Pima Association of Governments

PAGregion.com

APPENDIX A:

Transit Feasibility Study for Picture Rocks and Vail

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GORDLEYGROUP

Via

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List of Acronyms

ACS: American Community Survey

ADA: Americans with Disabilities Act

ADOT: Arizona Department of Transportation

BIPOC: Black, Indigenous, and People of Color

COA: Comprehensive Operational Analysis

CO2: Carbon Dioxide

DAR: Dial-a-Ride

ETA: Estimated Time of Arrival

EPA: Environmental Protection Agency

FTA: Federal Transit Administration

FY: Fiscal Year

LEP: Limited English Proficiency

MPG: Miles Per Gallon

MPO: Metropolitan Planning Organization

PAG: Pima Association of Governments

RTA: Regional Transportation Authority

TAC: Technical Advisory Committee

TBD: To Be Determined

TMS: Transportation Management Software

TNC: Transportation Network Company

TPC: Transportation Planning Committee

VMT: Vehicle Miles Traveled

WPCCC: Western Pima County Community Council

SECTION 01

Introduction

Pima Association of Governments (PAG) is studying the feasibility of introducing microtransit services in the greater Tucson region and evaluating existing dial-a-ride services. Microtransit is a flexible transit service that uses enhanced technology to allow passengers to request on-demand trips. Microtransit operates as a shared-ride model: passengers with similar request times and pickup and drop-off locations may be paired together and served by the same vehicle.

The study assesses needs and opportunities to provide transit in areas without service and to improve existing transit service in underserved areas. Currently, transit service is offered in the county in suburban and rural areas with a combination of fixed-routes and dial-a-ride services. The study seeks to determine if those service models are the most effective, from an operational standpoint and from the rider perspective, while also making recommendations to improve services.

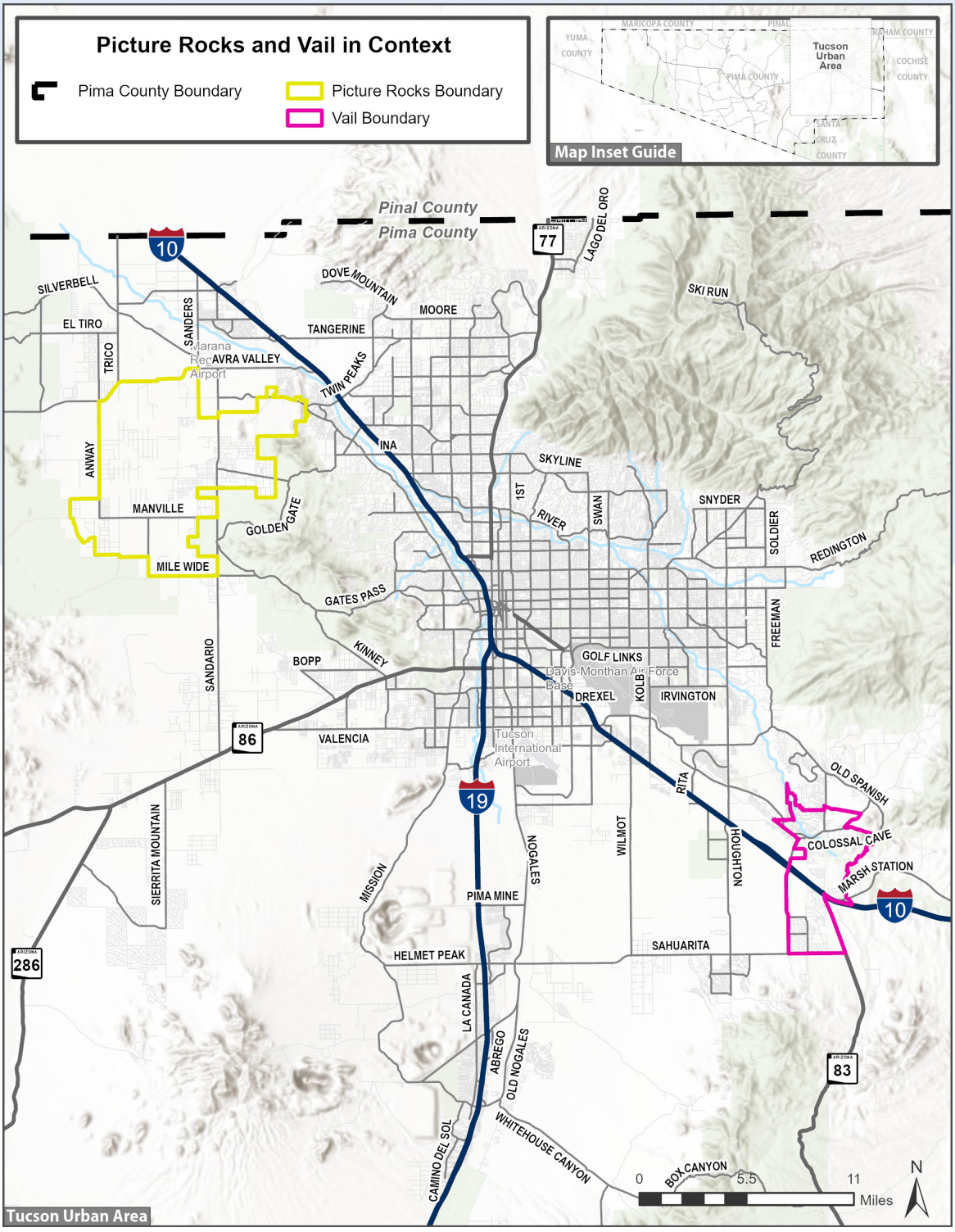
The areas of Picture Rocks and Vail are being studied in parallel with the larger microtransit analysis to explore the feasibility of providing transit service to these areas, which are not currently served by any transit. Besides microtransit, other modes of transit, including fixed-route and dial-a-ride services, are being studied in Picture Rocks and Vail. This Comprehensive Transit Planning Study will identify which type of transit service, if needed, will best serve the travel demand of these communities.

