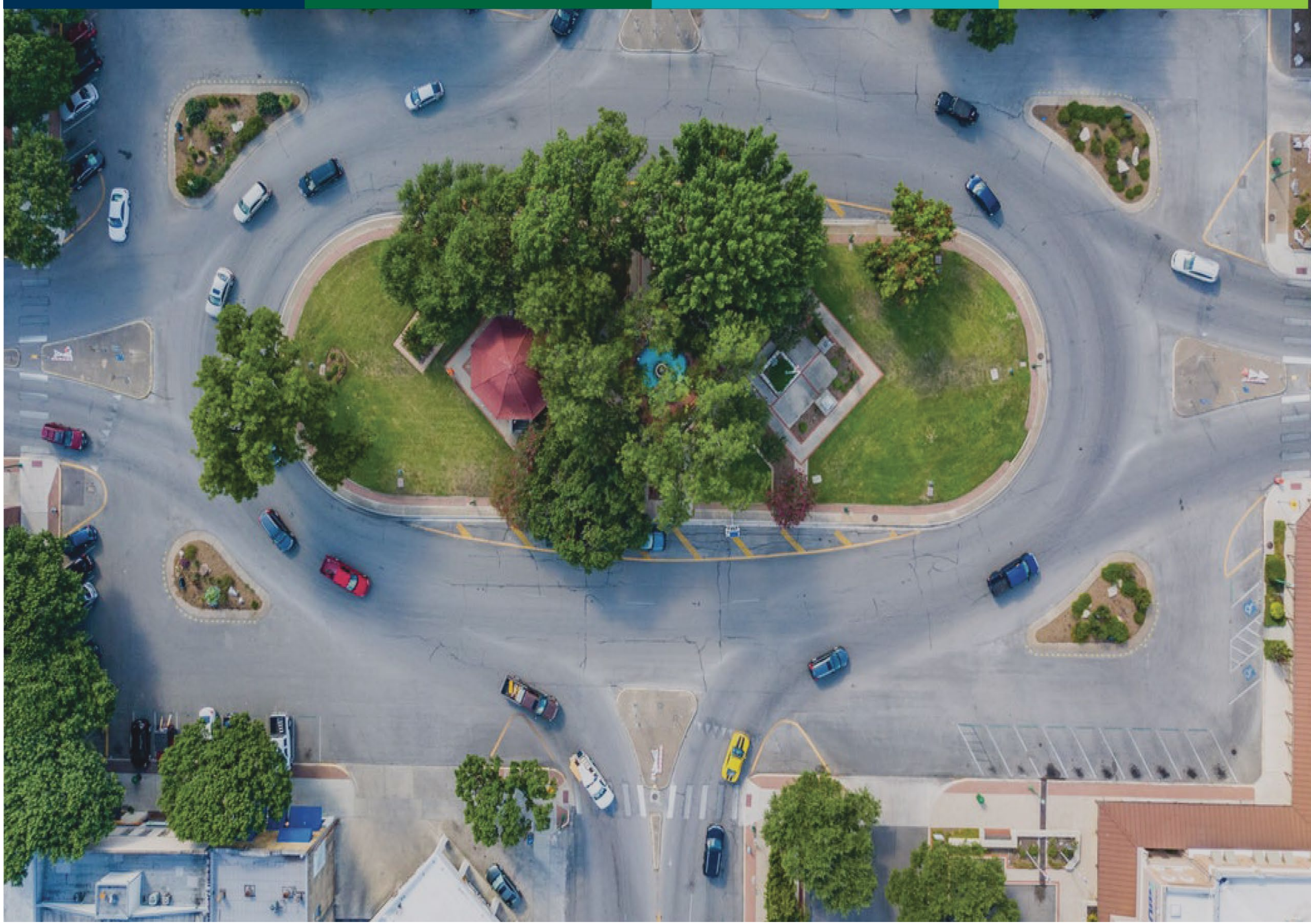
City of New Braunfels

TRANSIT DEVELOPMENT PLAN

October 2023



ACKNOWLEGEMENTS

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This report was prepared by Alliance Transportation Group, LLC and Via Mobility, LLC on behalf of the City of New Braunfels.

Photos and Graphics

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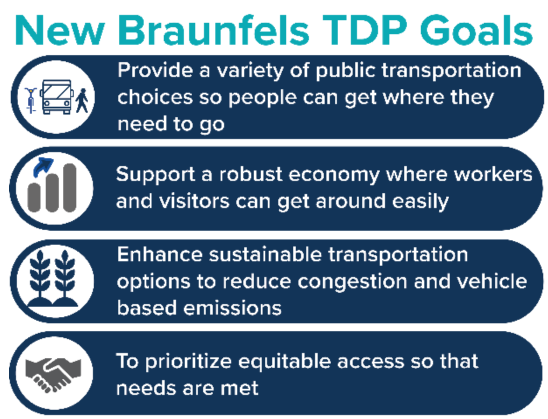
Chapter One

INTRODUCTION

INTRODUCTION

The New Braunfels Transit Development Plan (TDP) is a strategic effort to identify a path forward for the City to provide improved public transportation options for residents and visitors to the area within this rapidly growing community. City officials recognized that the demand for transit service currently outpaces the existing on-demand public transportation service provided by Alamo Regional Transit (ART), and as the area grows, so too does the opportunity to grow city provided services, including public transportation. This plan strives to provide equitable access to a variety of public transportation options so that residents and visitors can get to where they need and want to go in support of a robust economy and enhance sustainable transportation options to reduce congestion and vehicle based emissions. This TDP will analyze characteristics of New Braunfels, including the population, geography, transportation network, and existing transit options to provide a recommended approach to launch its own transit service within a two to five year period.

New Braunfels was the third-fastest growing city in the country from 2010-2019 according to the US Census Bureau (+56%).[1] Due to this growth, the area was designated as a new Small Urbanized Area (UZA) distinct from that of Greater San Antonio after the 2020 Census. Small UZAs have a population ranging from 50,000-199,999. **Figure 1** shows both the city limits as well as the New Braunfels UZA, which differ in how the Census defines urban based on population density.[2] Thus, the UZA extends into unincorporated Comal and Guadalupe Counties.



FTA Direct Recipiency

The reclassification of New Braunfels as a Small UZA renders the City of New Braunfels eligible to receive federal transit funding under the Federal Transit Administration's (FTA) Section 5307 Urbanized Area Formula Program and other applicable discretionary grant programs. Funding for small UZAs is apportioned to the State to support transit needs within these areas. To be eligible for funding through FTA and other Federal transportation programs, transit providers in Urbanized Areas are required to participate in federally prescribed multimodal planning processes led by a metropolitan planning organization (MPO). With coordination and concurrence from the Texas Department of Transportation (TxDOT), the City of New Braunfels may choose to become a direct recipient of FTA funds.

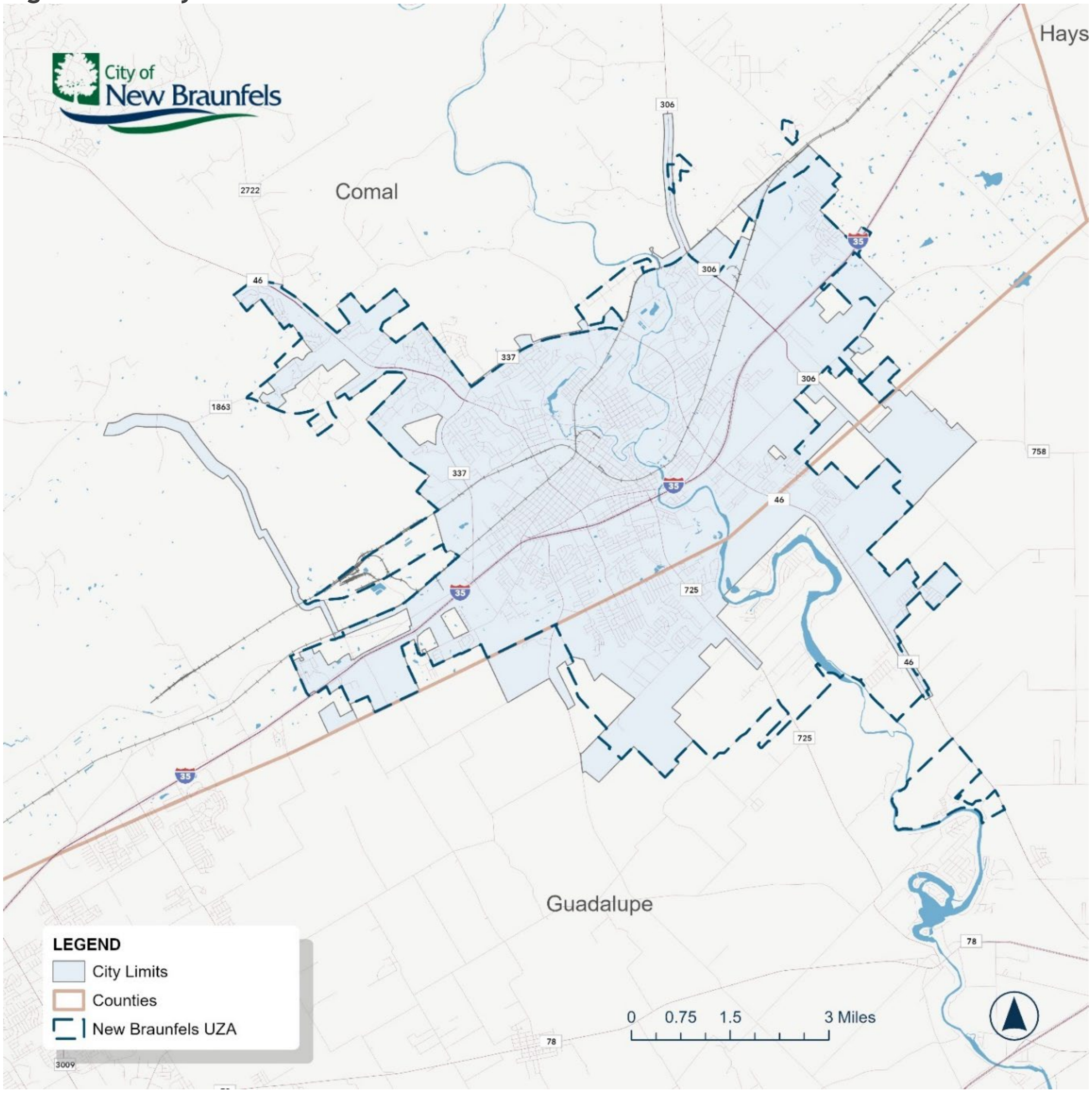
Being designated as a direct recipient entails oversight by the FTA, which includes additional reporting requirements and compliance reviews, including National Transit Database (NTD) Annual reports, triennial reviews, and other essentials such as an Agency Safety Plan (ASP) and Transit Asset Management (TAM) plan. Before FTA can award funding, recipients must comply with applicable FTA requirements and have completed FTA's preliminary capacity review.

[1] Includes cities over 50,000 population. From The 15 Fastest-Growing Large Cities - By Percent Change: 2010-2019

[2] From Redefining Urban Areas following the 2020 Census

Given these changes and the implications they may have on New Braunfels' public transportation, the City's desire to become a direct recipient of FTA funds can offer greater autonomy over funding allocation, access to additional resources for transit planning and operations, and provide the City a more direct role in decision-making processes that impact local transportation infrastructure. A precise action plan is unpredictable based on each potential recipient's unique local situation, and the City's timeline is heavily dependent on the regional, state, and federal processes, but **Appendix A** outlines the necessary steps to prepare for this transition effectively while this Transit Development Plan will provide the blueprint for transit service in the community.

Figure 1: Study Area



Sources: City of New Braunfels, US Census Bureau

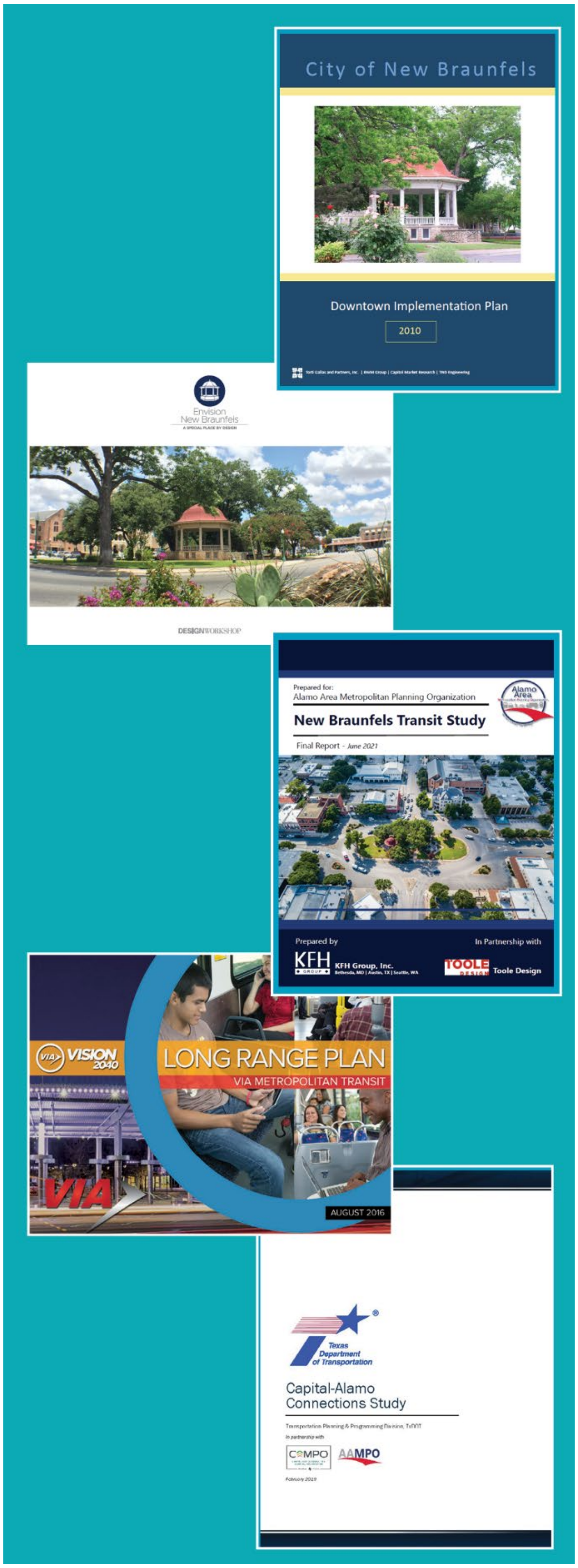
Plan Review

The New Braunfels Transit Study was prepared for the Alamo Area Metropolitan Planning Organization (AAMPO) in 2021 to assess the viability of public transit and develop a plan for effective services within New Braunfels and to commuter destinations. While the study presented a comprehensive look a transit goals, themes, and strategies, it was completed during a time of uncertainty due to the COVID-19 pandemic and without the full context of the City's eligibility and desire to pursue direct recipiency status with FTA. In addition to the Transit Study, several other planning efforts were reviewed to identify relevant goals, public comments, policies, projects, or implementation recommendations to be considered throughout the planning efforts of this TDP.

- New Braunfels Transit Study (New Braunfels/AAMPO, 2021)
- City of New Braunfels Parks and Recreation Department Strategic Master Plan (2017)
- Envision New Braunfels Comprehensive Plan (New Braunfels, 2018)
- Capital-Alamo Connections Study (AAMPO, 2019)
- VIA Vision 2040 Long Range Plan (VIA, 2016)
- Regional Bicycle and Pedestrian Planning Study (AAMPO, 2016)
- Downtown Implementation Plan (New Braunfels, 2010)

"At times I have been unable to drive due to short-term disabilities"

-Resident



Community Engagement

Public engagement, stakeholder engagement and coordination is a critical part of both the planning process and ongoing operation of a transit system. For this planning effort, a steering committee was established to guide the process at the City Department level. Interagency coordination occurred with agencies with a vested interest in the provision of transit service and stakeholders were interviewed by city staff. A public opinion survey was conducted to gather information about residents' attitudes about public transportation services.

"I would use public transportation to reduce pollution, number of cars on the road, and to get to medical appointments and procedures"

-Resident

Steering Committee

The steering committee was formed by the city to provide guidance and review project activities. Regular meetings were convened at critical thresholds to review and provide input to items such as data elements and progress on analyses, transit service options and identified implementation plans. The steering committee included members of the City Manager's Office and the Transportation & Capital Improvements, Economic & Community Development, and Planning & Development Services Departments.

Interagency Coordination

The project included coordination with organizations across all levels of government. Regional transit and planning entities like VIA Metro in San Antonio, Alamo Area Council of Governments (AACOG), and Alamo Area Metropolitan Planning Organization (AAMPO) were kept apprised of this study's developments. Similarly, TxDOT's transit department and FTA's Region 6 were involved in coordination and meetings throughout the course of this study, particularly in regards to future transit funding and requirements for New Braunfels.

Public Survey

A major component of the TDP's public participation included a public survey to gauge residents' attitudes toward current public transportation services and preferences for future service. The survey was open on the City's website from Monday, June 5 through Friday, July 7, 2023.

The survey was supplemented by other public outreach efforts detailed below.

- Flyers were distributed at key locations around town for about 2 weeks after launch.
- The City promoted the survey at AAMPO Walk & Bike Night on June 14.
- City staff interviewed Alamo Regional Transit (ART) passengers on June 15.
- The survey was reported in the Downtown newsletter on June 20.
- The survey was sent to recipients of the McKenna Foundation listserv around June 27.
- The survey was reported in the AAMPO newsletter on June 27.
- City staff tabled at the New Braunfels Public Library Facilities on June 27.

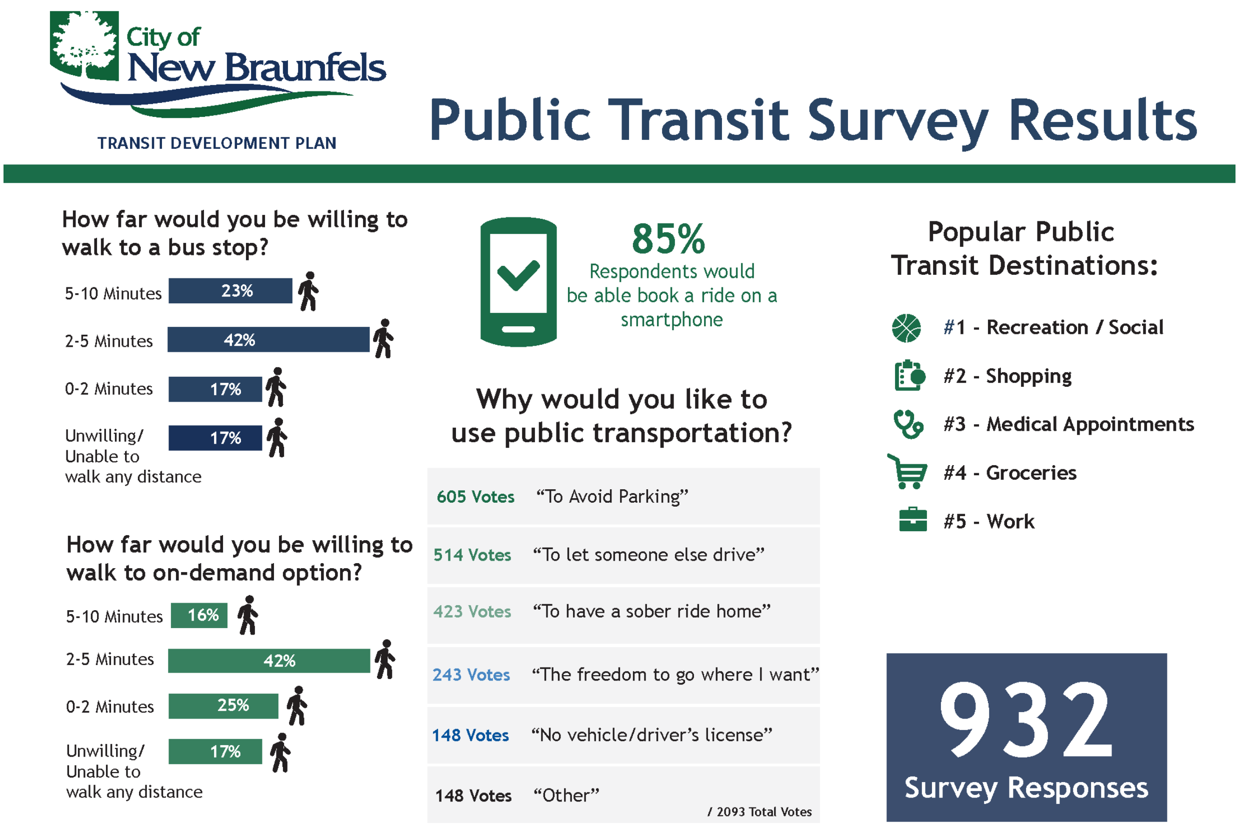
> ***"Too much traffic in a small town, public transit could help cut that down"***
> ***-Resident***

The survey exceeded response expectations, registering the opinions of 932 total respondents. Overall, the responses indicate that New Braunfels has great interest in transit from residents who do not currently use public transportation but would like transportation alternatives for recreational, social, and convenience purposes. Additionally, most respondents are familiar with Uber/Lyft, own smartphones, and have higher household incomes, but at the same time, are interested in a fixed-route network and willing to walk to bus stops.

