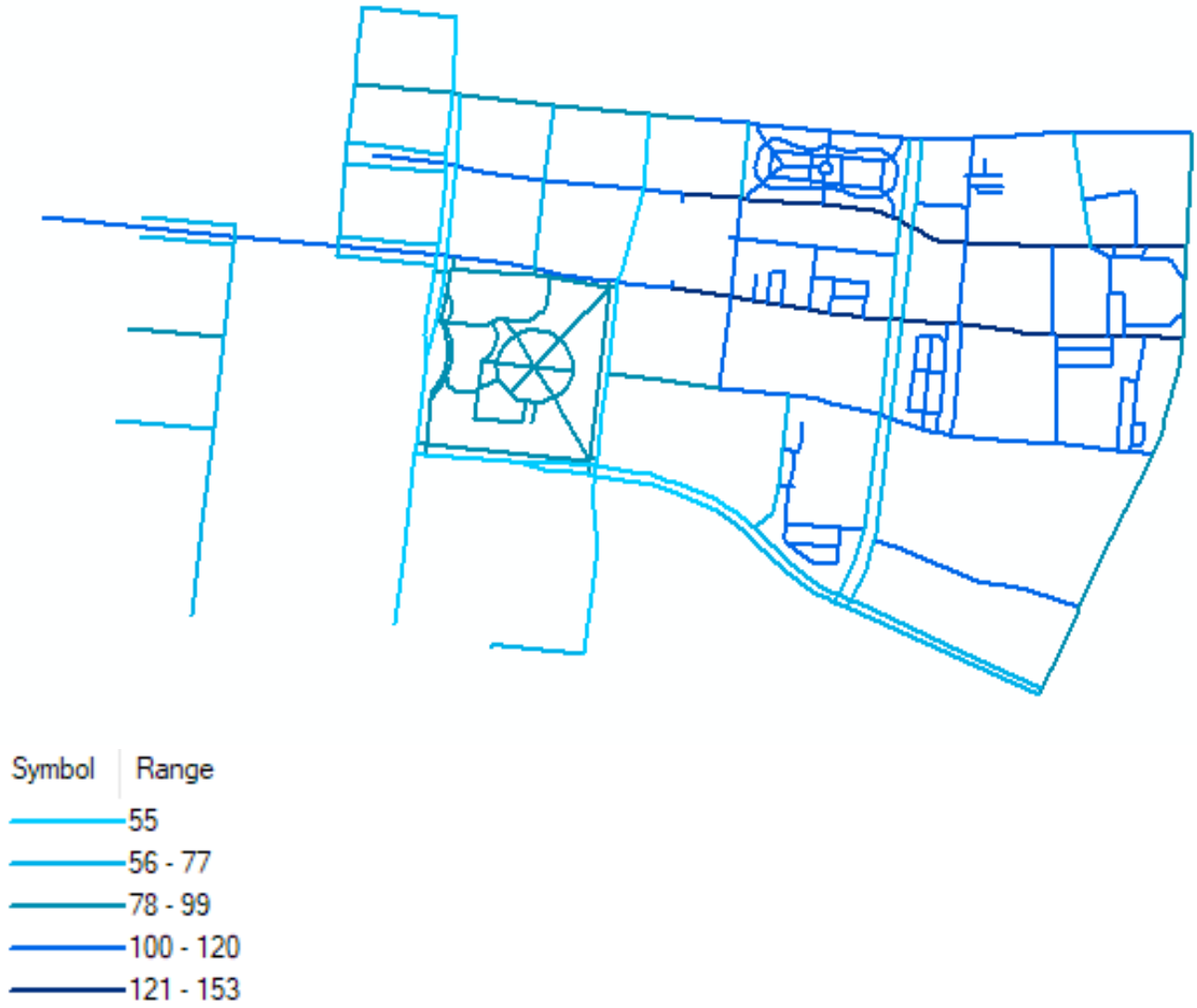


Figure 56. Average Annual Daily Bicyclists, assuming installation of bike lanes on all streets (Bike Lanes Everywhere)

B-Cycle Stations (Black = Existing, Blue = Proposed) (Background Photo Source: UTSA)

The expansion of the UTSA downtown campus also provides a unique opportunity for the Swell Cycle bike share program. Swell Cycle could provide students and residents an active convenient system to move about the campus and downtown as a whole. The stations should be positioned in clearly visible locations adjacent to the street and its bicycle infrastructure. In addition the stations should allow for unhindered access to the bicycle infrastructure via a nearby curb cut or by simply being located at the same grade. A swell cycle station at the data science campus on Dolorosa street could provide the service to both students and users of the newly renovated San Pedro Creek path. At the downtown campus, locations have been planned for their proximity to dorms, and for the allowance of intercampus travel. In addition to the proposed stations, supplementary bicycle and e-scooter parking is encouraged.