1.1
Background

PAG is the metropolitan planning organization (MPO) covering Pima County. As PAG is an association of governments, Pima County, City of Tucson, City of South Tucson, Town of Marana, Town of Oro Valley, Town of Sahuarita, the Pascua Yaqui Tribe, the Tohono O'odham Nation, and the Arizona State Transportation Board, which serves as an advisor to the Arizona Department of Transportation (ADOT), are member agencies of PAG. PAG is governed by a nine-member Regional Council, made up of the chief elected or appointed official from each of the member governments.

PAG manages the Regional Transportation Authority (RTA), a state-established political subdivision within Pima County. The RTA serves as the fiscal manager of the 20-year voter-approved regional transportation plan passed in 2006 and the voter-approved half-cent sales tax that funds it. The RTA oversees plan delivery of transportation improvements across the greater Tucson region. The original plan and tax measures are set to expire at the end of June 2026. The RTA is currently developing a new 20-year plan called RTA Next, which similarly will require voter approval of both the plan and related half-cent sales tax. The plan is anticipated to be considered by voters in Spring 2026.

Figure 1: Picture Rocks and Vail in Context



SECTION 02

Goals and Objectives

The following goals have guided this study:

- Identify potential service models that could serve Picture Rocks and Vail
- Explore the feasibility of providing microtransit to areas that lack access to transit
- Identify appropriate microtransit service models and prepare the implementation plan
- Evaluate transportation carbon emissions through increased transit use and reduction of single occupancy vehicles

SECTION 02

Transit Needs Assessment

This section analyzes demographic profiles and travel patterns to determine the need for transit in Picture Rocks and Vail.

2.1

Socioeconomic Conditions

Certain socioeconomic and demographic characteristics of a community may indicate that there is a higher need for public transit service. High population and employment density indicate high trip potential that may correlate with high transit use. Additionally, indicators such as youth population, senior population, minority status, population under 200% of the federal poverty line, population with limited English proficiency, and zero-car households may reveal neighborhoods with higher transit-dependent populations. This section describes these socioeconomic conditions using data from the 2018-2022 American Community Survey at the census tract geographic level. Then, this data is combined into one index known as a "transit propensity score" that shows the census tracts with the highest overall transit need.