A significant proportion of respondents, including those who currently use ART and who have less access to private automobile transportation, said they would use transit for most of their everyday travel needs. This suggests that expanding New Braunfels' public transportation would not only improve transportation outcomes for residents with relatively high need for transit service but could also provide enhanced quality of life for all people as the City continues to grow.

A selection of key survey findings is displayed in **Figure 2** with the complete survey results contained in **Appendix B**.

Figure 2: Public Transit Survey Key Findings



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Chapter Two

TRANSIT MARKET ANALYSIS

TRANSIT MARKET ANALYSIS

The Transit Market Analysis provides an overview of land uses and destinations in New Braunfels and a geospatial analysis of the city's potential transit market. Transit-supportive densities of population and employment are used as a basis for introducing or enhancing transit services. Additionally, the prevalence and location of several demographic groups are explored to indicate other areas that can be indicative of transit demand or serve to inform decision-makers in terms of enhancing opportunity or transportation equity.

Land Use and Key Destinations

Land Use

Various land uses existing close together can be indicative of a transit-supportive area. Although any one land use tends to attract trips at similar times and for similar purposes, multiple land uses near each other can create different types of trips. For example, a retail strip may draw shoppers at different times with different needs than an office development with traditional working hours will. Areas of mixed land use thus produce stronger, more consistent demand for travel. Mixed-use areas also tend to be more walkable because trips from one type of place to another, such as from home to a store, can be shorter, and transit can supplement these walkable areas to make more trips possible without needing a car.[3]

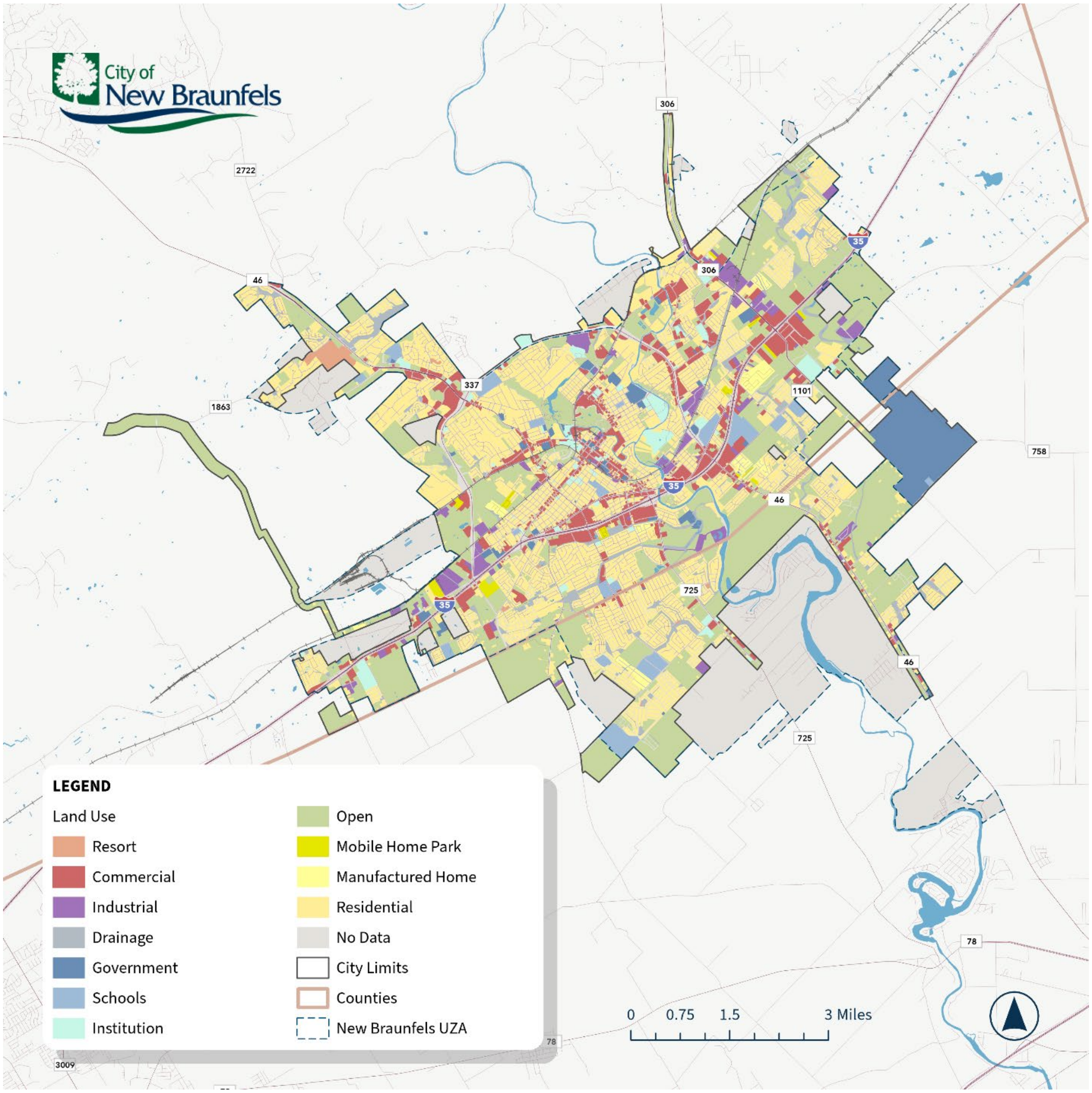
According to the City land use data (**Figure 3**) commercial areas are clustered among major corridors, such as IH 35, Loop 337, and SH 46 while residential areas expand from the urban core following commercial corridors, including to the south along S. Walnut Ave and FM 725, to the northwest along Common St., and along SH 46. Downtown is one of the few mixed-use areas where a variety of land uses exist in close proximity. Other areas with mixed-use include Landa St., W. San Antonio St., and the Common St. corridor northeast of Loop 337.

Key Destinations

Several key destinations are displayed in **Figure 4** to further illustrate which land uses attract travel and for what purposes. Civic facilities include government offices, churches, and New Braunfels Public Library facilities. Education centers include both public and private schools. Other destinations include market and retail centers, outdoor recreation areas, and medical facilities. Medical facilities, namely Christus Santa Rosa Hospital and Resolute Baptist Hospital, are particularly important in transit planning because persons with mobility difficulties may especially need public transportation to reach appointments, and hospitals are major job centers. Not captured in the data provided but also significant are tourism-related destinations like Downtown New Braunfels, the New Braunfels National Airport, water recreation areas, and the Gruene Historic District.

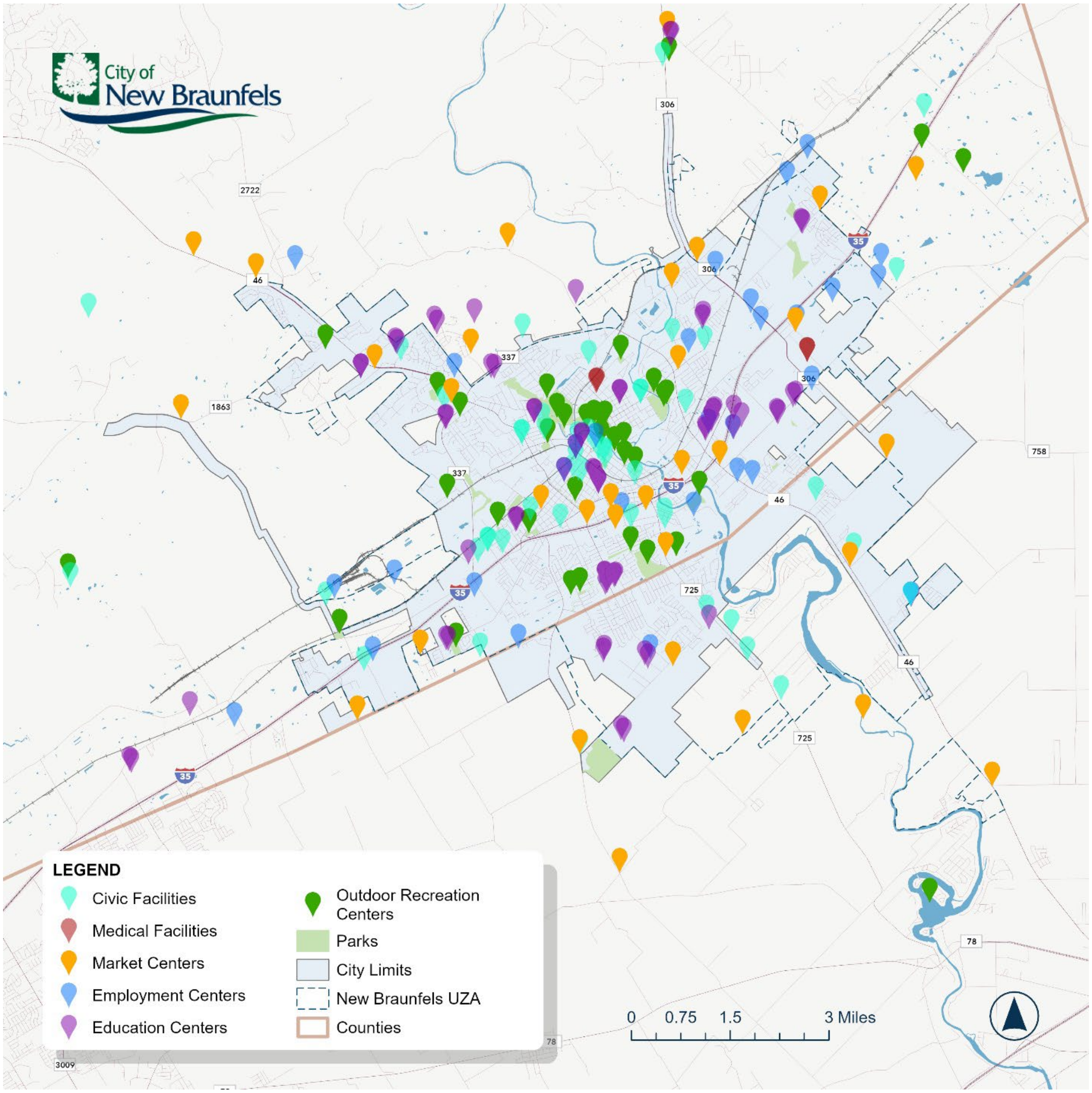
[3] From mxd+ Travel Demand Modelling Tool

Figure 3: Land Use within City Limits



Source: City of New Braunfels (2023)

Figure 4: Key Destinations



Source: City of New Braunfels (2023)

Transit Propensity

Population and employment characteristics provide insight into transit service potential, revealing where people will be most likely to use public transportation to meet their travel needs.

Population density is an indicator of potential transit demand. If more people live within a reasonable walking distance of a transit stop, then more people are likely to use it. Furthermore, the denser an area's population, the more frequently transit can efficiently serve that area. A sparsely populated area might not generate enough riders to justify serving it with more frequent buses whereas denser areas can support more frequent service.

Although both are important, research shows that employment density can induce transit demand even more strongly than population density.[4] [5] Because employment density is a stronger driver of transit demand than population density, areas with concentrated jobs could support more frequent transit, as buses from outlying neighborhoods could converge on job centers so that multiple buses pass through these dense areas every hour.

A broad review of research indicates the following population and employment densities can support transit at the following frequencies, shown in **Table 1**. Areas with lower density may still be prioritized for transit service based on a community's transit need. However, low-density but high-need areas may be better served with flexible transit service, such as microtransit, rather than fixed-route buses.

Table 1. Transit-Supportive Densities

Transit Frequency	Population Density (Persons per Acre)	Employment Density (Jobs per Acre)
15 minutes or better		More than 16
30 minutes or better	More than 16	8-16
60 minutes	8-16	4-8
Less than 60 minutes or Demand-Response/Microtransit opportunity	Less than 8	Less than 4

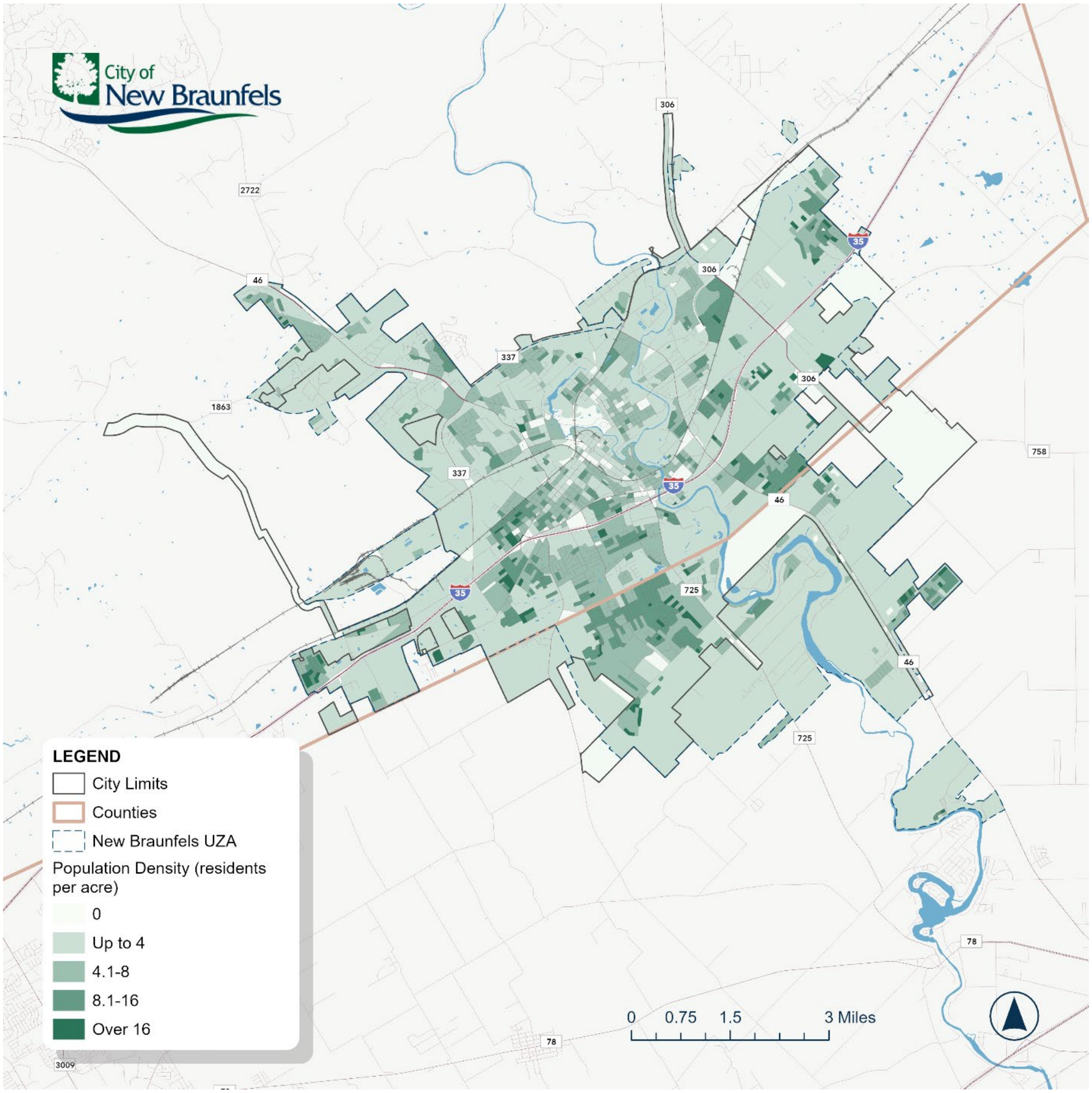
Source: New Orleans Regional Transit Authority[6]

The thresholds shown in **Table 1** are a framework for decisionmakers to consider rather than a precise measurement of success, and density is only one of many factors that can indicate transit-supportive areas. The connection between transit-supportive densities and service frequencies informs the data breaks used in the maps rather than explicitly recommending a level of service. A route of any frequency is likely to pass through areas of widely varying densities.

[4] From The Importance of Trip Destination in Determining Transit Share
[5] From Making the Most of Transit: Density, Employment Growth, and Ridership around New Stations
[6] From 2018 Strategic Mobility Plan, Market Analysis. Other transit agency studies were consulted, including from agencies in Fort Worth and McAllen, TX, as well as the Institute of Transportation Engineers. The NORTA study's thresholds are approximately average for all studied ranges.

Using the thresholds from **Table 1** as a guide, **Figure 5** indicates areas (at the block level) that display the population density to support economical transit frequencies. W. San Antonio St., SH 46 south of I-35, Common St. northeast of Loop 337, and the newly developed areas south of County Line Rd. stand out for the relatively high frequencies they could support based on their population density.

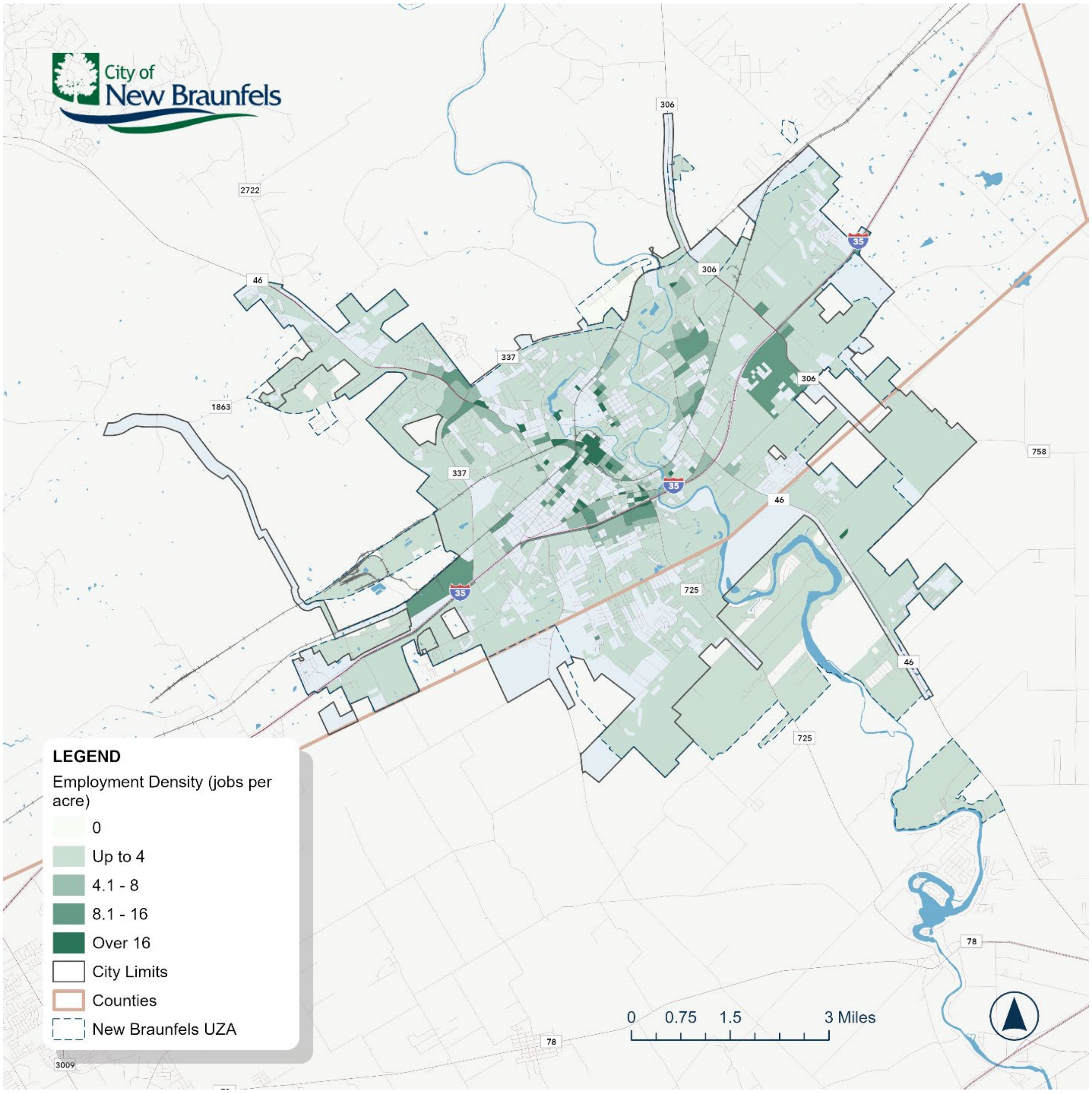
Figure 5: Transit Frequencies Supportable by Population Density, by Census Block



Source: US Census Bureau OnTheMap (2020)

Figure 6 shows what transit frequencies could be supported based on employment densities. Downtown (including the nearby Christus Santa Rosa Hospital) is the only area with employment density supportive of 15-minute frequency, but there are some notable areas that could support two buses per hour, or every 30 minutes. These include downtown, Elliot Knox Blvd, FM 306 (Creekside Crossing), Industrial St., Common St. northeast of Loop 337, the Westpointe Village area at the intersection of Loop 337 and SH 46, and SH 482 in the southwest of the city.