Curb Utilization

To develop our existing curb utilization structure with the rise of alternative transportation uses, we can utilize and format our recommendations for San Antonio, based on the framework of current cities preparing for the future. The recommendations for the study use the following guides when considering changes in curb management:

- Curb Appeal: Curbside Management Strategies for Improving Transit Reliability from NACTO—the National Association of City Transportation Officials
- Seattle's Right of Way Improvements Manual
- The Shared-Use City: Managing the Curb, from the International Transport Forum

Seattle recognizes the same challenges most cities in the United States are fronted with and confronts the challenge head on with a vision for complete streets. The shared space for the mobile user is transforming with the emerging transportation needs. The city has started to adapt and accommodate as the emerging trends rapidly approach. The manual provides a strategic approach to provide guidance with processes and standards that help manage the city curb and the streets they manage (City of Seattle 2019). Seattle provides in their manual, a process to allocate decision framework by consideration of street and traffic types for the area they serve. The process determines the types by amount of movement using the arterials that serve a specific area and use of place (City of Seattle 2019).

The curbside management treatment selection in Seattle's manual consists of the following steps:

1. Inventory existing conditions
2. Identify land use and activity considerations to develop modal prioritization
3. Identify appropriate treatment alternatives
4. Assess and present alternatives for public feedback
5. Refine and implement treatments

Utilizing the design tools approached by other cities, we recognize that safety of the pedestrian, whether walking or biking is given the highest priority. Following the scale of the user, cities prioritize as ordered from public space to passenger pick up and then, managed parking & delivery (NACTO 2017). When the local context is studied, we can manage the curb as a flexible space to enhance the area use for the people while also accommodating further growth of future transportation modes (International Transport Forum 2018). There are numerous options to consider when looking at the needs of our future city of San Antonio, however, looking at precedents like Seattle, we can fully consider viable options that have been tested and managed.

Given the context and future needs in the study area, we recommend the following:

1. Wider Sidewalks for pedestrian use
2. Minimize conflict between bicyclist and transit to improve safety and efficiency
3. Protected bike lanes
4. Consider Truck Freight Dimensions for curb side clearances

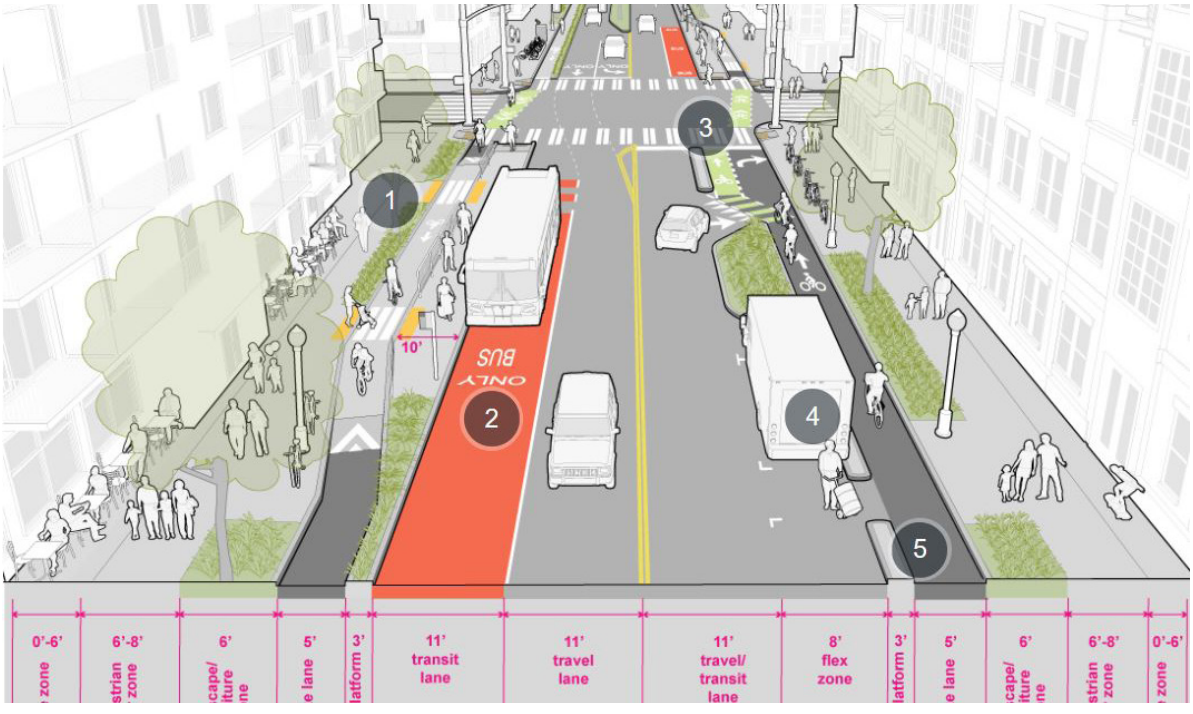


Figure 57. Seattle's manual shows how curbs can be realigned to fit a city's changing needs.