Table 1: Socioeconomic and Demographic Summary

Demographic Indicators	Arizona	Pima County	Tucson Urbanized Area
Population Density (people/sq mile)	**63.1**	**113.4**	**2,449.2**
Employment Density (people/sq mile)	**25.3**	**38.4**	**898**
Percent of Population Youth	**22%**	**20%**	**20%**
Percent of Population Senior	**18%**	**20%**	**20%**
Percent of Population People of Color	**33%**	**34%**	**35%**
Percent of Population Under 200% of Federal Poverty Line	**31%**	**34%**	**36%**
Percent of Population with Limited English Proficiency	**4%**	**4%**	**4%**
Percent of Households with Zero Cars	**5%**	**7%**	**8%**

Table 1 summarizes the socioeconomic and demographic characteristics of the State of Arizona, Pima County, and the Census Bureau defined Tucson Urbanized Area (which encompasses populated areas spanning the City of Tucson, the Town of Oro Valley, parts of the Town of Marana, Town of Sahuarita, South Tucson, and surrounding unincorporated areas).

Population under 200% of the federal poverty line, population with limited English proficiency, and zero-car households may reveal neighborhoods with higher transit-dependent populations.

PIMA COUNTY

34% **Under 200% Poverty Line**

4% **Limited English Proficiency**

7% **Households with Zero Cars**

2.1.1

POPULATION DENSITY

Picture Rocks

Population density (people per square mile) is a strong indicator of public transit need, as the higher trip potential is conducive to transit ridership. Population density is greatest in downtown Tucson and generally decreases farther from the city center. **Figure 2** shows the population density in the Picture Rocks area. Population density in Picture Rocks is low (less than 1,000 people per square mile).

Vail

Population density for Vail is higher than Picture Rocks, with most of the density concentrated in the northwest corner of the community, where residential development is most established as seen in **Figure 3** to the right.

Figure 2: Population Density by Census Tract in the Picture Rocks Area

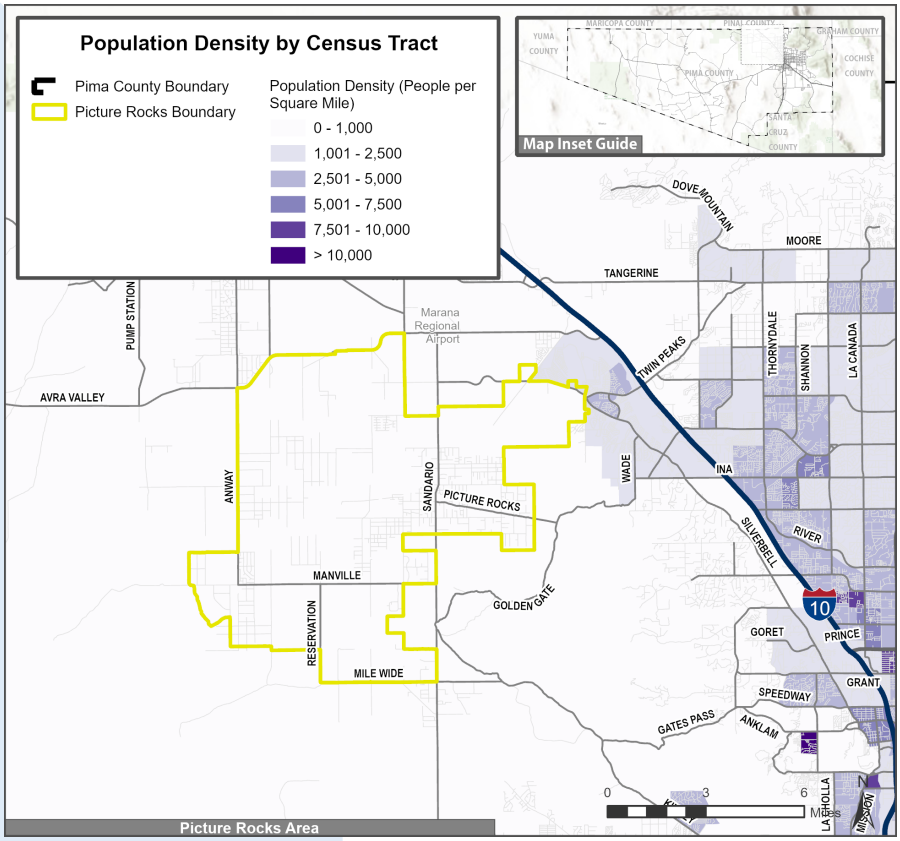
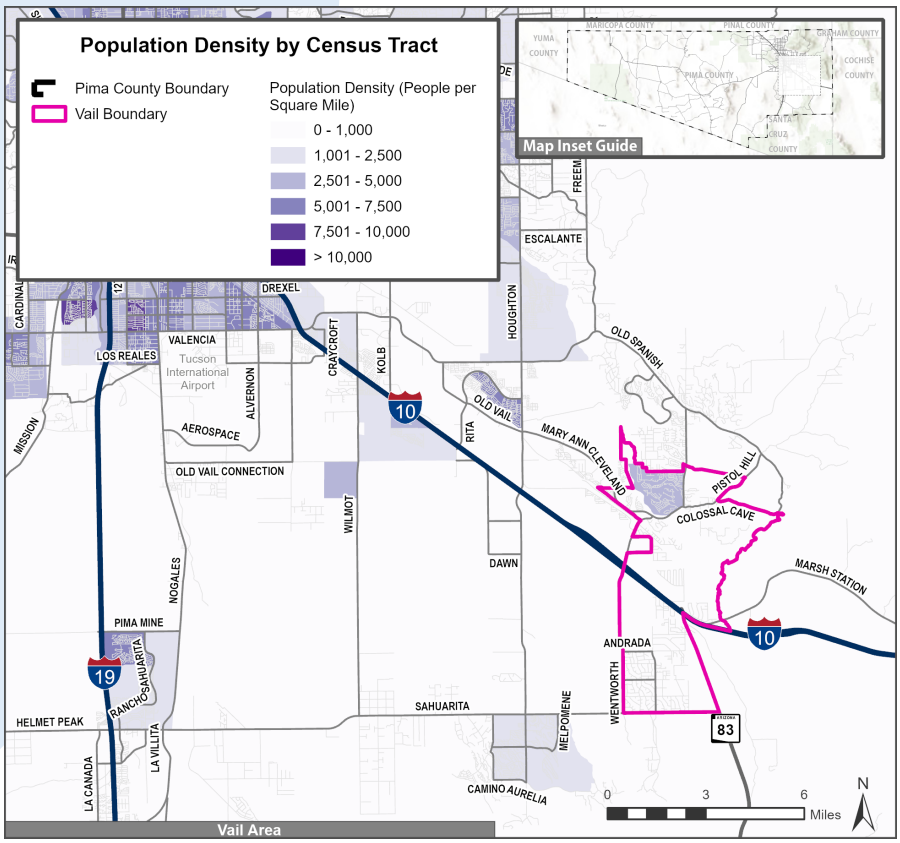