Figure 6: Transit Frequencies Supportable by Employment Density, by Census Block



Source: US Census Bureau OnTheMap

Transit Needs Assessment

Beyond densities that are supportive of transit use, some population and employment characteristics are indicative of disproportionate need for public transportation. People may use transit partly because they face barriers to owning or operating their own vehicles. These barriers are analyzed to account for areas of New Braunfels that may present a disproportionate need for transit service or otherwise be more likely to use transit.

Transportation costs typically account for around 13% of household expenditures, but low-income households may have to pay as much as 30% of their income. This is due to the many costs of private automobile transportation, including gasoline costs, maintenance, parking, and tolls.[7] This makes the fixed, predictable costs of riding transit a viable alternative to people living on a smaller budget. Analyzing where low-income people live can help anticipate where transit service could have a more equitable impact.

Figure 7 shows the areas with the highest proportions of low-income households are outside of the city limits along SH 46. Within New Braunfels, lower income areas may be found along Landa St. and IH 35. **Figure 8** shows where employees with low-wage jobs live, namely a cluster near downtown and other areas on the fringes of town. Areas where employees with low-wage jobs work was also analyzed but appeared to be evenly spread across the city.

People of color historically experience social disadvantages that result in lower incomes and wealth.[8] Nationwide statistics show that Black people are 4 times more likely to commute by transit than White people in the same area, and Latinos are 3 times more likely.[9] Therefore, areas where people of color people live can reveal where transit may address equity. The 2020 Census shows the population of New Braunfels is about 57% White, 35% Hispanic or Latino, 3% Black, and 1% Asian. **Figure 9** shows the highest percentages of people of color are along IH 35 and in Guadalupe County.

While most households in New Braunfels have access to personal vehicles, the areas where car-free households are located (**Figure 10**) overlap with the population over 65 (**Figure 11**). The area with the highest percentage of seniors contains the EdenHill retirement community, which provides transportation services for its residents.[10] Other concentrations of zero-car households are found near the Comal County Senior Citizens' Center, Landa Place, and the New Braunfels Housing Authority. Similarly, the population under 18 can be indicative of transit need and demand in some communities, though the youth population was found to be reasonably spread out through New Braunfels.

Regardless of age, disabilities may also limit a person's mobility, including their ability to drive a car. Public transportation can make it easier for people with disabilities to access jobs, shopping, medical appointments, and more**. Figure 12** shows that the greatest concentrations of people living with disabilities southeast of Downtown, west of Downtown around W. San Antonio St. and N. Walnut Ave., and in the far southwest of the UZA.

All transit needs factors analyzed are included in **Appendix C**.

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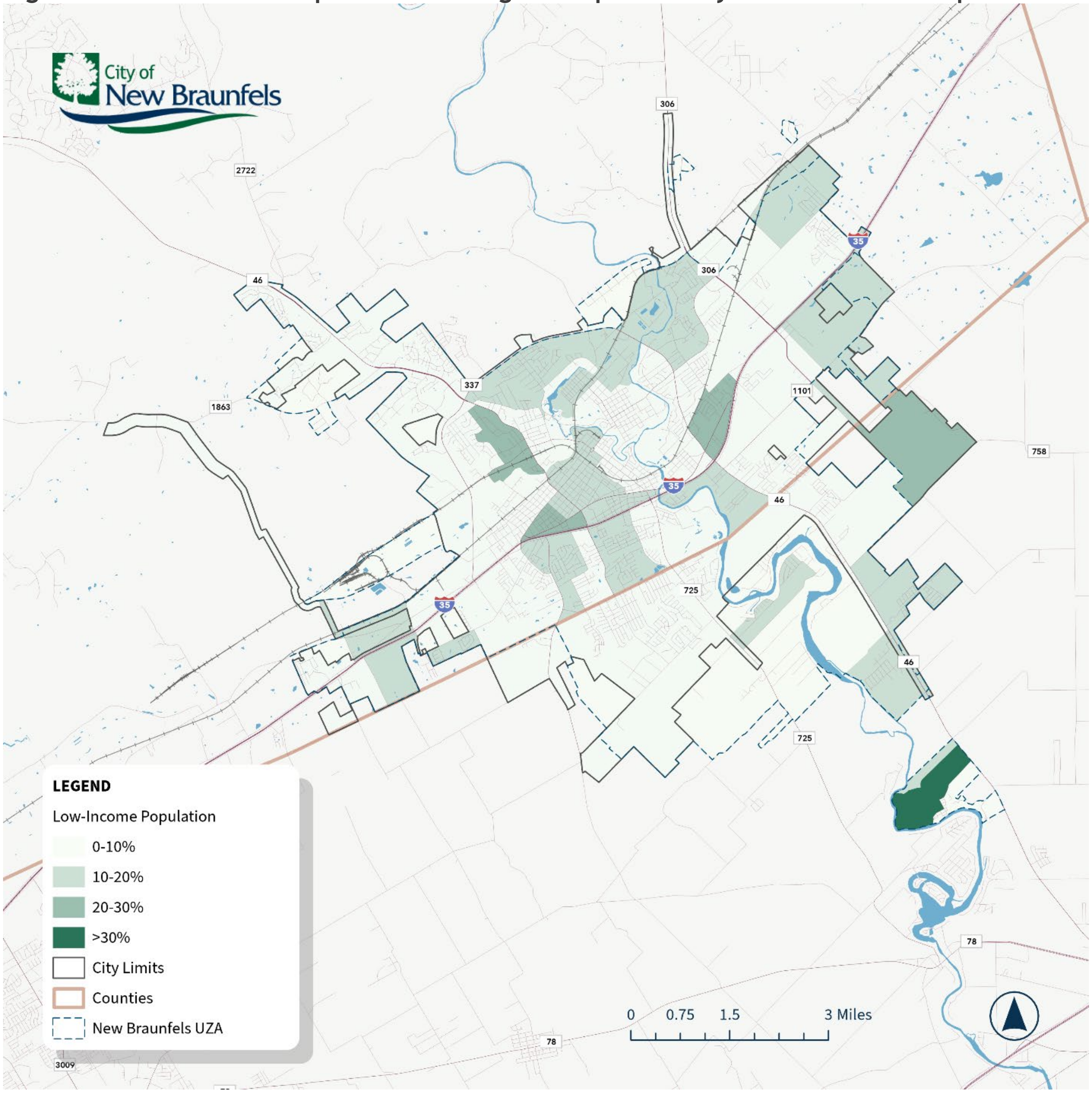
[7] From The High Cost of Transportation in the United States
[8] From Racial Inequality in the United States
[9] From To Move Is To Thrive: Public Transit and Economic Opportunity for People of Color
[10] https://edenhill.org/edenhill-communities/about-us/lifestyle/#amenities

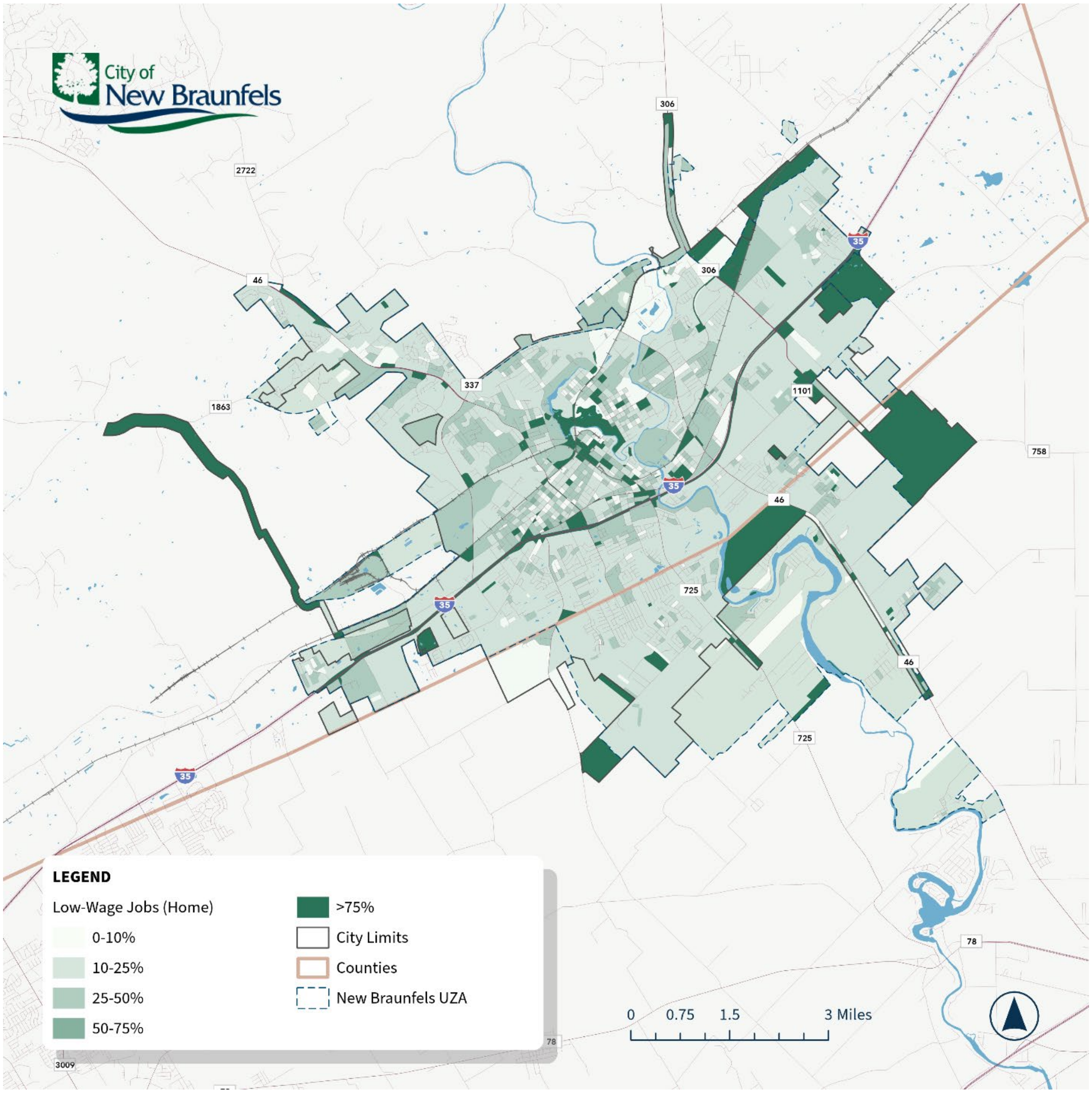
Figure 7: Low-Income People as Percentage of Population by Census Block Group[11]



Source: American Community Survey (2021)

[11] The visualization of Census data on maps is imperfect, particularly when assessing the proportions of population groups in census blocks or block groups. This is due to variations in block sizes, population density, and demographic composition, which may distort or skew how the data is represented visually. Additionally, when narrowing down Census data to a specific study area (here, a combination of the New Braunfels city limits and UZA), it's important to note that portions of some census blocks or block groups may not be displayed due to clipping the data to the area's boundaries. Considering these limitations and potential distortions, outlying areas such as the census block group to the southeast may appear to be overrepresented.

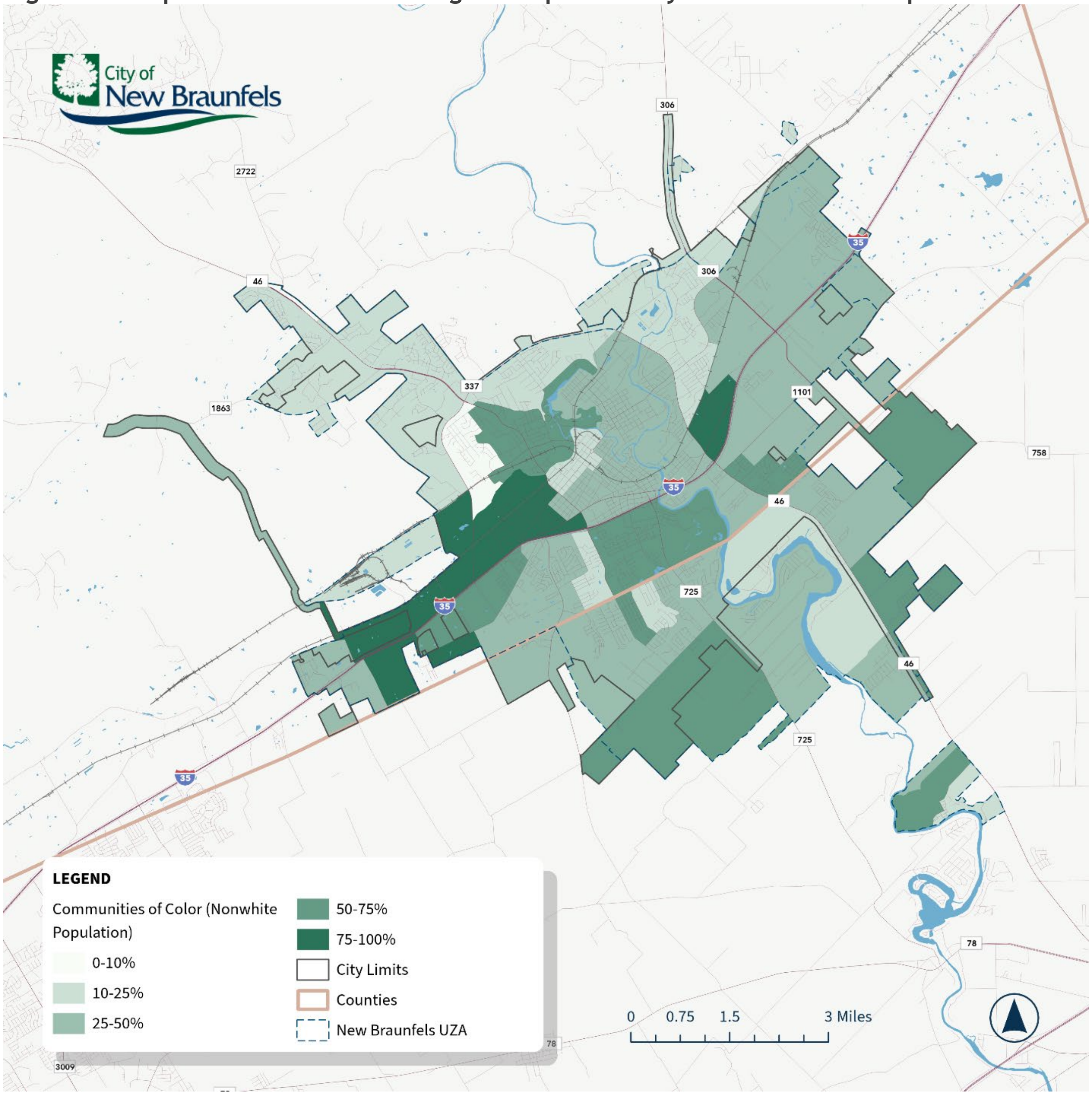
Figure 8: Employees Earning Low Wages, Home Locations, by Census Block[12]



Source: US Census Bureau OnTheMap

[12] Considering the limitations and potential distortions described in footnote 11 on the previous page, outlying areas at the edges of the study area may appear to be overrepresented, including but not limited to the large geographic area around the airport in east.

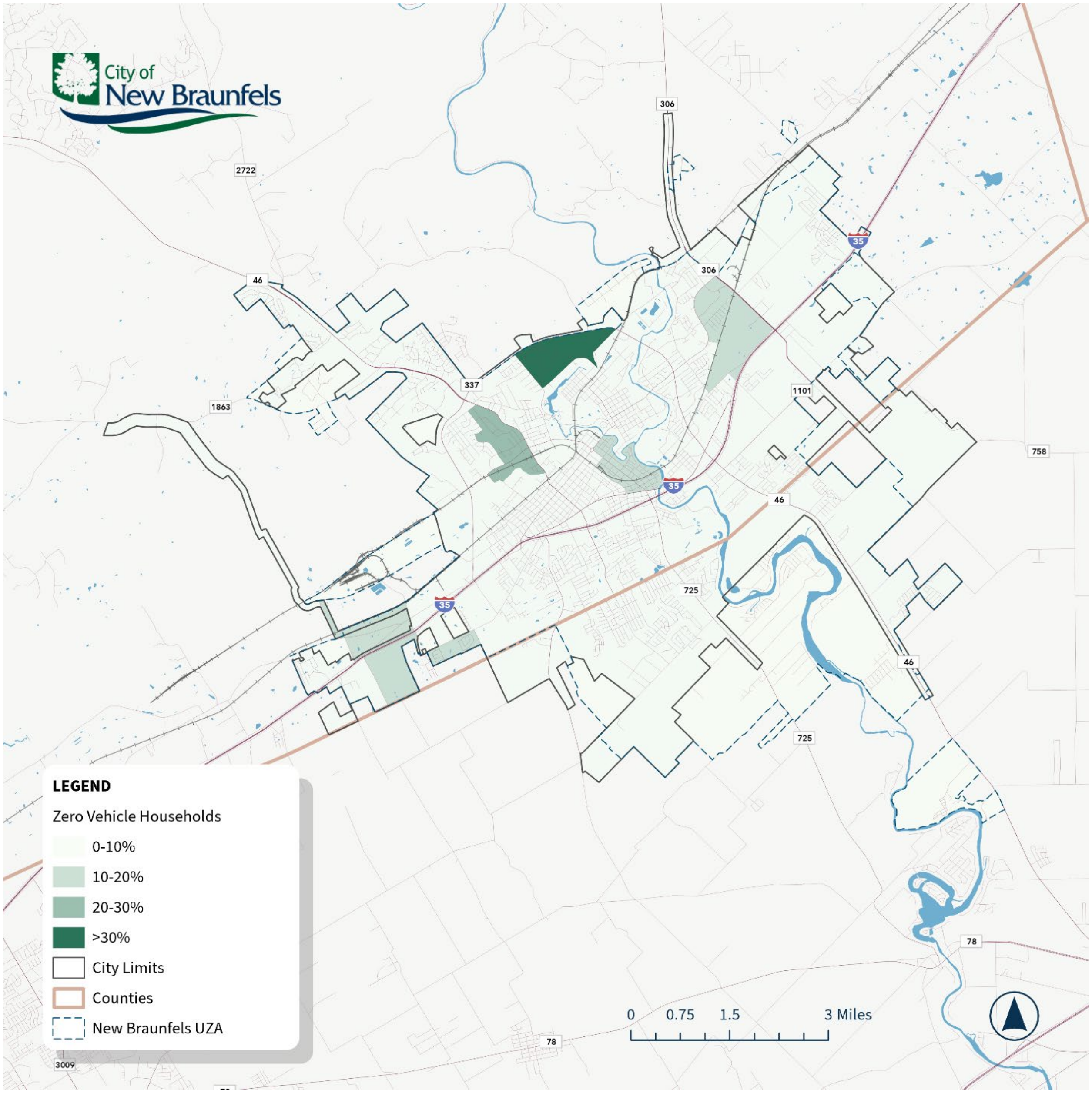
Figure 9: People of Color as Percentage of Population by Census Block Group[13]



Source: American Community Survey (2021)