Flex zones can be implemented along curbs to provide many different uses of the street, such as in the example from Seattle below. Defining specific uses at varying times of the day will create an efficient way to allow people and vehicular movement to shape the curb based on shared use (International Transport Forum 2018). However, extensive public involvement is needed to inform design on local needs.

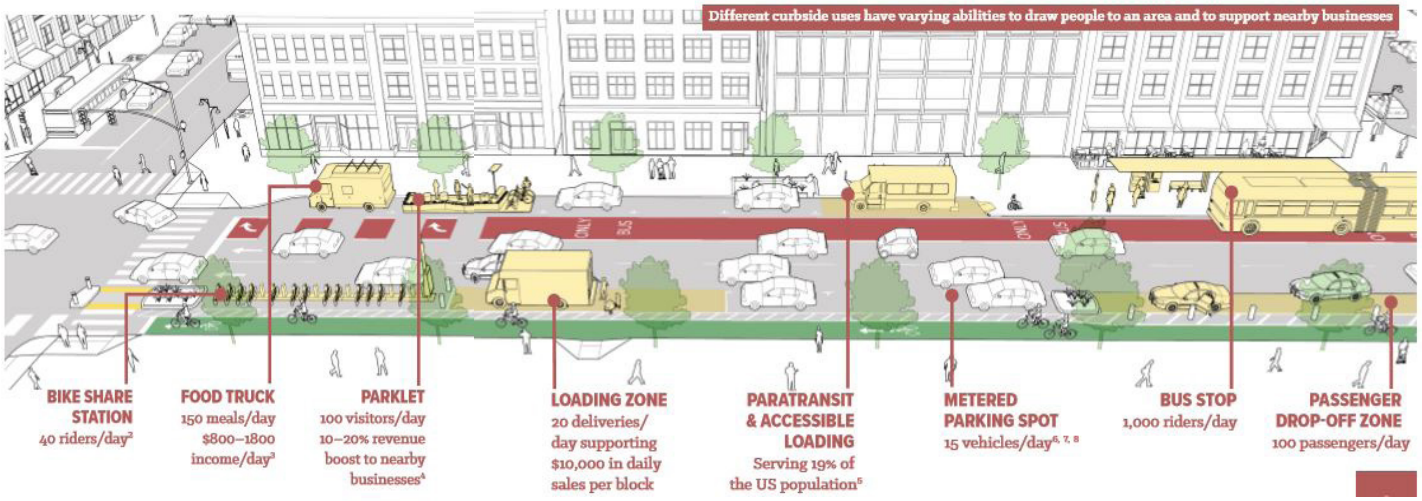


Figure 58. Flex zones create options for local needs, as in this example from Seattle.

E-Scooter and Pedestrian

Providing better right-of-way designs encourage people to utilize new modes of transportation, such as bicycles and E-scooters (Meyer, 2016). For new modes of transportation to be utilized, San Antonio must address safety first. Safe conditions attract people to utilize new modes such as bicycles and E-scooters more frequently (NACTO, 2019). Currently, there is a lack of safety for bicyclist and E-scooter riders. A few issues they face include: a lack of proper lanes, sharing lanes with vehicle traffic at times, and these modes lack a connected network.

The current and pending boom in construction in San Antonio will also bring a huge rise in people navigating the downtown area. If more people utilize bicycles and E-scooters, this would help to alleviate the congestion that the future construction and expansions may bring. Research shows that more people will walk or bike if they feel safe (Seattle Department of Transportation, 2017). This is the goal of designing complete streets with improved sidewalks and bike lanes, as well as easy access to public transportation or parking. By adding proper bike and E-scooter lanes with a buffer from the vehicle traffic, we will significantly see more people who bike regularly for short trips of three miles or less especially to school, work, or even for exercise (Meyer, 2016).

Pedestrian-oriented design is an essential component in the improvement ways of transit. Looking at the current study area and the challenges in linking the bike lanes and pedestrian walkways together, we propose two right of way designs. The first design proposal is at Dolorosa Street, the road along the new Downtown Campus Expansion (Figure 56). The second design proposal is for Frio Street (Figure 57), which poses challenges for pedestrians crossing between the Monterrey Building to the Campus across Frio Street, and also to parking surfaces crossing Buena Vista Street. It must be taken into consideration to ensure that any improvements will support existing or future transit systems and provide safe and direct connections between bicyclists, E-scooter rides and pedestrians within the area. Because of this, site and detail design enhancements to the pedestrian realm improve the overall transit experience.