Figure 3: Population Density by Census Tract in the Vail Area



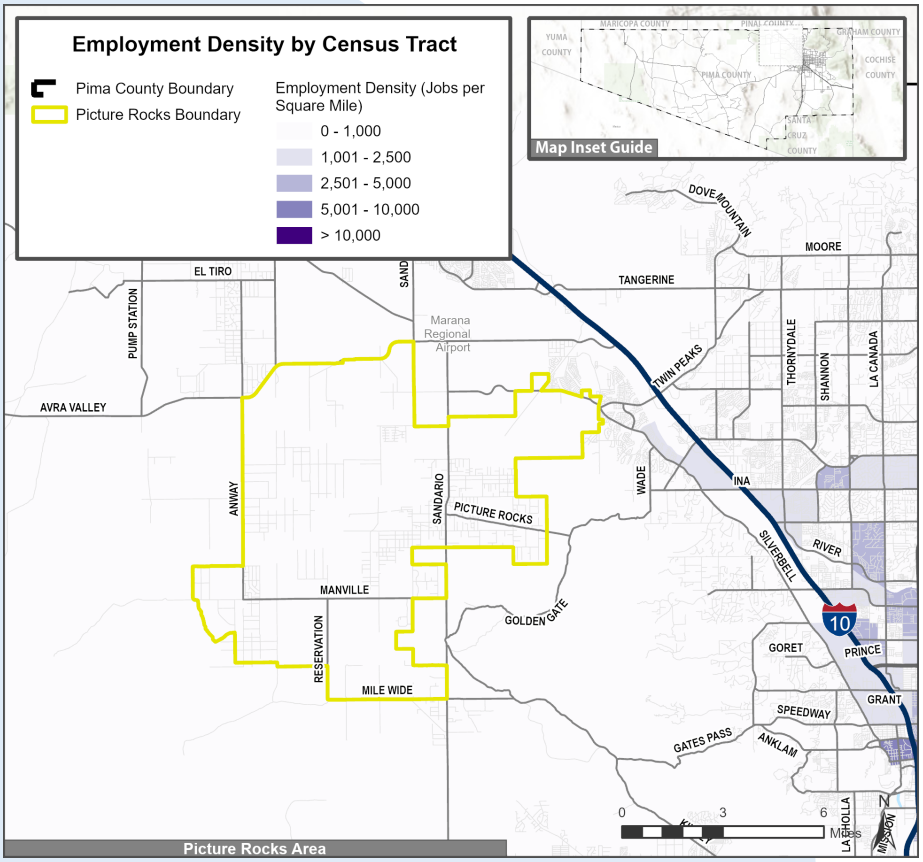


Figure 4: Employment Density in Picture Rocks Area by Census Tract

2.1.2

EMPLOYMENT DENSITY

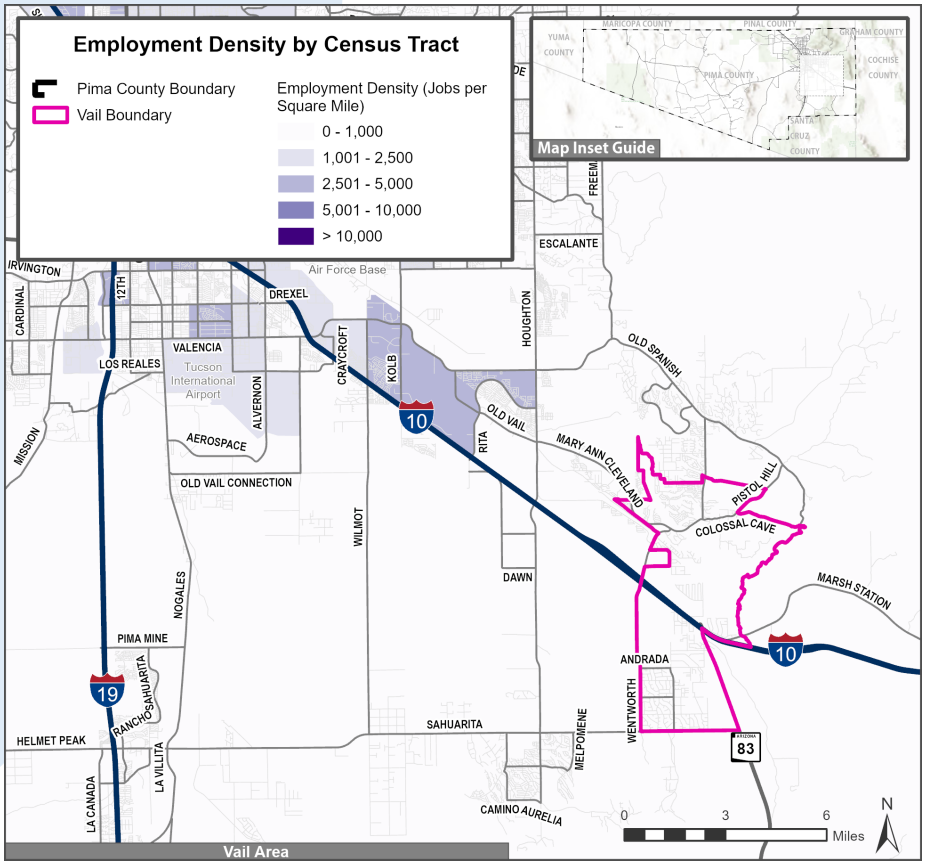
Picture Rocks

Job density, which is the number of jobs per square mile, indicates locations where there are high commute trips that may be served by transit. Improving transit near these employment centers improves accessibility of job opportunities to a larger population. Employment density in the Picture Rocks area is less than 1,000 jobs per square mile, as seen in **Figure 4** to the left.

Figure 5: Employment Density in Vail Area by Census Tract

Vail

Employment density in Vail is also less than 1,000 jobs per square mile as seen in **Figure 5.** Both communities have low employment density, indicating the need for residents to commute outside their communities for employment.