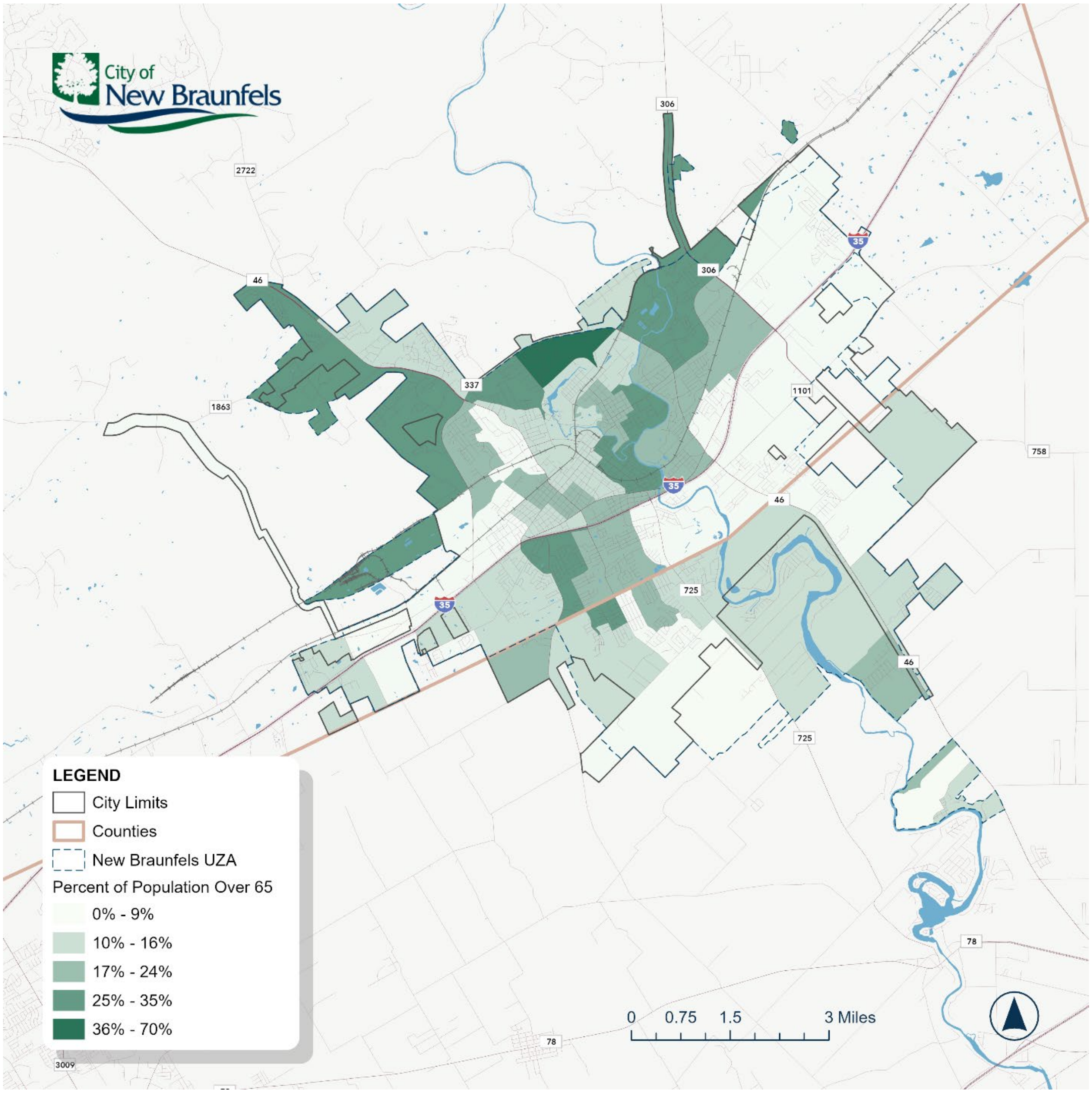
[13] Considering the limitations and potential distortions described in footnote 11, outlying areas at the edges of the study area may appear to be overrepresented.

Figure 10: Zero-Vehicle Households, Percentage, by Census Block Group[14]



[14] Considering the limitations and potential distortions described in footnote 11, outlying areas at the edges of the study area may appear to be overrepresented.

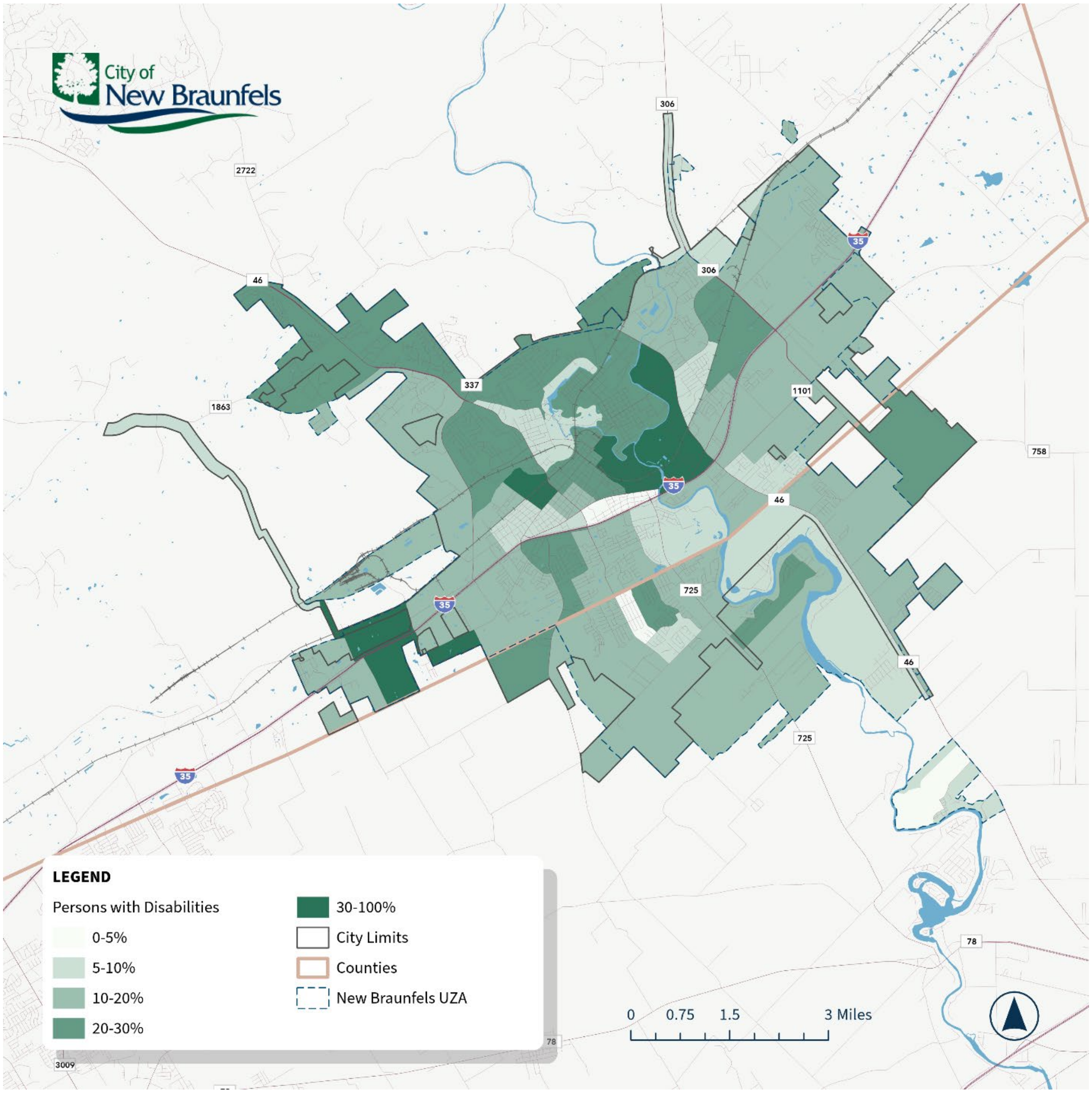
Figure 11: Percent of Population Over 65 Years Old by Census Block Group[15]



Source: American Community Survey (2021)

[15] Considering the limitations and potential distortions described in footnote 11, outlying areas at the edges of the study area may appear to be overrepresented.

Figure 12: Percent Persons with Disabilities by Census Block Group[16]



Source: American Community Survey (2021)

[16] Considering the limitations and potential distortions described in footnote 11, outlying areas at the edges of the study area may appear to be overrepresented.

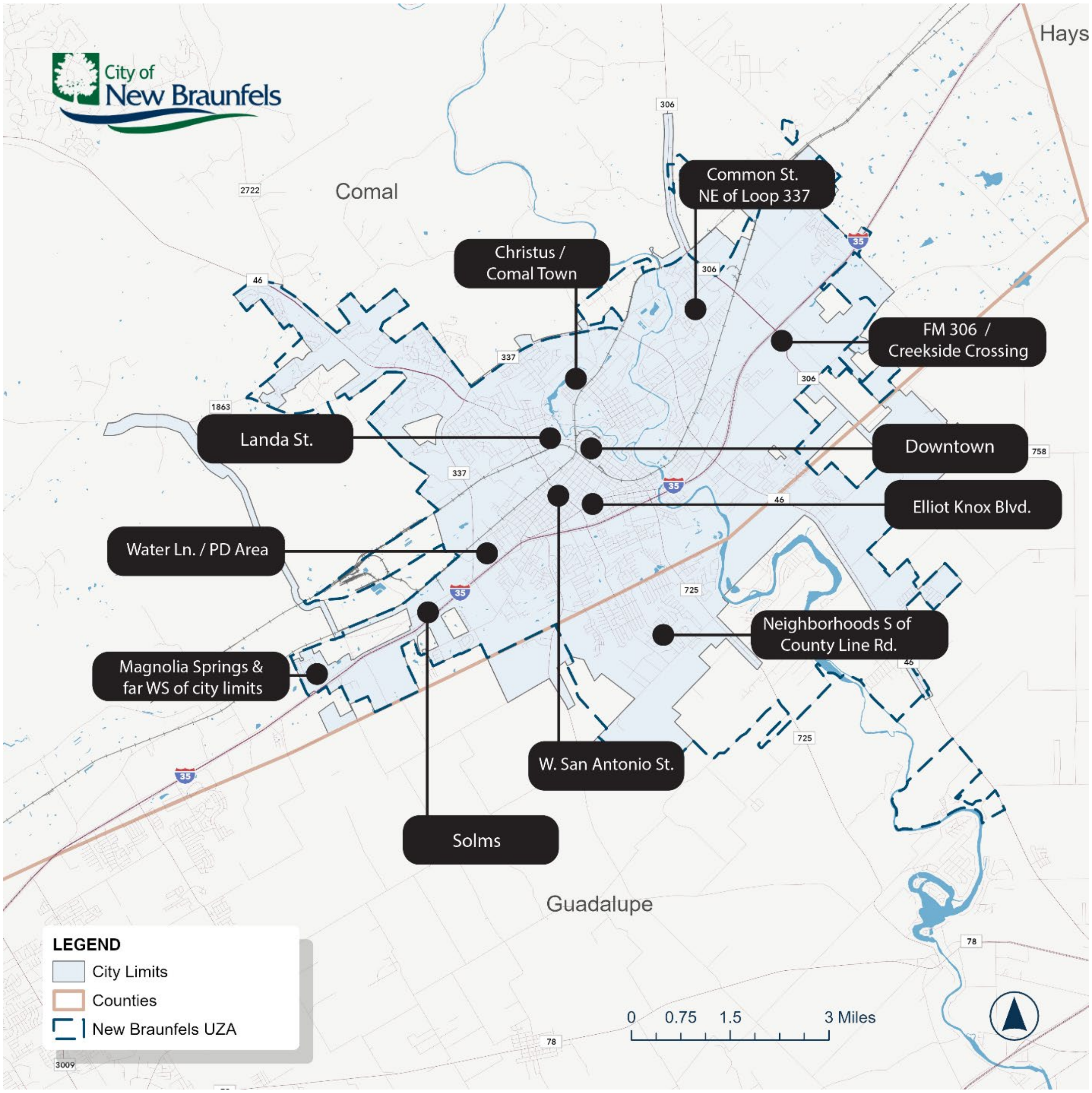
Transit Market Analysis Key Findings

New Braunfels was the third-fastest growing city in the US between 2010 and 2019 and sits just outside San Antonio, one of the nation's ten largest cities in terms of population. As the area continues to grow, enhanced transit services will prove critical to the community's transportation options. Several areas of New Braunfels exhibit characteristics supportive of enhanced transit services. **Table 2** summarizes areas and corridors of the city that may be especially important places to serve based on the transit market analysis, and **Figure 13** shows where they are within the city. Additionally, **Appendix D** includes a list provided by the City and the McKenna Foundation of nonprofits in the area that need transit access.

Table 2. Transit Market Analysis Key Findings

Area	Characteristics Supporting Transit Service
Downtown	• Dense employment • Mixed land uses • Low-wage jobs • Population under 18 years old • Medical facility nearby (Christus Santa Rosa Hospital)
W. San Antonio St.	• Dense population • Mixed land uses • Persons with disabilities • Lower-income populations • Communities of color
FM 306/Creekside Crossing	• Dense population • Dense employment • Medical facility (Resolute Baptist Hospital) • Low-wage jobs
Magnolia Springs and far southwest of City	• Dense population • Dense employment • Persons with disabilities • Communities of color
Common St. northeast of Loop 337	• Dense population • Dense employment • Mixed land uses • Population over 65 years old
Elliot Knox Blvd.	• Dense employment • Lower-income populations
Landa St.	• Mixed land uses • Lower-income populations • Households with no vehicles
Neighborhoods south of County Line Rd.	• Dense population • Population under 18 years old

Figure 13: Transit Market Analysis Key Findings



Chapter Three

CURRENT TRANSIT SERVICE ASSESSMENT

CURRENT TRANSIT SERVICE ASSESSMENT

VIA – San Antonio

Fixed-route service in the San Antonio region is provided by VIA Metropolitan Transit. In addition to traditional bus routes, VIA operates a range of commuter-focused Express, higher-speed Prímo, and tourist-focused VIVA services. VIA service is largely contained within the Loop 1604 freeway and is not immediately accessible from New Braunfels. The closest transfer point to VIA services is the Randolph Transfer Center, located approximately 22 miles southwest of downtown New Braunfels near the I-35/Loop 410 interchange. The facility is served by ten bus routes, which provide a mix of local coverage, express service to San Antonio, and high-frequency service along the Loop 410 beltway.

Alamo Regional Transit (ART)

ART operates within a 12-county service area forming a ring around Bexar County (and the City of San Antonio).[17] ART's demand-response service is the only transit option that operates within the New Braunfels city boundaries. The following provides a summary of the system's overall design.

- **Rider Eligibility:** ART service is open to the general public. Service is typically provided using a curb-to-curb model (where riders meet the vehicle directly outside their pick-up location and are dropped off directly outside their requested destination). Door-to-door service (where riders are given assistance to and from the vehicle) is available for riders with mobility limitations.

- **Service Area:** Riders can travel from New Braunfels to anywhere in the 12-county ART service area, as well as to destinations in and around San Antonio. Service is available to the Randolph Transfer Center, where riders can transfer to fixed-route VIA services.

- **Booking a Trip:** Service is pre-booked only. Trips must be scheduled a minimum of 24 hours before the desired pick-up time. Trips in the afternoon must be scheduled by 12:00 PM on the preceding day. Reservations can be made for trips up to 30 days in the future. Trips can be scheduled through a call center, online booking portal, or mobile app.

- **Return Trips:** Return trips cannot be scheduled until after the originally reserved trip is complete. When riders are ready for pickup, they must inform the ART dispatch center. A vehicle will then arrive in 60 minutes or less to complete the return trip request.

- **Service Span:** Service is available Monday to Friday from 7:30 AM to 5:00 PM. Exceptions to these guidelines are made on a per-rider basis as needed. Dedicated ART programs also provide additional transportation service to youths and large groups.

[17] The ART service area includes Atascosa, Bandera, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina, McMullen, and Wilson Counties.

Ridership Trends

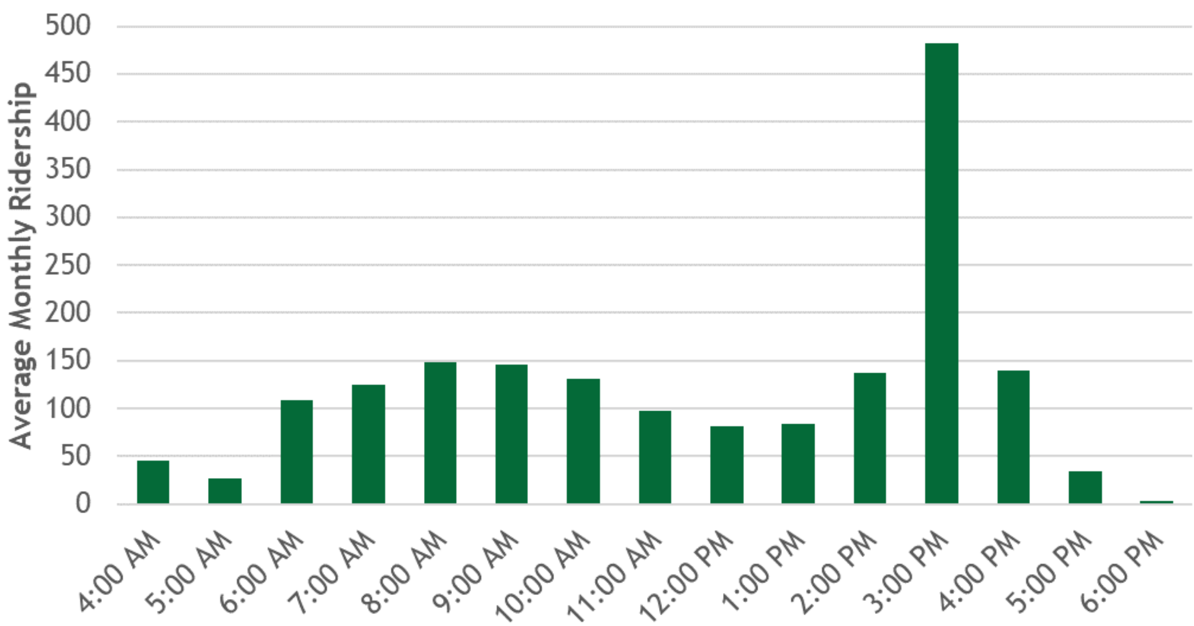
To understand how well ART demand-response service meets the needs of New Braunfels residents, the project team reviewed six months of trip-level ridership data for the period from October 1, 2022 to April 30, 2023. This dataset includes information on rider origins and destinations, pickup and drop-off times, trip purpose, and basic rider demographics (age and required mobility aids). To be included in the dataset, trip requests had to either (1) start in New Braunfels, (2) end in New Braunfels, or (3) both start and end in New Braunfels. Detailed analysis of monthly, daily, and hourly ridership is included in **Appendix C** and summarized below.

Across the six-month sample period, an average of 1,790 trips were provided each month. Ridership generally increased month-to-month, growing from 1,500 trips in November to 2,000 trips in April. In March — the highest ridership month — slightly more than 2,100 trips were provided.

With nearly 400 trips completed each month, Wednesday was typically the highest-ridership day. Although the standard span of service is Monday to Friday only, a small number of Saturday trips were recorded during the sample period. These trips reflect accommodations made to meet the needs of specific riders.

The number of completed trips each month during each hour of the day is illustrated in **Figure 14**. The data illustrates a slight morning peak followed by a sharp afternoon peak. The hour from 3:00 PM to 4:00 sees more than twice as many trips completed as any other hour throughout the day. This peak is potentially attributable to multiple factors, including the process for reserving return trips concentrating demand in the afternoon and the overall trip mix for New Braunfels containing a high number of after-school trips for youths.

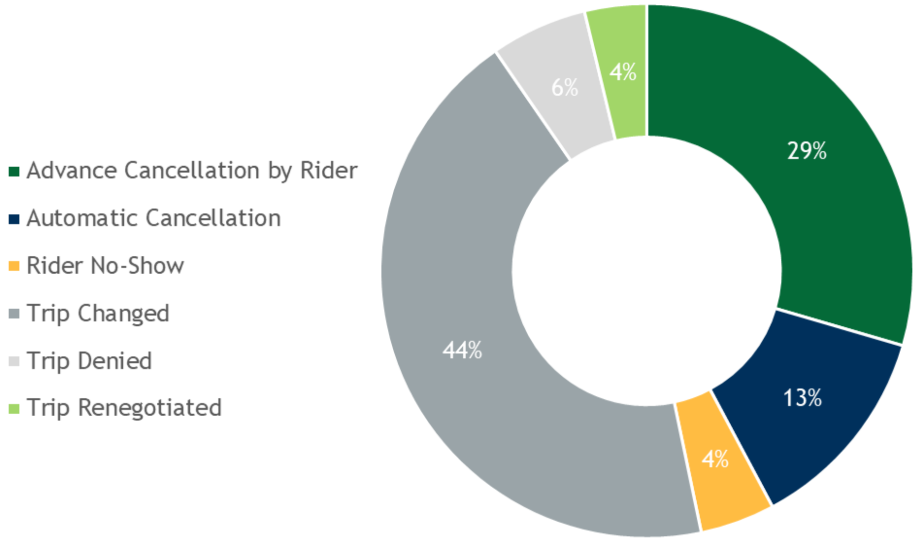
Figure 14: Average Monthly Ridership by Time of Day



Service Performance

Trip requests received by ART between November 2022 and April 2023 showed that nearly two-thirds of all received requests were marked as cancelled. The reasons for requests not resulting in completed trips — as well as the associated impact to the capacity and efficiency of the ART system as a whole — vary substantially, as illustrated in **Figure 15.**

Figure 15: Reasons for Cancelled Requests, November 2022 to April 2023



Riders changing scheduled trips or providing advanced notice of cancellation accounted for nearly three-quarters of all cancellations. Automatic cancellations include those when a rider cancels the first in a series of scheduled trips. Renegotiated trips include instances where a rider's requested time was unavailable, but a suitable alternative was found. Denials occur when riders make a request that ART is unable to meet, indicating a lack of capacity to meet demand. In an analysis of the hourly denial rate, a spike in denied requests during the morning peak period was noted.