Typical Street Classification(s)	**Arterial**
Green Lanes	Green buffers with vegetation, shade trees, as well as permeable pavement for sidewalks and landscaping.
Pedestrian Safety	Provide between 8'-0" - 10'-0" of pedestrian clear space at transit waiting areas and crosswalks.
Bicycle – E-scooters Lanes	Protected bike and E-scooter lanes (protected by green buffer zones), minor separation, Bike-share and E-scooter parking located strategically along right of way.
Transit Lane	Bus lanes designated for buses only to easy flow of traffic.
Sidewalks / Curb Lanes	Widen sidewalks between 8'-0" – 10'-0" to create a safer and enjoyable travel for pedestrians. Properly designed curb lanes to account for suitable passenger loading and unloading with minimal curb cuts and driveways to maximize pedestrian safety by reducing conflict points.
Streetscape amenities and Lighting	Provide proper streetscape amenities such as parking signs, walking signs, bicycle lane and E-scooter lane signs, street furniture poles, trash receptacles and lighting in order for pedestrians to feel safe and promote a walking environment.
Roads Width	Traffic lanes for buses should not be less than 10'-0"-11'-0" in width and 9'-0" for vehicle traffic.

Table 2. Main guidelines to proposed right-of-ways

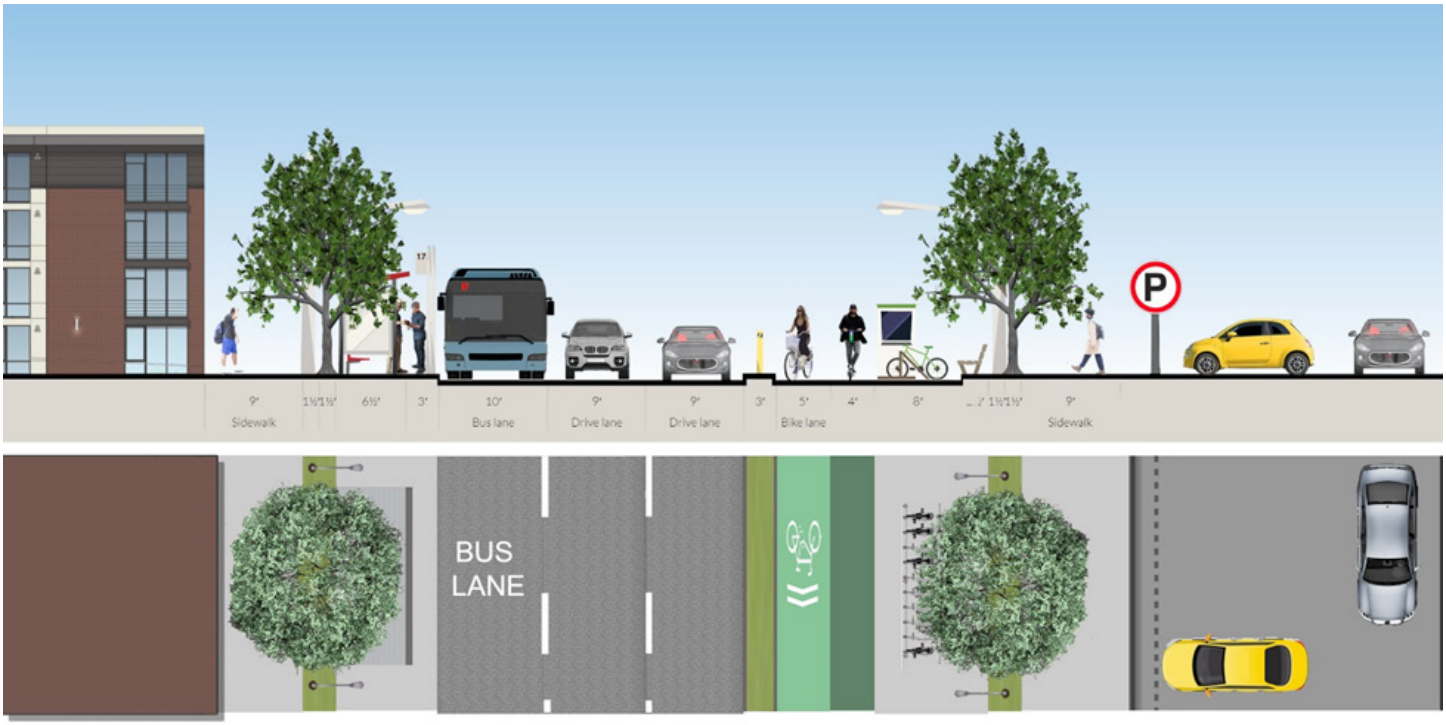


Figure 59. Dolorosa Street proposed right-of-way (plan and section)

Bicyclists feel uncomfortable when riding between fast-moving traffic and bus zones (NACTO, 2019). It is suggested to propose a right of way along Dolorosa Street as shown in Figure 56. The proposal calls for eliminating one traffic lane and providing a bike and E-scooter lane on the left side of the one-way street. Along the bike and E-scooter lanes, there will also be bike-share stations, as well as bicycle and E-scooter parking. These areas will be located strategically along the bike and E-scooter lanes at nodes which are convenient to bike and E-scooter users. This will allow for easy access to bicycles and E-scooters, while providing a designated location where they can be located as opposed to the current issues involving E-scooter parking. The City of San Antonio could collaborate with E-scooter companies in order to provide a way for E-scooter riders to be provided a form of credit for placing E-scooters in the designated zones. A green lane is also created with vegetation and trees as a buffer between the bike and E-scooter lanes and sidewalks. The green lanes seek to create a more comforting environment for pedestrians, while also beautifying the right of way. Widening sidewalks will provide more space for pedestrians to walk. In order to alleviate traffic congestion and ease the flow of traffic, the proposal also calls for designating a bus lane for bus routes.