2.1.3

YOUTH POPULATION

Picture Rocks

Based on national trends, younger people may rely on public transit more often due to lifestyle factors and may not have access to personal vehicles. **Figure 6** shows the percentage of the population that is under 18 years old in Picture Rocks. The population data indicates that less than 20% of the Picture Rocks community is under the age of 18. This is consistent with trends seen in the region where neighborhoods south of downtown Tucson have higher youth populations compared to those to the north of downtown.

Vail

In the Vail area, the percentage of the population under the age of 18 has more variability than that of Picture Rocks, where a higher percentage of youth live north of I-10, with the highest concentration in the northwest corner of the community as seen below in **Figure 7.**

Figure 6: Youth Population in Picture Rocks Area by Census Tract

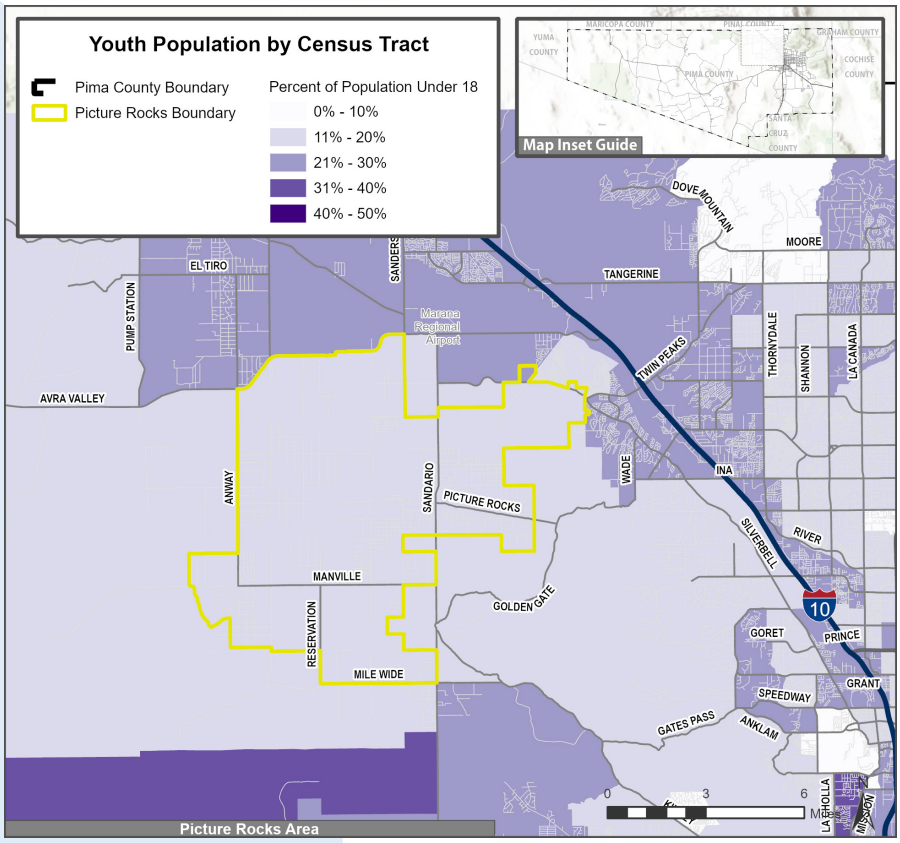
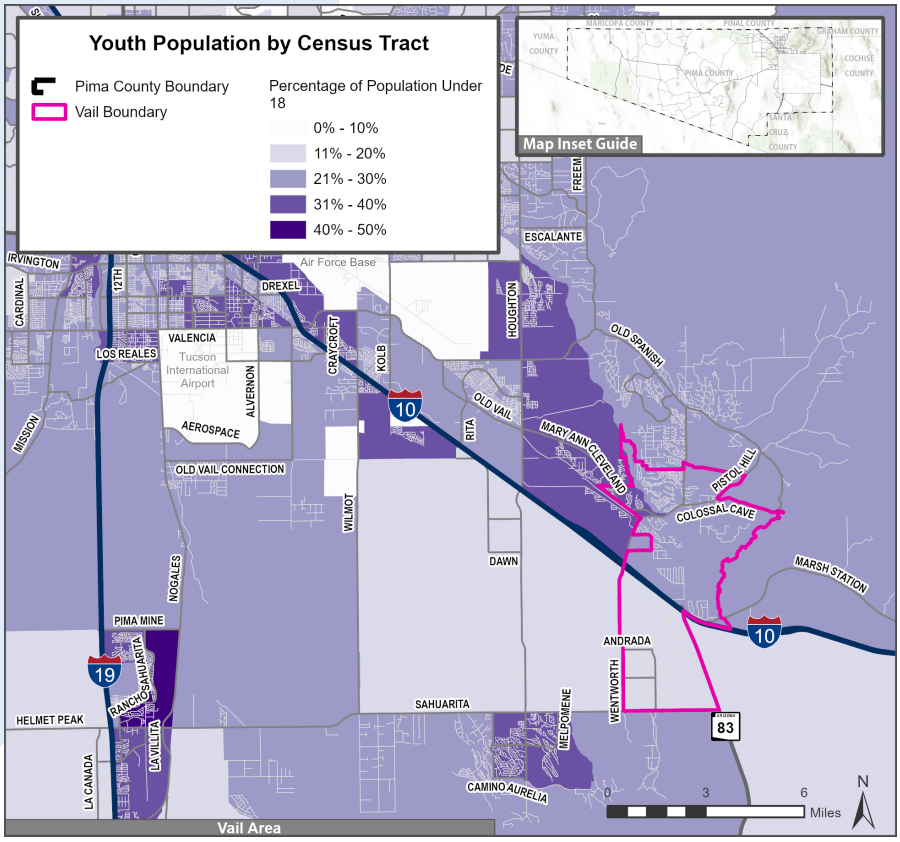