To better understand rider experience and system capacity, the difference between requested, scheduled, and actual pick-up times was evaluated. Nearly three-quarters of all trips were scheduled 30 minutes or less from the requested pick-up or drop-off times. Nearly 75% of trips ended with an arrival less than five minutes from the scheduled time.

The efficiency of demand-response transit service can be gauged by the distance travelled by riders compared to the direct distance between origin and destination (routing efficiency) and the time riders were onboard a transit vehicle compared to the direct travel time between origin and destination (time efficiency). In general, ART's routings were found to be relatively efficient, with 75% of trip routes no longer than twice the direct (i.e., no detour) distance. However, the service is typically much slower than driving: slightly less than 40% of trips take less time than twice the driving duration. Although these metrics are useful in evaluating quality of service, route detours result in shared trips, which help drive down the cost of individual rides and increase the amount of service provided by each individual vehicle and driver. Additionally, the transit ridership base in suburban areas like New Braunfels tends to use transit out of need rather than choice. Providing a transportation option — even if it is substantially slower than direct routes — to as many riders as possible takes precedence over delivering travel times competitive with driving.

Rider Profile

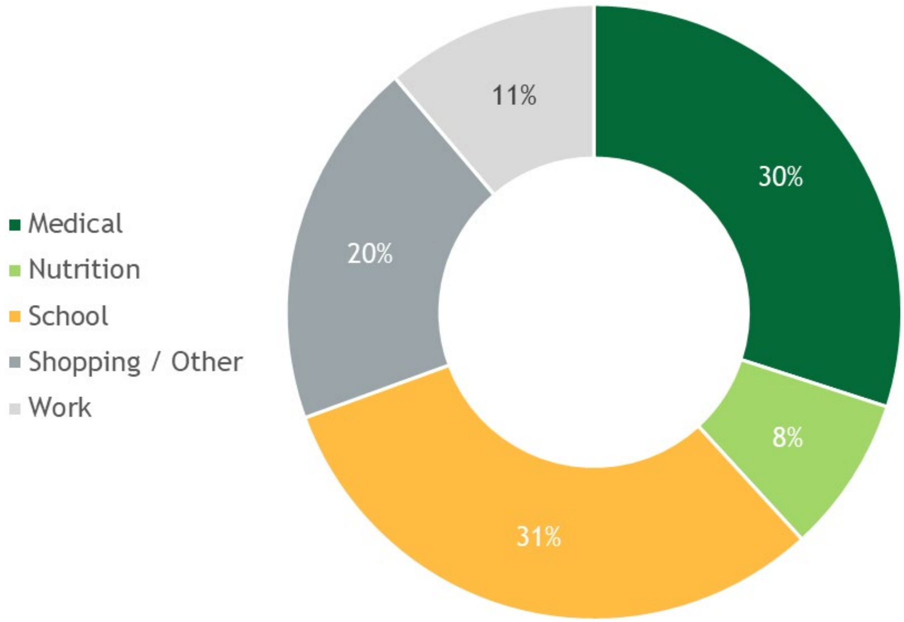
The following section summarizes available data on rider age, required mobility aids, and trip purpose for completed ART trips in the New Braunfels area during the sample period. Reviewing these demographic factors helps ensure the service design meets rider needs.

Residents of all ages rely on ART service. The distribution of completed trips by age cohort shows a broad user base, from youths to senior citizens. Although ART provides service to all age groups, the rate at which each age group uses ART varies substantially. For example, a typical resident between 55 and 69 is almost twice as likely as the average resident to take a trip on ART. That same resident is more than four times as likely to take an ART trip than a typical resident between the ages of 18 and 34.

During the period between November 2022 and April 2023, one in five ART riders required the use of a mobility aid during their trip. The need for mobility aids was predictably weighted toward the older age cohorts. While one in three riders between the ages of 55 and 69 required mobility aid, half of riders 70 and over required one.

Tracking trip purposes allows agencies to better understand rider needs and usage patterns and draw on supplementary grant funding for specific trip purposes (i.e., medical appointments for seniors) where appropriate. The purpose of trips completed during the sample period is summarized in **Figure 16**. The most common trip purposes were accessing school or medical care, followed by shopping or otherwise uncategorized trips.

Figure 16: Completed Trips by Purpose

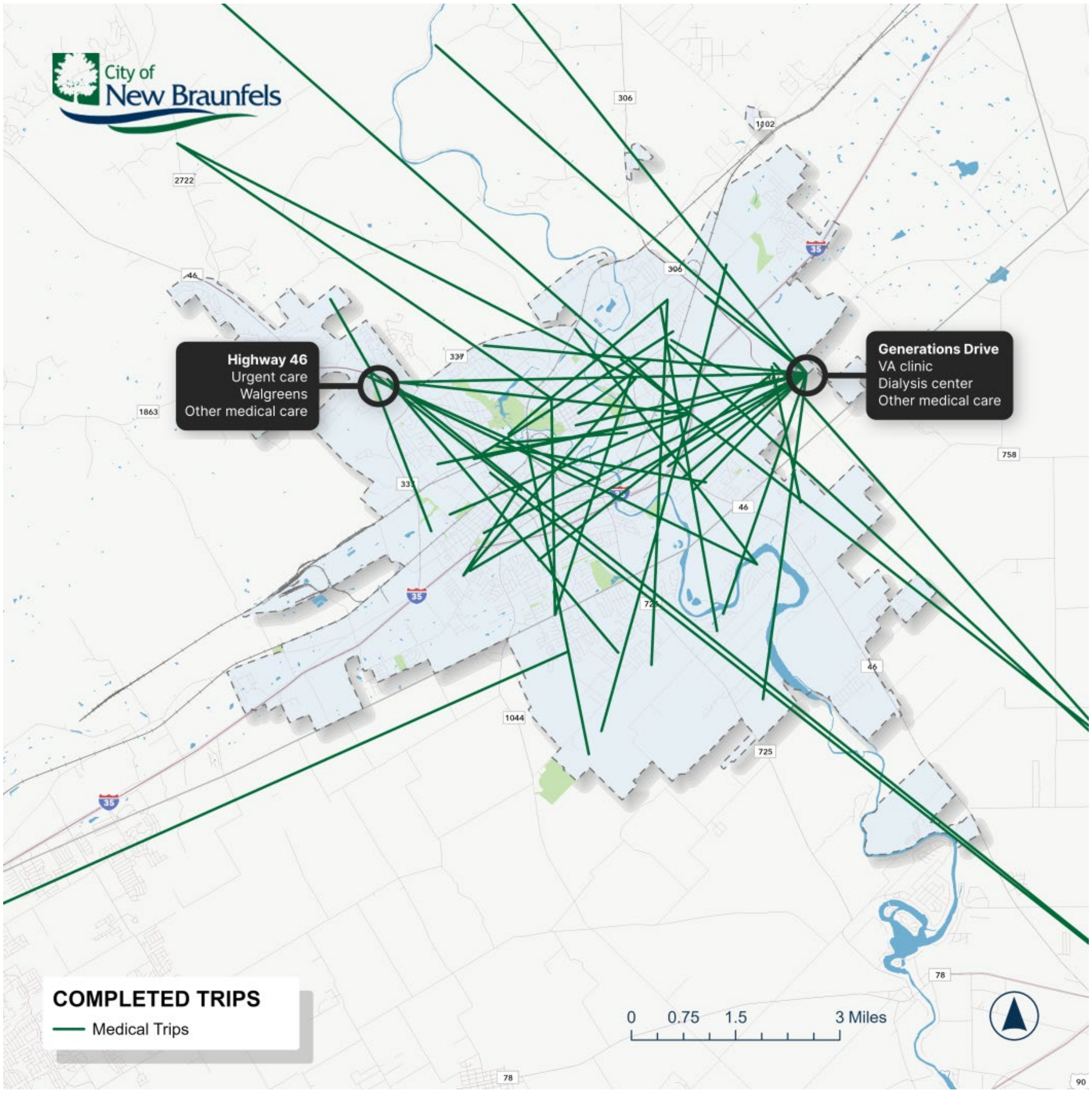


Trip purposes are segmented clearly by age cohort where almost all transit service provided to youths was for school, more than 75% of transit service provided to riders aged 70 or over was for medical, and nearly all work-related transportation was provided to riders between the ages of 18 and 69. Although medical trips are distributed relatively evenly through the day, school-related trips are heavily concentrated between 3:00-4:00 PM. This high degree of concentration combines with the high proportion of school-related trips within the ART network to skew hourly demand well upwards in the 3:00 PM hour.

Usage Patterns and Key Destinations

To better understand typical usage patterns and identify key destinations, one week of trip-level origin-destination data was reviewed (Monday, March 6 to Saturday, March 11).[18] The location and purpose of these trips showed that origins and destinations are highly dispersed overall, though two types—medical and school—showed clustering at key destinations. For medical trips, slightly more than 40% of travelled to or from a group of medical facilities along Generations Drive (**Figure 17**). School trips similarly exhibit a high degree of clustering with nearly 60% of all trips beginning or ending at a cluster of three elementary schools along Walnut Street, potentially illustrating how ART's service was able to accommodate the large spike in demand between 3:00-4:00 PM without seeing a similar spike in trip denials.

Figure 17: Completed Medical Trips, March 6 to March 11



[18] To be included, trips had to (1) start, (2) end, or (3) start and end within the New Braunfels UZA.

Key Considerations of Current Service

While VIA's Randolph Transfer Center is located around 20 miles from New Braunfels, it still boasts ten bus connections to the neighboring megacity of San Antonio and could serve future transit commuter potential. As for existing service within the city, a few major takeaways stand out in terms of performance, productvity, and cost based on the sample of data analyzed.

- Nearly 75% of trips arrived less than five minutes from the scheduled time
- Lack of system capacity during morning hours indicated by spike in denied requests during the morning peak period
- Residents aged 55-69 years took the most trips on ART with that age bracket almost twice as likely as the average resident to use ART and four times more likely than a resident between the ages of 18 and 34.
- One in five ART riders required the use of a mobility aid during their trip
- The most common trip purposes were accessing school[19] or medical care
- School Trips
    - Almost all transit service provided youths was for school-related transportation
    - 3:00–4:00 PM sees more than twice as many trips completed as any other hour throughout the day due to after-school trips by youths
    - School-related trips have the highest denial rate of all trip types because sharp spikes in demand can create capacity issues
    - Nearly 60% of school trips began or ended at a cluster of three elementary schools along Walnut Street
    - Trips taken to more local destinations like schools (and grocery stores) had shorter average lengths than other trip purposes
- Medical Trips
    - More than 75% of trips for riders aged 70+ was for medical reasons
    - More than 40% of medical trips were to or from a group of medical facilities along Generations Drive
    - About 15% of medical trips started or ended more than ten miles from downtown New Braunfels, indicating both New Braunfels residents travelling to San Antonio for specialized care and residents of adjacent communities travelling to New Braunfels for care
    - Trips for medical purposes were longer on average than others

[19] ART provides school service using the same vehicles but under a separate contract to the one with the City. The trips that are paid for by the school district or parents of school children are not separated in the reports to the City in terms of ridership data.

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Chapter Four

POTENTIAL TRANSIT SERVICE EVALUATION

TRANSIT MANAGEMENT MODELS

The primary purpose of this plan is to lay out a transit service **strategy** to meet the needs of the New Braunfels community – whether that is continuing a demand-response style service like ART provides, implementing a fixed-route network, or opting for alternative solutions in between. However, an important consideration that will shape the delivery and structure of transit services in the city is whether the City elects to directly operate their system or pursue a purchased transportation model.

The scale of the transit division's role can range from full operation and ownership that offers complete control over service delivery to a turnkey solution that provides minimal involvement in day-to-day operations. Each model option presents unique challenges and opportunities. Striking the right balance between flexibility, cost-effectiveness, and meeting the evolving needs of the community will be paramount in building a successful system.

Direct Operation Model

In a directly operated transit system, the City of New Braunfels takes full responsibility for managing and operating the transit service. The City procures and owns the fleet of vehicles and recruits, trains, and employs the operators and maintenance staff. In addition to these essential components of transit service, the City is also responsible for strategic planning, route and schedule planning, capital and facilities planning, public communications, and customer service. Even though a transit division in a small city does not have the same scale of operations as a large transit agency might, personnel will be needed to fill roles and responsibilities in financial management, procurement, legal, and human resource capacities. However, being in control of the entire operation provides the City the flexibility to make real-time adjustments to the transit service and ensures direct accountability to the public.

Purchased Transportation Model

The City may also decide to contract the transit service operations by issuing a Request for Proposal (RFP) for operations management. The contractor takes over the day-to-day operation of the transit service. This often includes handling operators, scheduling, maintenance, and dispatch. It may also include some aspects of customer service response, such as maintaining an information desk, phone line, and email communications for the public. The RFP will determine precisely which facets of transit service management the contractor will assume and the aspects of management the City will provide with its own staff, as exemplified in **Table 3.**

In addition to a Transit Manager (or equivalent position) that acts as the City's point of contact for its system, the City may fill other capacities with existing financial, procurement, and human resources staff. The City typically retains control over strategic decisions, such as setting fares, approving route changes, and overall service goals. The contractor operates under the City's directives and may be required to adhere to certain performance metrics and service quality standards outlined in the service contract. The City must monitor the contractor, ensuring that the service meets not only established quality standards but also complies with FTA regulations. Some aspects of monitoring and compliance may too be contracted out, but the City is required by FTA to monitor all its contractors and assumes full responsibility for its system's compliance with federal regulations.

Table 3: Potential Shared Responsibilities in a Purchased Transportation Model

	City's Transit Division	Transit Management Company
Route Planning and Design	Determines fixed-route and service expansion plans, considering public feedback and demographics	May assist in route planning, but final decisions often require city approval
Scheduling and Timetables	Sets policies and service standards	May develop schedules according to city policies and service standards
Vehicle Procurement and Maintenance	May procure the transit fleet with assistance of City's procurement department or rely on contractor to provide "turnkey" service	May oversee fleet maintenance or rely on external contractors
Driver Recruitment and Training	May use City channels to promote recruitment; monitors contractor for compliance with FTA regulations	Often recruits, hires, and trains operators in collaboration with applicable City guidelines
Fare Collection and Ticketing Systems	May manage some fare collection or selling of passes on City property	May implement and manage all fare collection systems, reporting revenues to the city; option for 3rd party vendor specifically for ticketing/passes as needed with input from City
Customer Service and Information	May field customer comments, questions, and complaints through general City channels and handle in-house or relay to contractor; Prepare relevant Title VI reporting to track complaints and resolutions	May maintain various avenues for customer service, including help desks, phone lines, and email addresses focusing on operations and maintaining service quality, forwarding other matters to the City; Prepare relevant Title VI reporting to track complaints and resolution on behalf of City
Service Quality and Safety Assurance	Ensures adherence to safety protocols, monitors service quality, and addresses passenger feedback; Develops and implements public transportation agency safety plan	Collaborates on service quality assessments, implementing city-defined safety standards; Implements public transportation agency safety plan on behalf of City
Marketing and Public Outreach	Engages marketing campaigns to promote transit and reach riders	May contribute to marketing efforts, aligning with the city's strategic goals
Budgeting and Financial Management	Develops and manages the overall transit division budget, allocating funds for operational expenses	Assists with financial management, providing operational cost estimates and financial reports to City
Data Collection and Performance Metrics	Collects and analyzes relevant transit data (including but not limited to NTD) to evaluate performance and inform future decisions	May support data collection and performance tracking, aiding the city in assessing service or collecting relevant transit data on behalf of the City

The responsibilities of a transit management company may vary based on the agreement with the City. The level of involvement and authority delegated to the management company will depend on the terms outlined in the contract. Similarly, the City's transit division may have varying degrees of autonomy and resources, which can influence their roles in day-to-day operations and the overall efficiency and effectiveness of the service.

Service efficiency refers to a transit system's ability to deliver services with optimal resource utilization, reported to FTA and the National Transit Database (NTD) as operating cost per hour. Service effectiveness, on the other hand, gauges how well the transit system achieves its intended objectives and meets the needs of passengers and the community, which NTD defines as passenger trips per hour. Cost effectiveness combines those two measures, evaluating the effectiveness of the transit system in relation to its operating costs, or cost per passenger trip. Neither management model necessarily performs better than the other in terms of these metrics inherently, but **Table 4** provides considerations for each regarding these and other aspects of transit service.

Table 4: Comparison of Transit Management Models

	Directly Operated Transit Services	Purchased Transportation Models
Service Efficiency	May offer greater service efficiency due to direct control, quick decision-making, and better integration with city services and departments	Service efficiency can be achieved through specialization, technology-driven solutions, and best practices gained from industry experience
Service Effectiveness	May offer greater potential for service effectiveness as transit may be regarded as a public good responding purely to local demands	May offer comparable service effectiveness with clear communication and performance metrics with the management company
Cost Effectiveness	City may have higher overhead costs if providing an in-house workforce, including dedicated operations and maintenance personnel, as well as the cost of maintaining vehicle fleets, including purchase of parts and products to support operations	Reduced administrative burden and access to specialized resources and technology may offer advantages
Decision-making control	Full control over operations and service decisions	City retains full control over service planning, delegating daily operational decisions to management company, City will provide general oversight and review of operations.
Innovation and expertise	Limited to City's capacity and resources	Can offer expertise, innovation, and best practices from managing multiple transit systems

Chapter Five

SCENARIO DEVELOPMENT AND EVALUATION

SCENARIO DEVELOPMENT

To guide the overall service design process, the project team established four key goals in coordination with the City's project manager and staff.

- **Deliver citywide transit coverage:** The recommended network design should provide a transit option to the vast majority of City residents, if feasible.
- **Focus service on key corridors and destinations:** Although the network should provide citywide coverage, higher-quality service should be provided in the portions of the city most likely to generate substantial transit ridership.
- **Develop a system that can be launched quickly:** The City is well into the process of becoming a Direct Recipient of Federal Transit Administration (FTA) funding. To maintain alignment between the launch timeline and expected receipt of future grant funds, the network design should allow for an initial service launch no more than 12 months after adoption of this TDP.
- **Provide adequate capacity for future growth:** The design of the recommended transit network should account for future population growth and increases in transit mode share. For example, although microtransit services have a shorter launch timeline than fixed-route services, fixed-route services have higher ridership capacity and may operate more efficiently in high-ridership areas. The recommended network should balance the benefits and drawbacks associated with each mode.

To capture the full range of service options relevant to the City, two service design extremes — a microtransit-only service and an exclusively fixed-route system — were explored to illustrate the unique advantages and challenges associated with each model. Additionally, the pros and cons of a fixed-route with microtransit service were considered determine if a hybrid solution or phased implementation offers the best path forward for New Braunfels.

Microtransit-Only Alternative

Like the existing ART demand-response transit system in New Braunfels, microtransit is a form of flexible, "on-demand" transit. As with the existing ART demand-response service in New Braunfels, microtransit operates within a predefined service zone. A fleet of vehicles roam throughout the service zone, responding to ride requests in real time. Riders travelling in the same general direction are grouped onto the same vehicle to increase efficiency. Whereas a traditional demand-response system typically requires rides to be scheduled at least 24 hours in advance, microtransit allows riders to be picked up 15-30 minutes after requesting a ride, offering the opportunity for spontaneous travel.

While microtransit excels in adaptability and provides an excellent passenger experience, it may face capacity limitations during peak travel periods. In well-patronized areas, microtransit has a lower productivity ceiling than traditional fixed-routes, leading to higher per-trip costs. However, microtransit can have similar or lower costs per trip in areas that are poorly suited to fixed-route buses, such as lower density areas or places with poor pedestrian infrastructure.