The proposed right of way along Dolorosa Street should extend from the new campuses that will be located along San Pedro Creek to the existing campus on Frio Street. This will allow for students to have a protected path of travel whether by car, foot, bicycle or e-scooter to and from each campus.

Frio Street

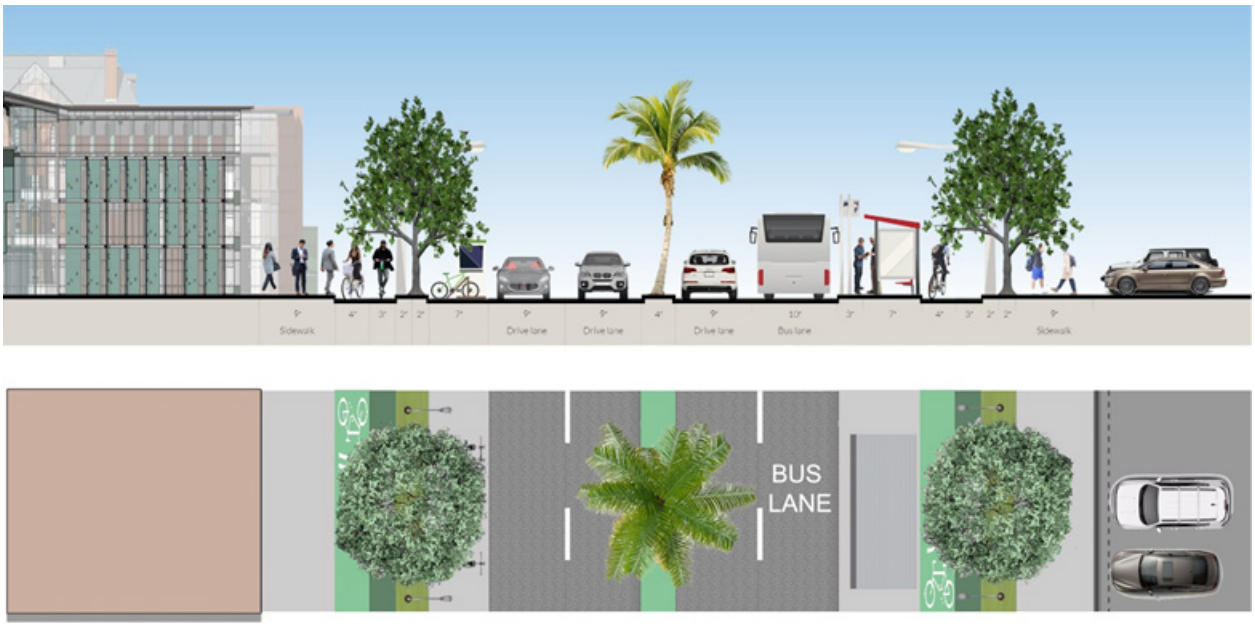


Figure 60. Frio Street proposed right-of-way (plan and section)

It is suggested to propose a right of way along Frio Street as shown in Figure 57. The proposal calls for the introduction of bike and E-scooter lanes on both sides of the street. The widening of sidewalks, to create more space for pedestrians to walk, and green buffer lanes between the bike and E-scooter lanes and sidewalks. The addition of greenery seeks to create a more comforting environment for people to walk. The designation of a bus lane for bus routes will aid in alleviating traffic congestion while also easing the flow of vehicle lanes. The introduction of bike-share stations with bicycle and E-scooter parking on the left side of the right of way will aid in removing the obstacles currently created by E-scooters being left on sidewalks, as they have no dedicated lane or parking guidelines. This proposal will remove bicyclists from potential conflicts with bus traffic and creates a pedestrian safety island that decreases exposure time for pedestrians.

The proposed right of way along Frio Street, should extend from Martin street to Guadalupe street along Frio. While a portion of this proposed extension is beyond our study area, it takes into account future expansion of the downtown campus along Frio. The extension also serves as a connection for users other than students who may be commuting by bicycle, e-scooter or on foot from the West Side into downtown San Antonio.