Ridership Projections

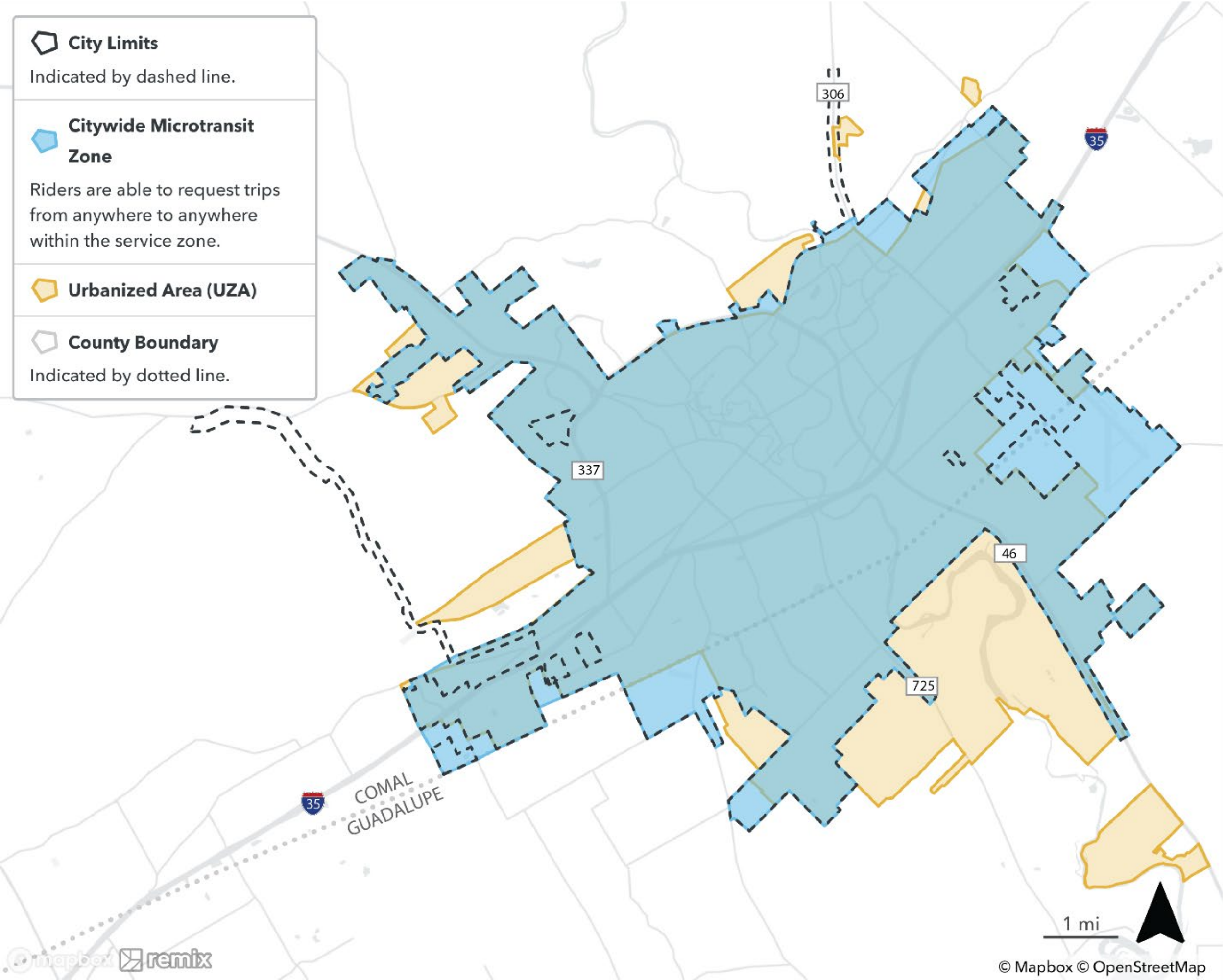
The ridership projected for a microtransit zone is primarily a factor of the size and shape of the proposed zone. Based on prior analysis and discussion with City officials, the zone shown in **Figure 18** was developed. The proposed zone largely follows the city boundary. Two narrow (and largely undeveloped) strips extending north and west of the city are excluded, while the unincorporated enclaves completely enclosed by the city are included. These changes help maintain a reasonable and easy-to-understand zone shape.

Demand Scenarios and Ridership Estimates

Ridership estimates for the proposed zone were developed by applying a ratio of completed rides relative to the assumed hours of operation and sum of population and employment, known as the "capture rate." This capture rate is based upon observed ridership patterns on microtransit deployments in contexts similar to New Braunfels. Comparable deployments were identified using the following criteria:

- **Regional similarity:** Services located in the South and Southeast, including in Texas, Alabama, and Tennessee.
- **On-demand service:** Trips are entirely or mostly requested in real time, with a minority of trips pre-scheduled one or more hours in advance of the actual pickup.
- **Fares collected:** Riders pay a fare to use transit services. If the microtransit service is part of a larger multimodal network, the fare collected for microtransit trips is equal (or close to equal) to the fixed-route fare.

Figure 18: Proposed Citywide Microtransit Zone



Source: Via (Remix)

After identifying an appropriate capture rate, the project team developed a low-demand, medium-demand, and high-demand ridership scenario to account for the uncertainty inherent in estimating travel demand. This approach recognizes that ridership can be affected by many qualitative and quantitative factors, such as a transit agency's stakeholder partnerships, marketing campaigns, and customer outreach activities, to name just a few. These three scenarios are described below:

- **Low-demand.** This scenario assumes the launch of a new service which may not perform as well as established microtransit services. Common reasons for lower ridership outcomes could include poor marketing, lack of community support, or poor stakeholder relationships (e.g. with major employers).
- **Medium-demand.** The medium-demand scenario represents the project team's best estimate of ridership within 6-12 months of operation, at a capture rate similar to the average of peer services.
- **High-demand.** This scenario assumes the service is more popular than most of its peers. Common reasons for an especially high-ridership microtransit service include strong community support, strong stakeholder and employer relationships (often employers are strong advocates of the service), fare-free service, or highly effective marketing campaigns.

The proposed microtransit zone was assumed to operate from 6:00 AM to 9:00 PM on weekdays, and from 8:00 AM to 8:00 PM on Saturdays and Sundays. Based on this span of service and the capture rate developed above, ridership projections for a city-wide microtransit zone are provided in **Table 5**.

Table 5. Projected Boardings for Citywide Microtransit Zone

Demand Scenario	Projected Boardings		
	Weekday	Weekly	Annual
Low	210	1,200	63,000
Medium	330	1,950	102,000
High	480	2,800	147,000

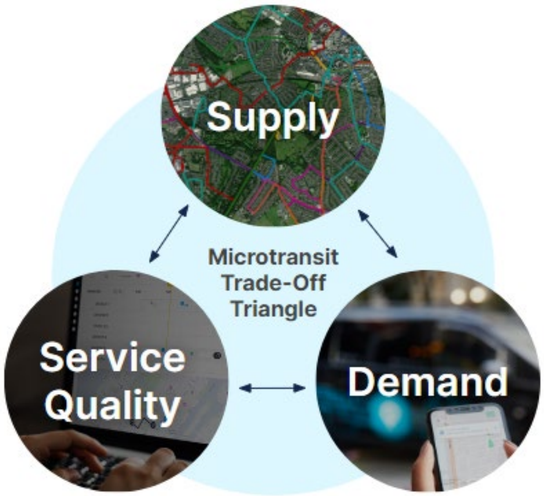
The existing service provided by Alamo Regional Transit (ART) delivers about 21,000 trips per year, meaning that even the low projections in **Table 5** represent a dramatic expansion in transit usage.

Fleet Requirements

Using the established zone boundaries, ridership estimates, and phased implementation plan, the project team conducted a series of microtransit simulations to number of vehicles and annual revenue hours to provide service in the proposed zone.

Approach to Microtransit Simulations

Designing a microtransit service requires balancing three fundamental variables: vehicle supply, rider demand, and service quality. Adjusting one leg of this "trade-off triangle" will affect the other two — for example, increasing service quality by shortening wait times will either (1) require more vehicles to serve the same number of trips, or (2) reduce the total number of trips the system can serve. By performing multiple rounds of simulations, the project team was able to identify the best fleet mix for New Braunfels. Additional details for each of the three key variables are provided below.



Supply can be measured by vehicle hours, total budget, or the size of the microtransit fleet. Supply also directly correlates with a microtransit service's ongoing operating cost. With increased supply, the microtransit service can complete more passenger trips while keeping quality of service constant or, alternatively, offer greater quality of service (e.g. shorter average wait times) if the passenger demand is kept constant. On the other hand, with reduced supply the quality of service will diminish if passenger demand is kept constant (e.g., longer wait times, fewer available seats at peak times). The reverse is also true — increasing supply can improve service quality if demand is held constant.

Demand is typically expressed in terms of a service's ridership, as effective service design should keep any unmet demand (e.g., rider cancellations or denied ride requests due to seat unavailability) to a minimum. Demand can be increased by enlarging the zone to serve additional activity centers, reducing fares, offering incentives to riders, or conducting focused marketing campaigns to raise awareness of the service. A significant increase in demand will necessitate either (1) lowering the target quality of service to keep vehicle supply constant or (2) adding extra vehicles to ensure that quality of service remains acceptable.

Quality of service encompasses various metrics for how fast, frequent, comfortable, reliable, and efficient the microtransit service is. Quality of service parameters are typically set using the microtransit technology provider's algorithm, although the exact parameters available for adjustment may vary slightly by provider. Significantly increasing quality of service will result in either (1) higher operating costs from the additional vehicles required to serve the same level of demand or (2) a lower passenger capacity if no vehicles are added. These parameters are designed to balance the efficiency of service — which conserves vehicle resources and therefore operating costs — with the quality of service that riders experience.

In addition to vehicle supply and customer demand, the service parameters specified below have significant bearing on the quality-of-service riders experience. Carefully calibrating these parameters early in the microtransit design phase will help produce a service that effectively balances efficiency and cost with quality and rider experience. The parameters and recommended values presented in **Table 6** have the most bearing on a service's performance, cost-effectiveness, and customer satisfaction.

Table 6. Quality of Service Parameters for Microtransit Service in New Braunfels

Parameter	Description	Recommended Value(s)
Stops Model	Two primary stop models are available. **Curb-to-curb:** Vehicles pick up and drop off riders directly outside their requested addresses. **Corner-to-corner:** Passengers walk to or from a nearby corner (or predetermined hub location) to meet their vehicle or access their destination. Note: Riders who indicate they have a **disability will always be offered curb-to-curb service**.	**Corner-to-corner** Riders may be asked to walk a short distance between their requested origin and pickup location and/or their requested destination and drop-off location. Riders who indicate they have a disability will receive curb-to-curb service.
Maximum Walking Distance	In a corner-to-corner stop model, a maximum walking distance is set from the rider's location to the pickup point *and* from the rider's drop-off point to their destination. Transit industry research suggests that ¼ mile is the furthest most riders will walk to access local bus service. Note: Operators can reduce the maximum walking distance in areas without appropriate sidewalk coverage.	**Max. Walk: 400 meters (about 1,200 feet) at either trip end** The average walking distance riders will experience is expected to range from 600 to 1,000 feet.
Maximum Wait Time	When a rider requests a trip, they will be shown a proposal indicating their estimated pickup time. During busy times, there may not be sufficient vehicles to pick up a passenger in a reasonable amount of time. If a passenger must wait longer than a certain threshold, the service is considered 'unavailable' for booking. Sufficient vehicle supply should be provided such that very few riders have their ride requests declined.	**Max Wait: 30 minutes** Average wait times are expected to range from 10-20 minutes. A 30-minute threshold is typical for on-demand microtransit services in moderate-density areas.
Detour Allowance	Detour allowance describes the detour thresholds a vehicle can take to pick up additional riders when a rider is already on-board. If the detour exceeds the maximum allowance, additional trips will not be assigned, and those ride requests would be quoted a somewhat longer wait time.	**Max. Detour Length: 50% of base ride duration, or 5-15 minutes total** Example: a 10-minute direct trip could only detour up to 5 minutes, while a 20-minute trip could detour up to 10 minutes.
Vehicle Capacity	Microtransit service is typically operated with minivans, vans, or cutaways with seating capacity of at least 6 passengers. Larger vehicles can be used, although vehicles in the 6-8 seat range will accrue lower per-mile operating costs.	**Vehicle Size: Minimum of 8 seats and 2 wheelchair positions** Simulation results suggest that this capacity is not typically filled in any of the zones; a 6-seat vehicle could be used if desired.

Simulation Results
After establishing the zone boundary, ridership estimates, and quality of service parameters, iterative simulations were performed for the proposed zone. Across simulation runs, quality of service was held constant while demand was varied. This allowed the project team to identify required vehicle supply, as well as the number of vehicle hours that would be accrued each year of operation. The results of microtransit simulations performed for the proposed zone are presented in **Table 7**.

Table 7. Simulation Results for Proposed Citywide Microtransit Zone

Zone Performance	Low Demand	Medium Demand	High Demand
Fleet Size *Vehicles required at peak (excl. spares)*	4 - 5	5 - 6	7 - 8
Weekday Ridership *Boardings*	210	330	480
Daily Avg. Microtransit Productivity *Boardings / Vehicle Hour*	3.5 - 4.5	3.5 - 4.5	3.5 - 4.5
Annual Ridership *Passenger Boardings*	63,000	102,000	147,000
Annual Vehicle-Hours *Hours*	14,000 – 18,000	22,000 - 29,000	33,000 - 42,000

Operating Cost Projections

The assumed microtransit cost per hour was developed using data from the Federal Transit Administration's National Transit Database (NTD)[20]. Hourly operating cost data from 2019 for all demand-response operators in Texas was averaged and factored upward by 15% to account for recent inflation. Based on the outcome of this calculation, an hourly operating cost of $85 per revenue hour was developed. Using this value, the annual operating costs of the recommended microtransit service component were calculated. The results of the process are presented in **Table 8**.

Table 8. Annual Operating Cost for Microtransit Service

Scenario	Annual Vehicle Hours	Annual Cost
Low-Demand	14,000 – 18,000	$1.2M - $1.5M
Medium-Demand	22,000 – 29,000	$1.9M - $2.5M
High-Demand	33,000 - 42,000	$2.8M - $3.6M

[20] According to the NTD Policy Manual, there are two major expense categories: operating and capital. Operating expenses are expenses that a transit agency incurs during day-to-day operations. Capital expenses are the expenses that are related to purchasing a capital asset or making an improvement to a capital asset that materially increases its value or useful life.

Fixed-Route Only Scenario

Fixed-route systems provide a scheduled, predictable service for passengers. Larger vehicles and predefined routes make them suitable for denser areas with consistent travel patterns. However, fixed-routes may not be the most cost-efficient option for areas with lower demand, leading to underutilized services. Limited flexibility can lead to inefficient routes and service gaps in underserved neighborhoods. To ensure equal access to transit, Federal regulations require ADA paratransit service to be provided within ¾ miles of fixed-route lines.

New Braunfels is not currently served by any fixed-route transit. To guide the creation of a future fixed-route network, the following design goals were established:

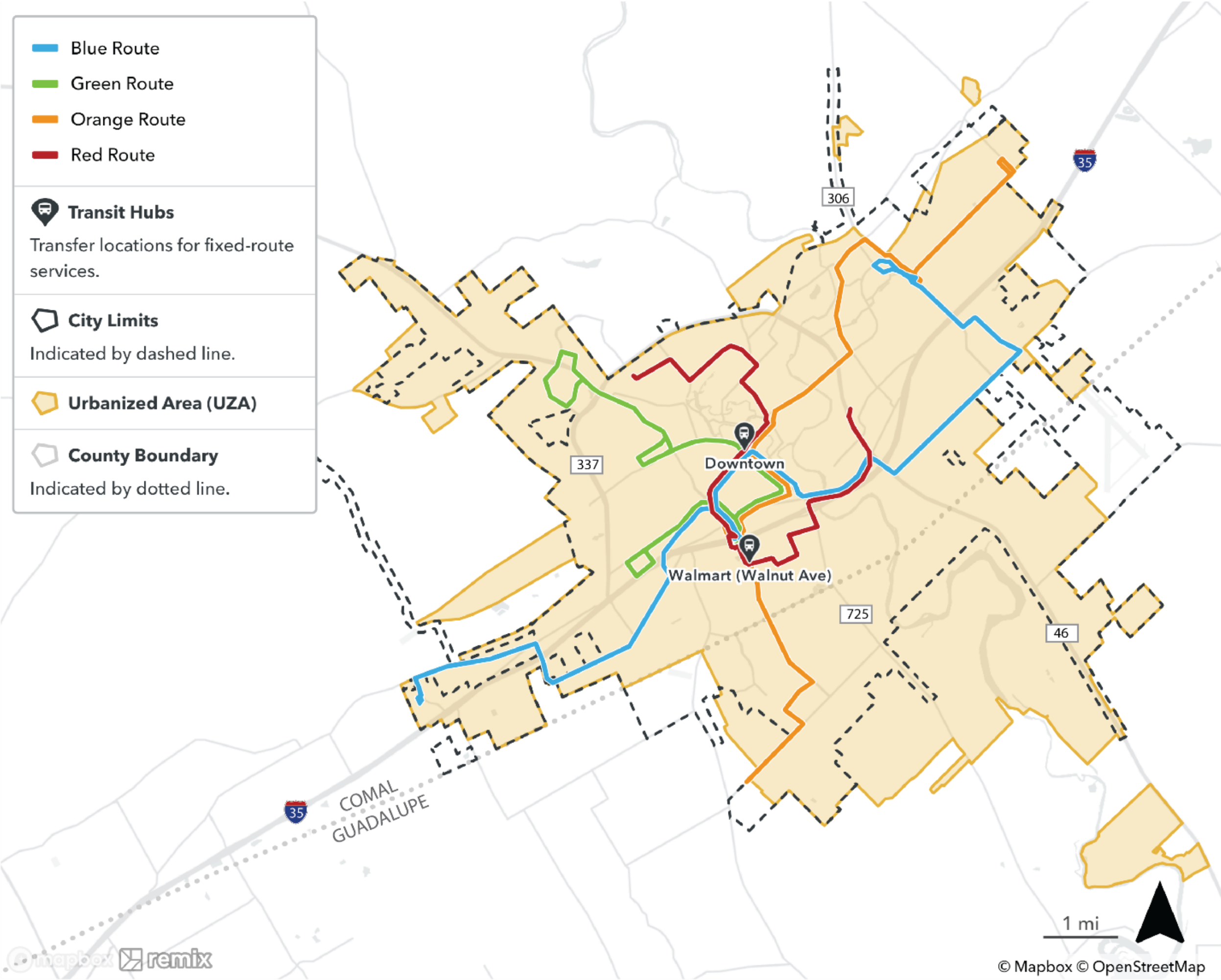
- **Direct and linear routes:** Routes should be as direct as possible, providing efficient and time-competitive travel between important destinations. Service should be concentrated along the corridors that are likely to produce the most ridership.
- **Centered around transfer hubs:** Direct and linear bus routes enable easy transfers. To facilitate route-to-route transfers, "hubs" should be created where most or all routes come together. Based on analysis of land use patterns and performance in peer systems, two hub locations were identified: Downtown New Braunfels and Walmart (Walnut Avenue).
- **Realistic and sustainable operations:** The number of revenue hours accrued by a given network design annually is a factor of route lengths, desired headways, and service start/end times. The number of revenue hours required to operate the proposed fixed-route network should be comparable to similar cities with quality transit offerings.
- **Avoid one-way routing:** Routes should follow the same alignment in each travel direction as much as possible, allowing passengers to easily travel in both directions. In addition to lengthening some rider trips, maintaining separate alignments for each travel direction makes it harder for riders to understand the bus network.
- **Balance running times on both sides of downtown**: Each route should be centered on the downtown transfer hub. To ensure efficient usage of transit vehicles, the round-trip run-times (the time required for a vehicle to travel from downtown to one end of the route and back) on either side of downtown should be as close to equal as possible. The enables timed transfers, meaning that the vehicles should arrive at the hubs at similar times, minimizing waits for connecting passengers.

Based on these design criteria, the project team created a network of four routes. The alignment of these routes was then reviewed by New Braunfels staff. Comments provided during this review process are reproduced in **Appendix E**.

The proposed fixed-route network is illustrated in **Figure 19**. As drawn, the network places about 65,000 residents and 30,000 jobs within walking distance of a bus stop.[21] These totals represent about 70% of residents and 80% of jobs within New Braunfels.