Conclusions and Recommendations

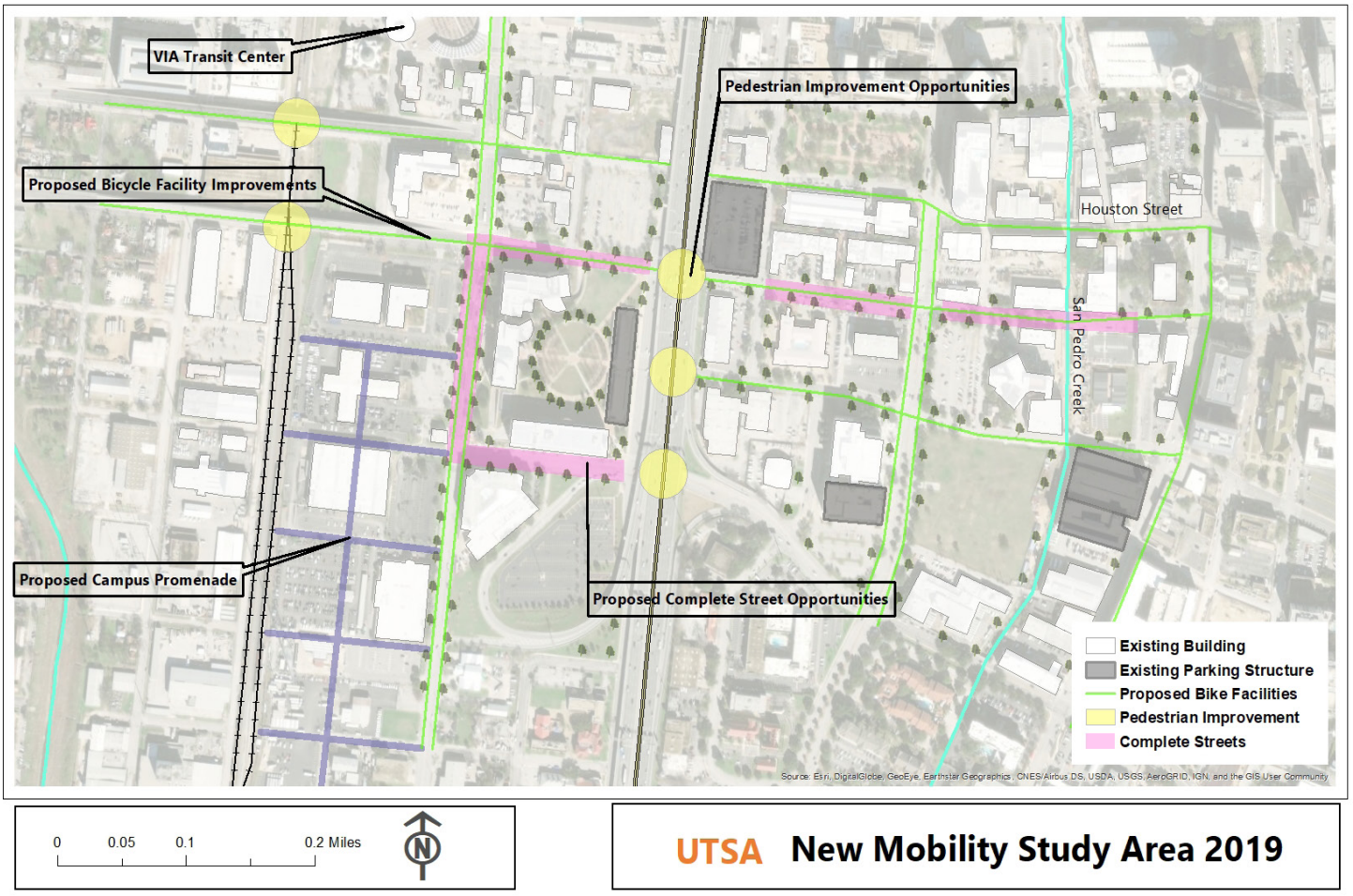


Figure 61. Recommendations for the New Mobility Study Area

The map above highlights some opportunities for short-term and long-range improvements within the study area. A growing network of bicycle and micromobility facilities is necessary to accommodate alternative modes of travel. The addition of several complete street corridors would give a level of comfort and safety to pedestrians and cyclists alike, especially those who are attending UTSA's downtown campus and surrounding area. With the forecasted growth driven by the university, an increase in pedestrian activity is inevitable. Safety is especially imperative at crossings that take pedestrians under the interstate and over the railroad corridor to reach their destinations. There are several ways to incorporate these opportunities for all modes of travel so that the growth in this area can be managed and implemented with safety measures in mind.

The greater UTSA downtown campus area in San Antonio offers a testbed for thinking about how to work with new mobility concepts. We can contextualize rapid change in terms of three time periods:

- ***Then***—The recent past, marked by a tendency to use one transportation modes and rarely switch.
- ***Now***—New approaches to mobility, including bike share, ridehailing, and e-scooters, enabled by mobile technologies.
- ***Future***—Many consider mobility-as-a-service to user a new era for efficiency, convenience, and perhaps equity, through emerging modes of microtransit and autonomous vehicles.

The only part of the future that we can know for certain, is that our actions and planning decisions now—as a community of residents, scholars, practitioners, and agency officials—will impact how the future of new mobility plays out. This study is one effort to inform our community's next steps.

Overall, the city, university, and local partners should view both existing policies and new proposals through an equity perspective. As the community changes, our approach to improve mobility should also adjust. To that end, we offer the following recommendations for next steps in planning and policy in this study area, regarding new mobility. The site First, **prioritize existing public transit services** as a key for mobility for all. This includes exploring new technologies while continuing to improve services from end-to-end, such as major investments in sidewalk improvements and bicycle infrastructure. Next, **rapidly build bicycle infrastructure** to sustainably and safely support growth in the area. Many streets may need relatively simple on-street protected bike lanes included in scheduled maintenance of surface material. Today's bicycle infrastructure designs, as adopted by the City through NACTO, serve a variety of emerging modes such as e-scooters and bike sharing. Third, **reconsider curb utilization** to begin planning for a more shared, autonomous future. Expected reductions in surface parking needs will be concomitant with increased demand for drop-off and pick-up space along curbs, in addition to safe access for micromobility modes. Parking costs and policies may need to be adjusted soon. Finally, **e-scooter and pedestrian interactions require urgent attention**. Many sidewalks in the study area are inadequate for either mode, and the introduction of micromobility has further stressed walking in the area. Policies and laws relating to e-scooter use in pedestrian zones must be reviewed in areas where there is no safe alternative. San Antonio's famed walkability must be maintained and improved while exploring new mobility options.

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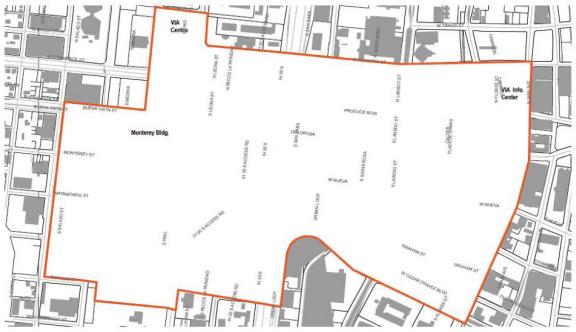
Field Data Appendices

Appendix 1- Traffic Sound Field Data Collection

Location: Houston Street, San Antonio, Texas
Date: September.28.2019
Due Date: October.8.2019
Noise App: Decible X and Apple Voice Memos

	Location 1	Location 2	Location 3
Date	September.27.2019	September.27.2019	September.27.2019
Time	11:37am	11:51am	12:12pm
Street Address	230 E Houston St, San Antonio, TX 78205	301 E Houston St #105, San Antonio, TX 78205	E Houston and Alamo, San Antonio, TX 78205
Decibels	**30 DB**	**35 DB**	**41 DB**
Average	**33.9 DB**	**34.6 DB**	**39.3 DB**
Max	**36.4 DB**	**43.7 DB**	**47.5 DB**
Peak	**39.4 DB**	**50.9 DB**	**51.7 DB**
Notes on your experience of sound at this site	Low pedestrian traffic. Brick pavers Few trees for noise absorption. Plenty of reflective surfaces (glass)	Moderate pedestrian traffic. Man singing at the corner for street entertainment. Construction (indoor) happening across the street. Few people in Revolucion's front patio having private conversations.	Heavy pedestrian traffic at alamo plaza. Heavy car traffic such as buses and heavy trucks with construction materials. More trees and planters for noise absorption. More activity.



DATA GATHERING

Via 100 primo

- fewer stops and traffic signal priority for faster trips.
- larger stations feature recognizable arching shelters
- overhead digital signs with real-time next bus information.

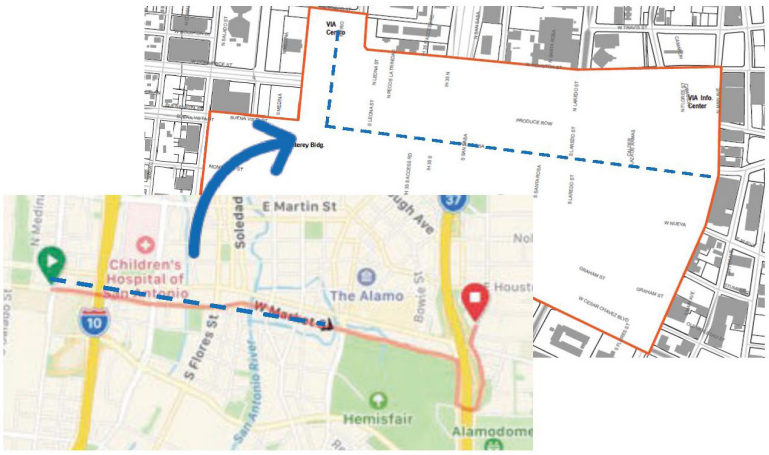
Ride with GPS

Study Area

RIDE WITH GPS

TRIP 1

Start Time: 11:46 a.m.
End Time: 11:55 a.m.
Passengers at Start: 14
Passengers at End: 7
Stops: 5
Bicycles: 0