[21] In this project, walking distance is defined as 0.5 miles.

Figure 19: Proposed Fixed-Route Network for New Braunfels



Source: Via (Remix)

Ridership Projections

As with microtransit, a capture rate was used to estimate the number of passengers that would use fixed-route transit were it available in New Braunfels. The capture rate is based on a number of factors, including land use patterns along the proposed routes, demographic characteristics, and performance of comparable services. In addition to capture rate, two additional service parameters must be defined to project ridership:

- **Headways:** 60 minutes headways are assumed; shorter headways were evaluated, but resulted in unrealistically high costs and significantly more service than is observed in peer cities throughout the United States.
- **Span of Service:** The proposed bus routes were assumed to operate daily from 7:00 AM to 7:00 PM.[22]

Based on this information, boardings were projected for each proposed route. This information is summarized in **Table 9**.

Table 9. Projected Ridership for Fixed-Route Services

Route	Projected Boardings		
	Weekday	Weekly	Annual
Red	150	900	46,800
Orange	200	1,950	102,000
Green	150	900	46,800
Blue	230	1,400	72,800
Total	**730**	**5,150**	**268,400**

Fleet Requirements

Unlike with microtransit, where a complex simulation process is required to estimate fleet size and vehicle hours, estimating the same for fixed-route services is relatively straightforward. Both values can be estimated based on the length of each route, forecasted run time, span of service, and desired frequency as shown in **Table 10**.

Table 10. Daily Fixed-Route Fleet Requirements, Long-Term Scenario

Route	Round-Trip Runtime	Route Frequency	Vehicles Required	Daily Revenue Hours
Red	75 mins	Every 60 mins	2	17
Orange	110 mins	Every 60 mins	2	24
Green	75 mins	Every 60 mins	2	17
Blue	130 mins	Every 60 mins	3	29
Total	**-**	**-**	**9**	**87**

The systemwide daily revenue hours equate to 610 per week or 31,700 annually. The number of revenue hours accrued by the fixed-route network each year is expected to remain

[22] For the purpose of establishing a baseline service, daily service hours of 7AM to 7PM are assumed. Additional service hours can be flexed in as needed and as operations show potential demand.

constant regardless of ridership. Ridership increases will increase fixed-route productivity, but will not require additional service to be provided – buses will instead operate with a higher load factor and thus, lower cost per rider to the City.

Bus Stop and Pedestrian Infrastructure Considerations

Safety should be the primary consideration in determining placement of stops and how passengers will interface with parking, pedestrians, bicycles, and vehicles at crossing locations. Other factors include accessibility, desired headways, and adjacent land use. Bus stop spacing – the distance between stops on a route – is important to maximize efficiency, while providing the coverage necessary to serve key destinations. Spacing is typically 0.25 to 0.5 miles apart; however, the availability of accessible pedestrian infrastructure and safe crossings will require consideration. Bus stops amenities like benches, shelters, lighting and trash cans can increase transit use by making the system feel safe, convenient, and easy to use. Amenities provided may be determined based on a variety of factors such as ridership/stop usage, route type, surrounding land uses and available right of way.

Operating Cost Projections

Hourly operating costs for the proposed fixed-route service component were calculated in a similar manner. NTD data for all fixed-route operators in Texas in 2019 were averaged and adjusted upwards by 15% to account for recent inflation. Fixed-route services can operate a greater range of vehicle types and sizes than demand-response services, so upper and lower cost per hour estimates were also established:

- **Lower bound:** \$75 per revenue hour. This value represents the 20th percentile of 2019 operator costs in Texas, adjusted for inflation.
- **Midpoint:** \$100 per revenue hour. This value represents the 50th percentile of 2019 operator costs in Texas, adjusted for inflation.
- **Upper bound:** \$125 per revenue hour. This value represents the 80th percentile of 2019 operator costs in Texas, adjusted for inflation.

Based on these hourly cost estimates, annual operating cost projections were developed. These projections are presented in **Table 11**.

Table 11. Annual Operating Cost for Fixed-Route Service

Scenario	Annual Vehicle Hours	Annual Cost
Lower bound cost	31,700	\$2.4M
Midpoint cost	31,700	\$3.2M
Upper bound cost	31,700	\$4.0M

These cost estimates are in line with the hourly operating costs incurred by neighboring systems. VIA, the public transit operator in San Antonio, reported an hourly fixed-route cost of \$100 in 2019 (\$115 per hour after cost escalation applied). Capital Metro, the transit operator in Austin, reported an hourly cost of \$114 in 2019 (\$131 per hour after cost escalation). Both of these values are higher than the midpoint established for New Braunfels, which reflects the higher cost of labor in both comparison cities, as well as the additional complexity of operating the larger comparison networks.

Hybrid Fixed-Route and Microtransit

A hybrid model combines the strengths of both fixed-route and microtransit systems. Fixed-routes provide a backbone for higher capacity travel corridors while microtransit can efficiently serve lower demand areas, connect remote neighborhoods, and provide first/last mile connections to other modes of travel. Integrating different service models can be complex and require careful coordination between providers (if multiple service providers exist) and the public to ensure they understand the transit services being offered. Balancing resources between fixed-route and on-demand services necessitates ongoing strategic planning to optimize cost-effectiveness and customer satisfaction and adapt to changing demographics and development. **Table 12** summarizes the elements of fixed-route, microtransit and hybrid models for transit service.

Table 12: Comparison of Transit Service Models

	Fixed-Route	Microtransit	Hybrid
Service Flexibility	Limited flexibility with predefined routes and schedules	More flexible, allowing on-demand pick-up and drop-off within a defined service area	Highly flexible and adaptive, optimizing routes in real-time based on demand
Cost Efficiency	Cost-efficient for high passenger volumes and established routes	Cost-efficient in low-demand areas or during off-peak hours	Improved cost efficiency due to optimized routes, but may still have higher costs per passenger
Passenger Capacity	High capacity due to larger buses and dependent on frequencies offered	Lower capacity compared to fixed-route, especially during peak demand periods	Moderate capacity due to use of smaller vehicles
Suitability for Different Areas	Ideal for urban areas and some suburban areas with higher density corridors	Beneficial for rural areas, areas with low demand, and areas lacking fixed-routes	Well-suited for areas with variable demand, suburban areas with limited transit access
Accessibility	Accessible for individuals with mobility challenges but requires complementary paratransit for others	Can be made fully accessible to individuals with specific needs or refer riders to paratransit services	Can be made fully accessible to individuals with specific needs or refer riders to paratransit services
Reservation Requirement	No advanced booking required	Often requires prior reservations	May require reservations in advance for better coordination
Technological Integration	Less reliant on technology	Technology-driven, often leveraging mobile apps for bookings and tracking	Uses technology for route optimization and passenger communication

Table 4 in an earlier section compared FTA's NTD metrics of service effectiveness, service efficiency, and cost effectiveness regarding trends of different transit *management* models (directly operated vs purchased transportation). Similarly, to further illustrate the advantages and disadvantages of these transit service design extremes, **Table 13** calculates their relative effectiveness and efficiency. The service effectiveness, service efficiency, and cost effectiveness measures below are based on the annual projected ridership, estimated service hours, and estimated operating cost of each scenario.

Table 13: Effectiveness and Efficiency of Microtransit and Fixed-Route Scenarios

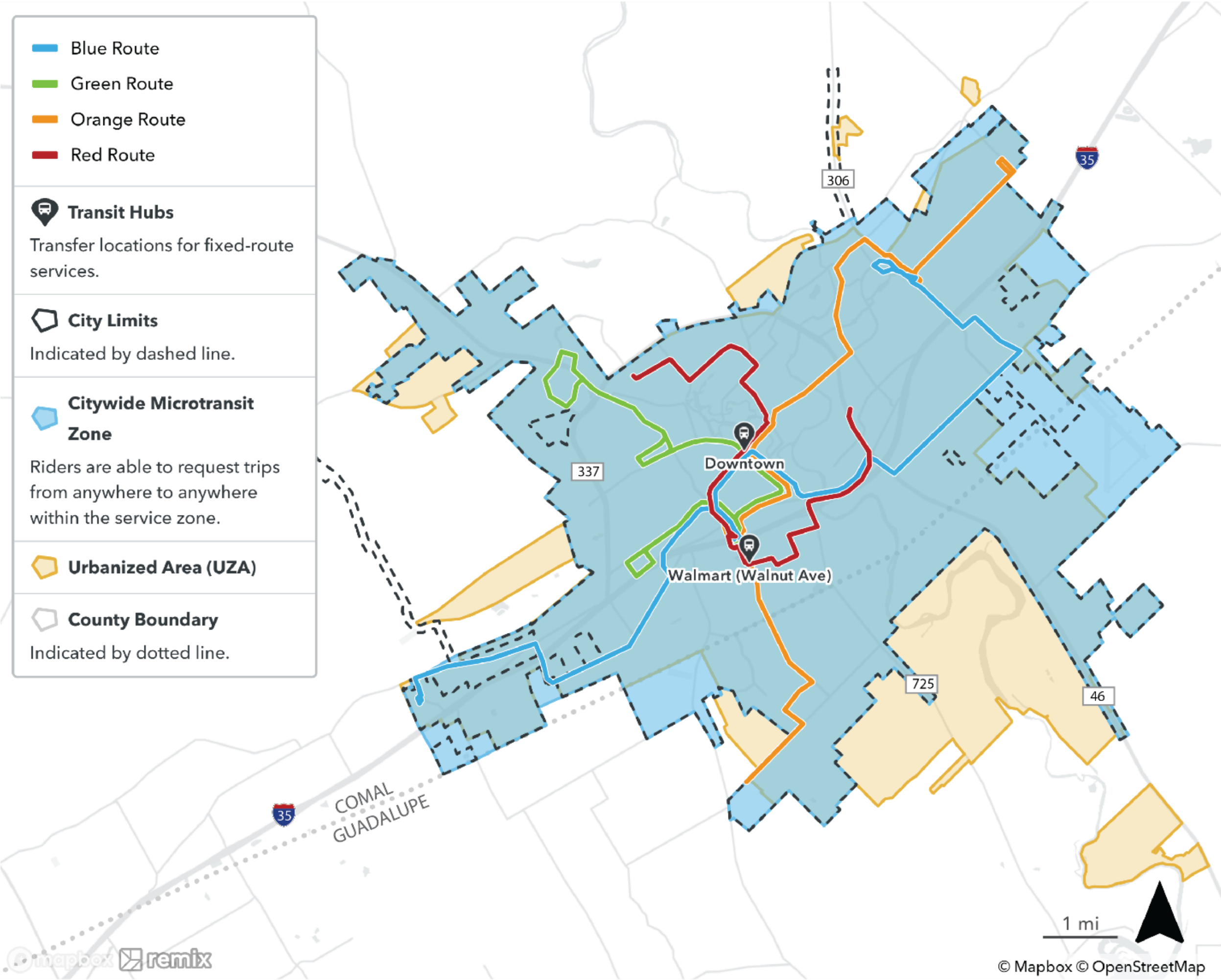
	Microtransit	Fixed-Route
Ridership	102,000	268,400
Vehicle Hours	25,500	31,700
Operating Cost	$2,200,000	$3,200,000
Service Effectiveness (Riders per Hour)	4.0	8.5
Service Efficiency (Cost per Hour)	$86.27	$100.95
Cost Effectiveness (Cost per Rider)	$21.57	$11.92
Fleet Requirements	6	9

Fleet requirements are included as a reminder that depending on the management model chosen, there could be capital costs for vehicles involved as well. It is also difficult to make a convenient comparison here as the vehicle types (and thus, cost) vary not only between microtransit and fixed-route service but within each as well depending on the type and size of vehicles selected to operate the service.

Each model considered for New Braunfels offers distinct advantages, and the choice should be tailored to the city's specific needs and demographics. A traditional fixed-route system with ADA paratransit provides reliable service and capacity for future growth, but is a poor fit for the lower-density neighborhoods outside the downtown area. A microtransit-only service offers flexibility and a quick launch timeline, but will struggle to accommodate rising demand without substantial cost increases as transit becomes better established in the City. The hybrid option presents a promising middle ground, but its successful implementation depends on seamless coordination between the fixed-route and microtransit components.

Figure 20 illustrates a hybrid fixed-route and citywide microtransit network. Such a design would operate microtransit with a fixed-route referral method, which combines the coverage and flexibility of microtransit with the efficiency and effectiveness of fixed-routes. The system optimizes the use of microtransit by directing passengers to fixed-routes for some or all of their trip. If a transfer to or from a fixed-route is determined to offer the rider the best trip, the transition from microtransit to fixed-route is designed to be as seamless as possible, ensuring minimal wait times or disruption for transfers between service. A fixed-route referral hybrid network can more easily scale up as demand increases as compared to a microtransit-only system.

Figure 20: Hybrid Fixed-Route and Microtransit



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Chapter Six

RECOMMENDATIONS AND IMPLEMENTATION PLAN

RECOMMENDATIONS

On-demand microtransit and fixed-route buses were evaluated separately to understand the expected baseline performance of each mode within New Braunfels. However, launching a transit network comprised exclusively of one mode or the other could present severe operational constraints, as illustrated in **Table 14**.

Table 14. Performance Against Service Design Goals by Network Model

Goal	Microtransit Only	Fixed-Route Only	Hybrid Network
Deliver citywide transit coverage	**Meets goal.** The proposed microtransit zone functionally covers all of New Braunfels. Riders can request trips from anywhere to anywhere within the service zone.	**Does not meet goal.** Even assuming a relatively generous 0.5-mile walkshed around stops, only 70% of residents are covered by a fixed-route only system.	**Meets goal.** A hybrid design can use microtransit to provide citywide coverage and fixed-route services to focus on key corridors.
Focus service on key corridors and destinations	**Somewhat meets goal.** More vehicles are assigned to high-demand areas, but trip aggregation (and efficiency) gains will be limited.	**Meets goal.** Bus routes can be designed to serve specific corridors and destinations.	**Meets goal.** A hybrid design can assign additional resources (bus routes) to important areas.
Develop a system that can be launched quickly	**Meets goal.** Microtransit services routinely begin operating 6-12 months from the day project RFPs are issued.	**Does not meet goal.** Fixed-route services typically take 18-24 months to launch. Items like vehicle procurement tend to take longer than on microtransit services.	**Meets goal.** A phased approach would allow microtransit to be launched first, with fixed-route service to follow as ridership grows.
Provide adequate capacity for future growth	**Does not meet goal.** Operating costs for microtransit-only systems tend to scale linearly with ridership. Essentially, if ridership doubles, the cost of each trip will not dramatically change, and the required fleet size will increase.	**Meets goal.** Fixed-route systems tend to become more productive (and cost-efficient) as ridership grows. Essentially, if ridership doubles, the cost of each trip will be cut in half.	**Meets goal.** A phased approach would allow fixed-route service to be launched once demand grows. This will dramatically increase total capacity from a microtransit-only system.

Phased Implementation Plan

A hybrid network that incorporates both microtransit and fixed-route transit best aligns with the service design goals for this TDP. In addition, a phased approach — where microtransit is launched first and fixed-route services are added as ridership grows — will allow the City to develop a robust transit network in a sound, data-driven way. The recommended phasing projects an approximate five-year network buildout, starting with a citywide microtransit zone and adding up to four bus routes as summarized in **Table 15**.

Table 15. Recommended Phasing Plan

Phase	Network Structure	Launch Timeline	Launch Trigger
Short-Term	Citywide microtransit zone	As soon as feasible	Funding for initial launch is available.
Medium-Term	Citywide microtransit with 1-2 bus routes	2-5 years from plan adoption	Microtransit ridership within one or two proposed bus corridors grows to 100-200 trips per day. Above this threshold, bus routes will likely operate more efficiently than microtransit.
Long-Term	Citywide microtransit with 3-4 bus routes	5+ years from plan adoption	The remaining bus corridors reach 100-200 microtransit trips per day.

A snapshot of service footprints during each phase is provided on the following pages while **Table 16** shows a summary of the operating cost estimates. A phased approach and hybrid network design will allow New Braunfels to scale up transit investment as demand grows. Initially, microtransit-only coverage will cost between $1.2 million and $3.6 million per year. In the medium-term scenario, micro-transit with two fixed-routes will cost between $2.3 million and $4.5 million per year. At full buildout, a citywide microtransit zone and four bus routes is expected to cost between $3.6 million and $7.6 million per year, assuming citywide microtransit is maintained in conjunction with the fixed-routes.

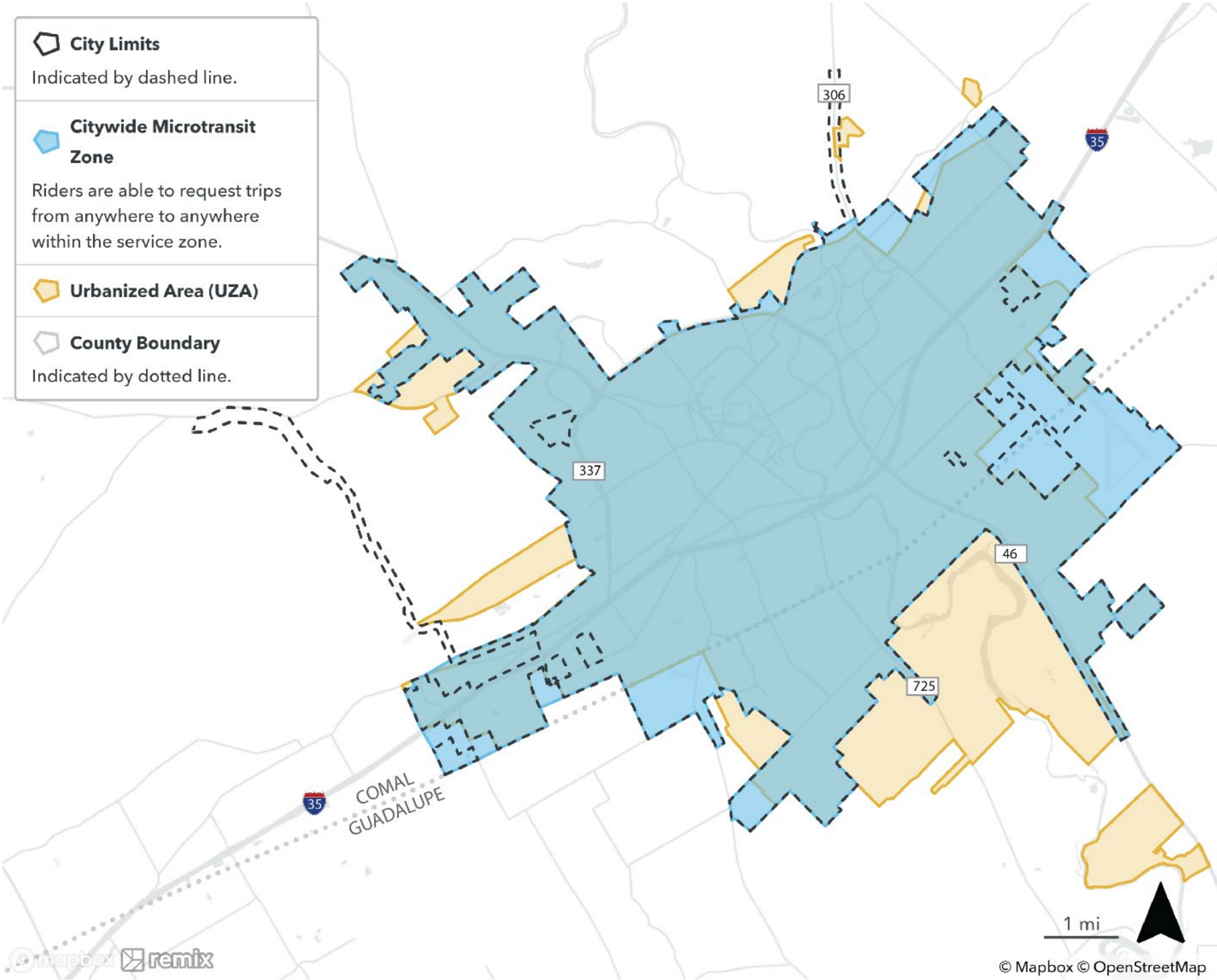
Table 16: Operating Cost Estimates Summary

Scenario	Annual Vehicle Hours	Annual Cost
Short-term scenario (citywide microtransit operating)		
Low-Demand	14,000 – 18,000	$1.2M - $1.5M
Medium-Demand	22,000 – 29,000	$1.9M - $2.5M
High-Demand	33,000 - 42,000	$2.8M - $3.6M
Medium-term scenario (two fixed-routes)		
Lower bound cost	15,100	$1.1M
Midpoint cost	15,100	$1.5M
Upper bound cost	15,100	$1.9M
Long-term scenario (four fixed-routes)		
Lower bound cost	31,700	$2.4M
Midpoint cost	31,700	$3.2M
Upper bound cost	31,700	$4.0M

Short-Term

During this phase, the city is served by microtransit only. The footprint of the service zone is shown in **Figure 21**. Riders can request a trip from anywhere to anywhere within this service zone.

Figure 21. Short-Term Transit Network (Microtransit Only)



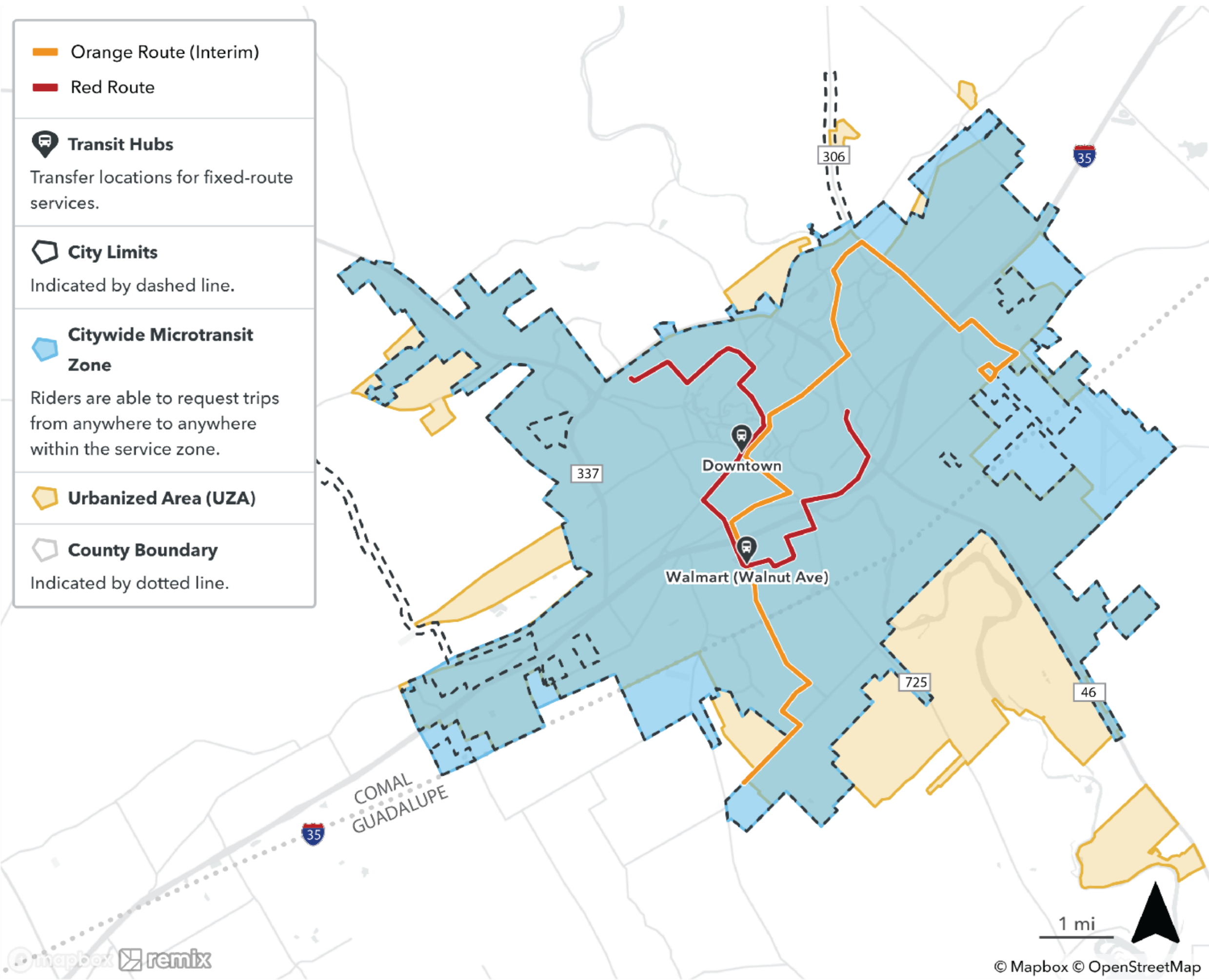
Source: Via (Remix)

City of New Braunfels

Medium-Term

Ridership on the microtransit system is expected to grow in the years following launch. Once ridership along one or more of the future bus routes reaches 100-200 boardings per day, the City should look to launch the first fixed-route services. Based on the areas served, it seems likely that the future Orange and Red lines will cross this threshold within 2-5 years from adoption of this plan. **Figure 22** shows the microtransit zone complemented by these two routes. If the Orange route is indeed one of the first routes to launch, the modified alignment shown in **Figure 22** should be used. One the Blue route is launched, the Orange route should be changed to the alignment shown in **Figure 23**.

Figure 22. Medium-Term Transit Network (Microtransit with Two Bus Routes)



Source: Via (Remix)

Bus Stop Considerations

Transitioning to a fixed-route system requires providing safe and easily identifiable boarding locations, which includes additional capital costs for purchasing and installing signs, benches, shelters, and other stop amenities. Since the New Braunfels fixed route service will be new, it will not have the benefit of existing stop-level ridership to plan infrastructure investments around, but educated decisions can be made based on microtransit ridership, transit propensity, and key destinations. At a minimum, the initial phase of bus stop implementation should include pole and sign stops approximately every 0.25 to 0.50 miles of each route in each direction of travel.

Capital costs for bus stops vary widely based on amenities included, infrastructure improvements needed at or around stop locations, cost of materials, and cost of labor. Estimated unit costs for typical stop amenities are included below in **Table 17.** The costs outlined for pole and sign installation in the table also account for ADA upgrades, which may not be needed at every location and can be phased in over time if needed. The location of the main transfer hub in downtown and the main transfer hub at Walmart may be immediately prioritized with a greater level of amenities, including a shelter, additional lighting, trash can, bicycle parking, seating, and sidewalk connectivity as well as enhanced signage with stop, route, and system information.

Table 17: Bus Stop Amenities Unit Cost Estimates

Stop Amenities	Unit Cost
Pole and Sign with ADA Approach Upgrades[23]	$2,700
Shelter[24]	$7,100-$14,300*

Ideally, every bus stop in a system would have a shelter to protect riders from the elements, but cost considerations typically require a phased approach or prioritization plan for providing amenities. Using boarding data for one full year of service can help determine the need for amenities to address demand. **Table 18** below offers a simplified example for utilizing stop-level data to prioritize stop amenities for planning purposes.

Table 18: Example Thresholds for Bus Stop Amenity Prioritization

Level	Ridership	Amenities
1	Low – Stop with up to 15 boardings per day	Sign and pole, ADA Accessibility
2	Moderate – Stop with 15-30 boardings per day	Add bench, prioritize sidewalk connectivity
3	High – Stop with more than 30 boardings per day	Add shelter, safety lighting, trash can, bicycle parking

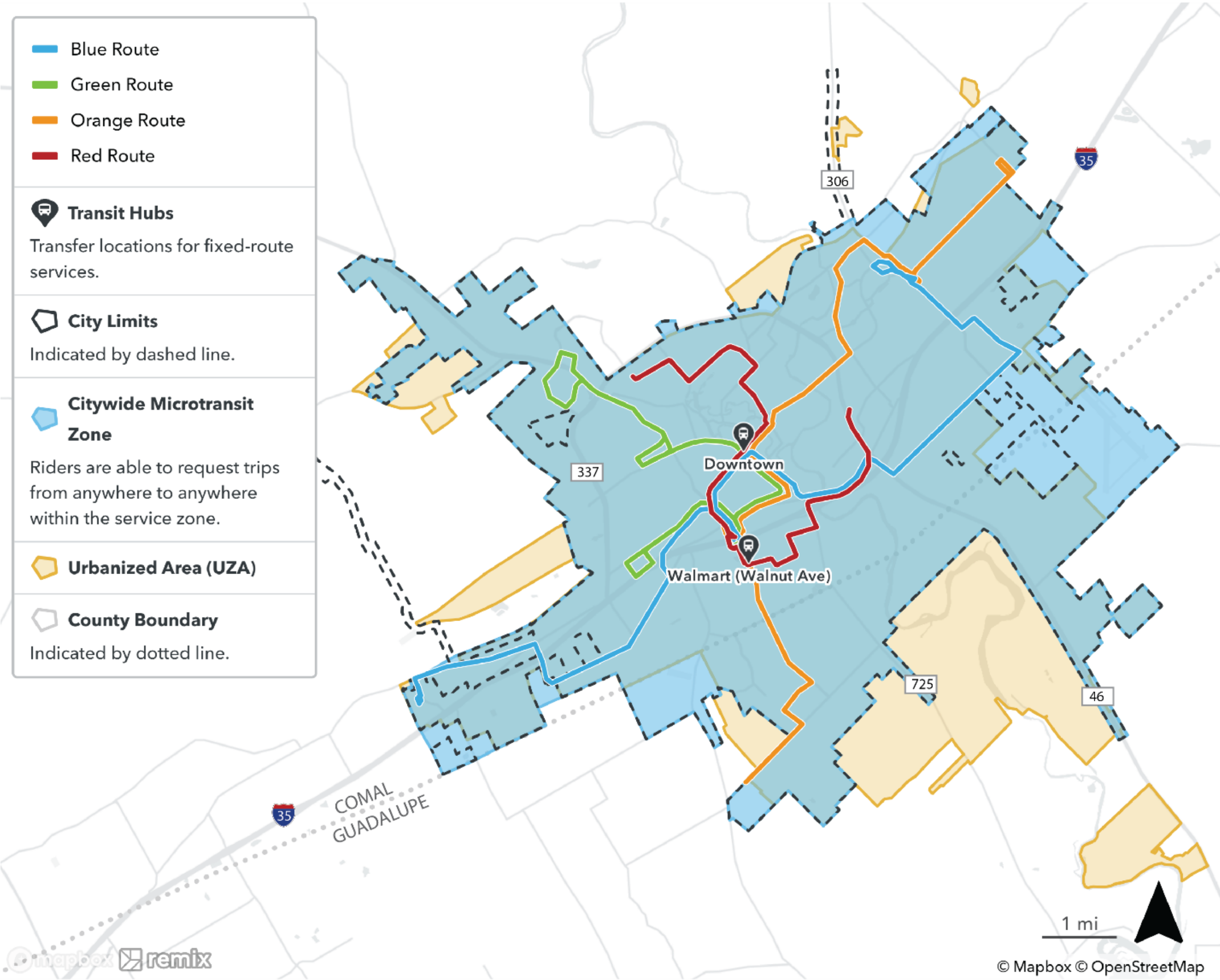
[23] ATG estimated calculation as updated using the Consumer Price Index (CPI) calculator (https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=6%2C000.00&year1=201901&year2=202301)

[24] Sourced from: https://pedestrianobservations.com/2019/04/12/little-things-that-matter-bus-shelter/and updated using the CPI calculator (https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=6%2C000.00&year1=201901&year2=202301)

Long-Term

Once all four routes are launched, the network will appear as shown in **Figure 23**.

Figure 23. Long-Term Transit Network (Microtransit with Four Bus Routes)



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Funding Transit Service

The City of New Braunfels will be eligible to receive funding through FTA formula and other discretionary grant programs once designated as a Direct Recipient. Federal funding for small UZAs is apportioned to the State, so the City must establish an Urban Transit District to qualify for FTA formula funding through TxDOT as well as separate State funding for transit. The MPO for the area prepares a Unified Planning Work Program (UPWP), Metropolitan Transportation Plan (MTP), and Transportation Improvement Program (TIP), which enable transit providers to access funding opportunities. Since marketing and promotional activities to raise awareness and attract riders may need to take place before FTA and TxDOT transit funding is established, New Braunfels has already earmarked funds for related startup costs.

Federal Funding Opportunities

Financing the construction, operation, and maintenance of public transportation systems involves many different types of funding sources, including formula-based grants and other discretionary programs offered by FTA. FTA typically offers many distinct discretionary grants, but the available funding and focus of the programs changes over time and with changes in the Federal administration. Currently, under the Bipartisan Infrastructure Law (BIL), all of FTA's discretionary grant programs focus on promoting equity in transportation and supporting the transit industry's role in combatting climate change. The largest grants key to New Braunfels' implementation of this TDP are summarized below.

Urbanized Area Formula Funding (5307)

For small UZAs like New Braunfels, 5307 funding is typically the primary source of revenue. These resources are made available for transit capital and operating assistance as well as planning, engineering, design, and evaluation of transit projects and other transportation-related studies. Funding is apportioned based on legislative formulas, which for small UZAs is based on population, low-income population, and population density. The federal share for capital expenses must not exceed 80% of project costs in most cases while for operating assistance, the funding share is 50-50 between federal and local funding.

Grants for Buses and Bus Facilities (5339)

The Grants for Buses and Bus Facilities program makes Federal resources available to recipients that operate fixed-route bus service. Eligible activities include replacement, rehabilitation, and purchasing of buses and related equipment as well as construction of bus-related facilities. Funding is provided by formula (5339a) to eligible recipients as well as on a separate, competitive basis under two sub-programs. The first discretionary sub-program (5339b) provides additional funding beyond the formula funds while the Low or No Emissions Vehicle Program (5339c) specifically funds the purchase or lease of low or no emission vehicles and related equipment or facilities as well as workforce development and training activities that support such advanced technologies.

As previously stated, the federal share of eligible capital costs typically does not exceed 80% of the project cost, but for certain projects related to the ADA and the Clean Air Act, including all low-no emission projects, the Federal share can be as much as 85% of a total bus cost and 90% of the cost of leasing or acquiring low- or no-emission bus-related equipment and facilities.

State and Local Funding Opportunities

Generally, federal funding requires a 20% local match for capital assistance and 50% match for operating assistance. This "local match" comes from State and local funding dedicated to transit as well as fare revenue of the transit system itself.

State Funding and the Unified Transportation Program

The General Fund is the primary operating fund for the State of Texas and includes funding for transportation. TxDOT receives federal funding for transportation through the USDOT and administers it to agencies according to the mode of transportation. FTA formula funding allocations pass through TxDOT but are considered federal funding.

TxDOT manages funding for the Unified Transportation Program (UTP). The UTP is fiscally constrained by the planning cash forecast, which means TxDOT can only develop projects that it can afford to execute within potential funding limits. TxDOT's transportation revenues are comprised of a combination of state funds appropriated by the Texas Legislature and Federal Highway Funds appropriated by Congress. In addition, local governments contribute resources to certain projects to help offset project funding needs.

The UTP is organized into 12 funding categories, each UTP addressing a specific type of project or range of eligible activities. Projects are selected by MPOs, TxDOT districts, certain TxDOT divisions, or the Texas Transportation Commission, depending on the category. In addition, categories may be either project-specific or based on allocations. Funding in project-specific categories is awarded to individual projects around the state, while allocation categories are distributed by formula to TxDOT districts or divisions, which subsequently manage the project selection and programming.

Local Funding and Directly-Generated Revenue

Local governments may allocate funding to transit via their general fund or a variety of dedicated revenue generation strategies. Common revenue streams include sales taxes, property taxes, and parking fees but other, more complex strategies include public private partnerships (PPP), tax-increment financing (TIF) districts, and transportation development districts (TDDs). Transit providers may also directly generate revenue through fare collection and advertising on vehicles and facilities. For small UZAs, fare revenue typically makes up a small portion of overall revenue, around 10%.

Areas for Future Study/Consideration

Downtown Shuttle

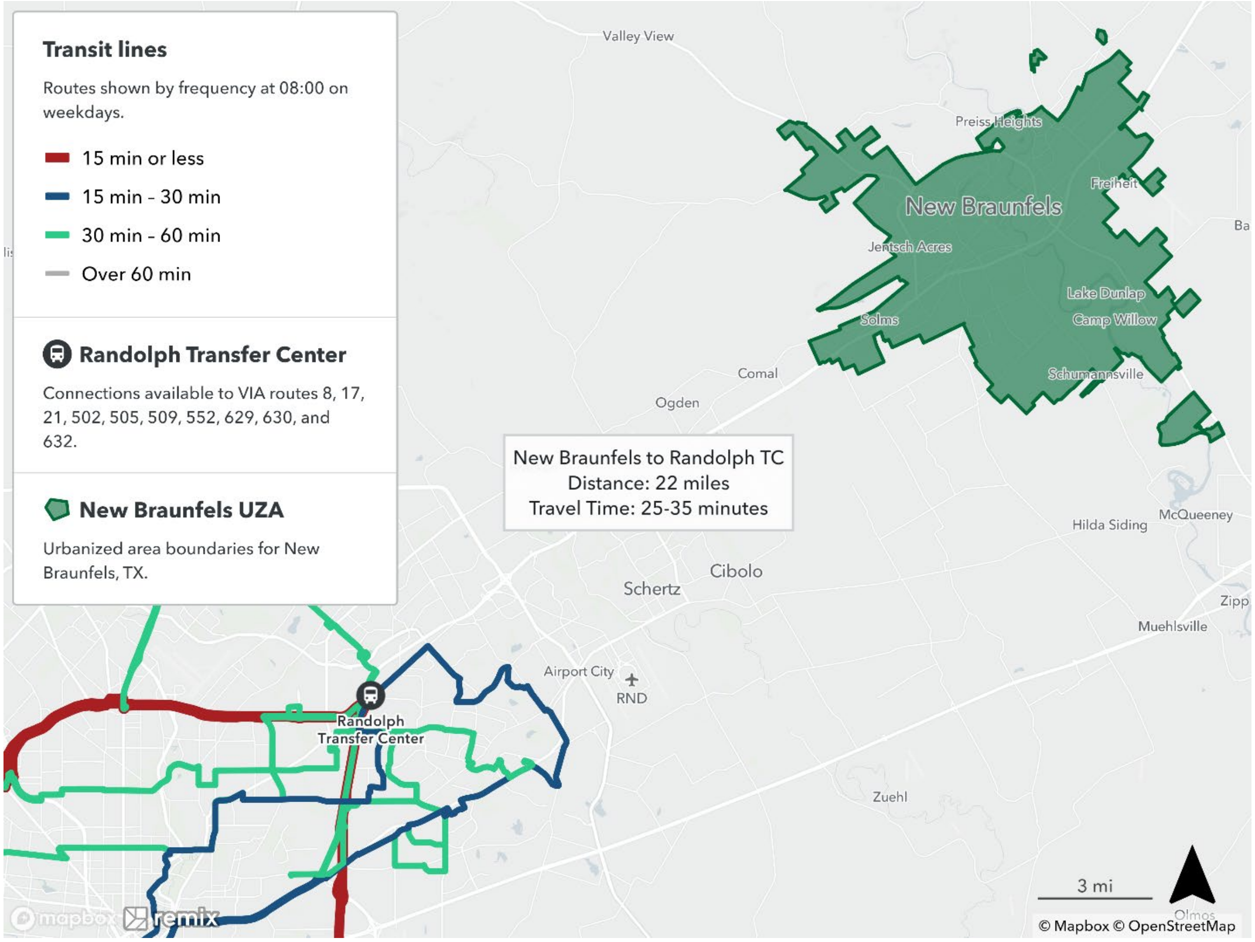
The phasing of the implementation plan includes fine-tuning future fixed-routes to the demands shown by the short-term implementation of microtransit service. Additionally, other concepts may be explored as appropriate based on the ridership demand. If ridership after a year reveals an opportunity for a Downtown Shuttle, that should be explored. Downtown circulators are best suited for areas with sufficient employees, tourists, and shoppers to provide a regular ridership base. A dedicated source of funding is key, and some downtown shuttles (ex. Waco, TX), are at least partially funded by local businesses. Other best practices that lead to the success of downtown shuttles include very frequent service, fare-free service, and unique branding.

Intercity Bus Services and Commuter Routes

Although VIA's services may be out of reach for most potential New Braunfels transit riders, a future commuter connection to the Randolph Transfer Center in San Antonio could provide an important connection to the one of the country's largest cities and transit systems (**Figure 24**). This may be accomplished through an outlying microtransit hub designated outside of the citywide zone or may arise as an outside opportunity by way of additional service provided by VIA at commute times.

The city should remain active in regional transit forums and discussions and be ready and open to seizing opportunities if and when they arise to increase public transportation options between New Braunfels and nearby cities of Seguin, San Marcos, and Austin (**Figure 25**).

Figure 24: Fixed-Route VIA Services Available from the Randolph Transfer Center



Source: Via (Remix)

Figure 25: Regional Opportunities for Intercity Bus Service