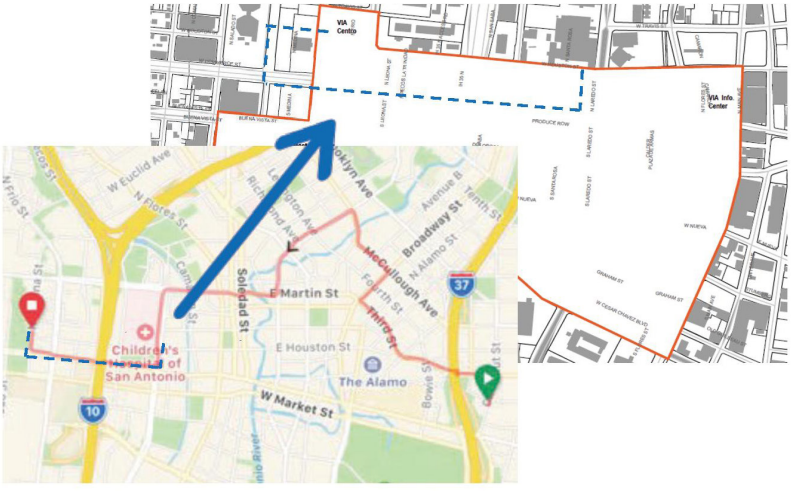


Via Centro, along Dolorosa to Main St.

Distance .83 miles | Duration: 9.58 min. | Avg. Speed: 11.547 mph

TRIP 2

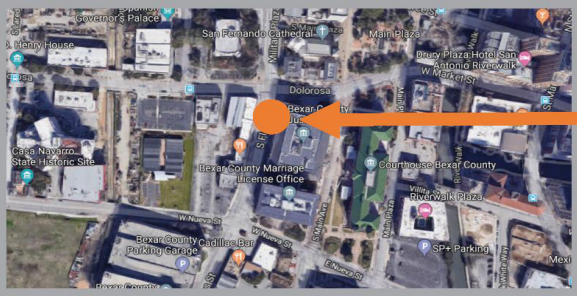
Start Time: 12:03 p.m.
End Time: 12:14
Passengers at Start: 14
Passengers at End: 18
Stops: 2
Bicycles: 0

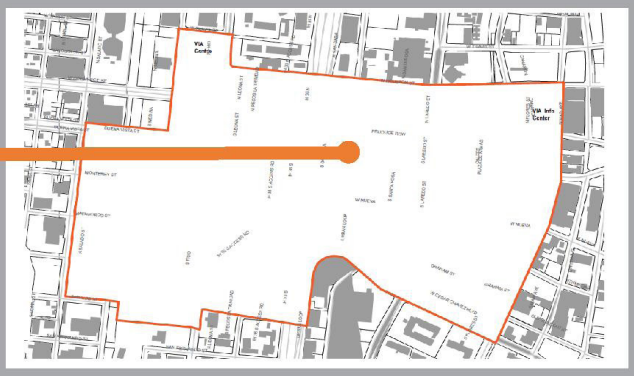


Santa Rosa to Houston to Via Centro

Distance .52 miles | Duration: 10.48 min. | Avg. Speed: 20.16 mph

LOCATION





Imaginary Line

Results

Date: 22 -09 -2019

Location: S Flores St.

Between: Dolorosa St. **&** W Nueva St.

Count Period: 10:11 AM **TO** 11:11 AM

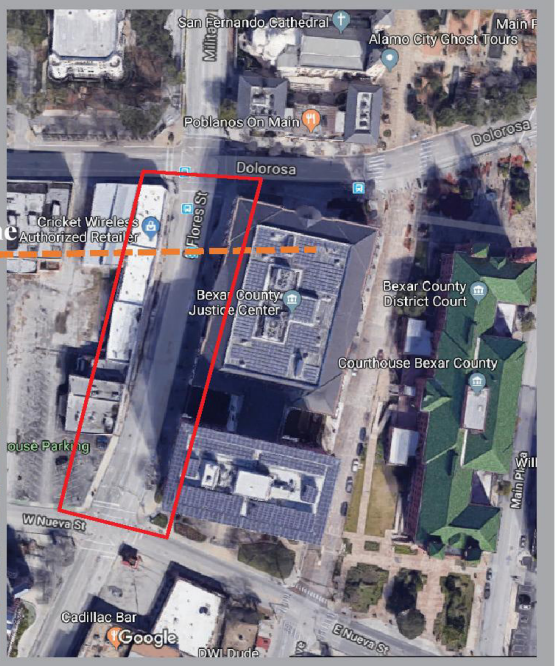
No Rain

TOTALS	Count
Bikes – Right to Left	4
Bikes – Left to Right	7
Pedestrians – Right to Left	41
Pedestrians – Left to Right	74

No E-Scooters were seen on site

Imaginary Line

Imaginary Line



UTSA The University of Texas at San Antonio

URP-5433-901-Fall-2019-Transportation Planning

Screenline Count Form