Figure 7: Youth Population in Vail Area by Census Tract



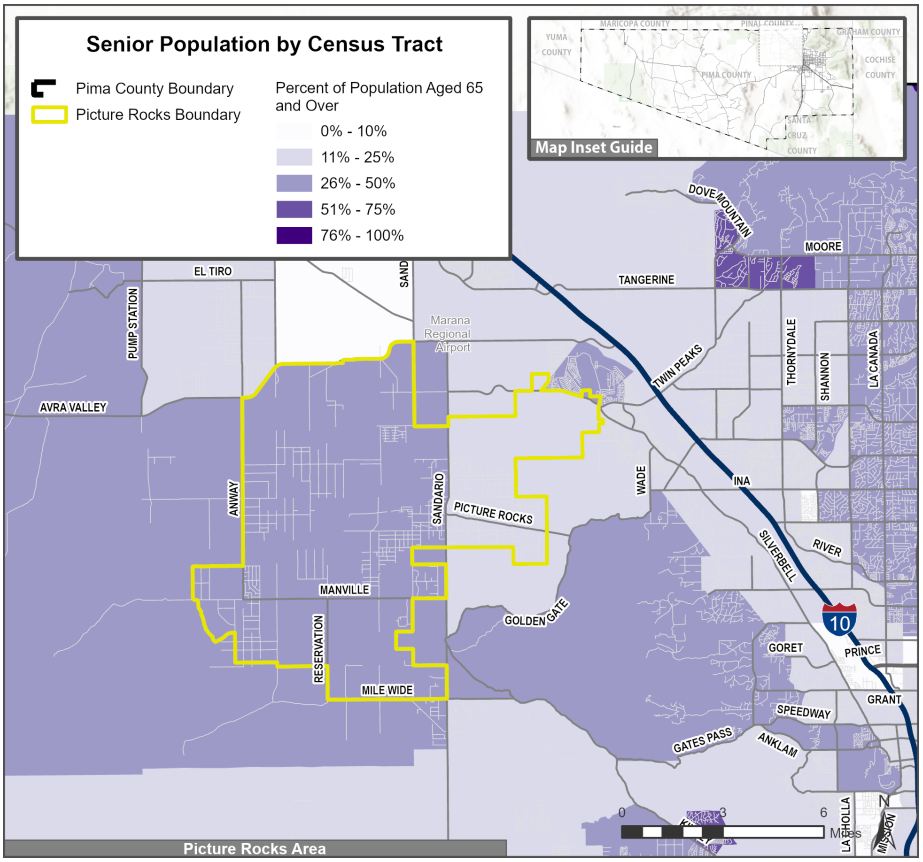


Figure 8: Senior Population Density in Picture Rocks Area by Census Tract

2.1.4

SENIOR POPULATION DENSITY

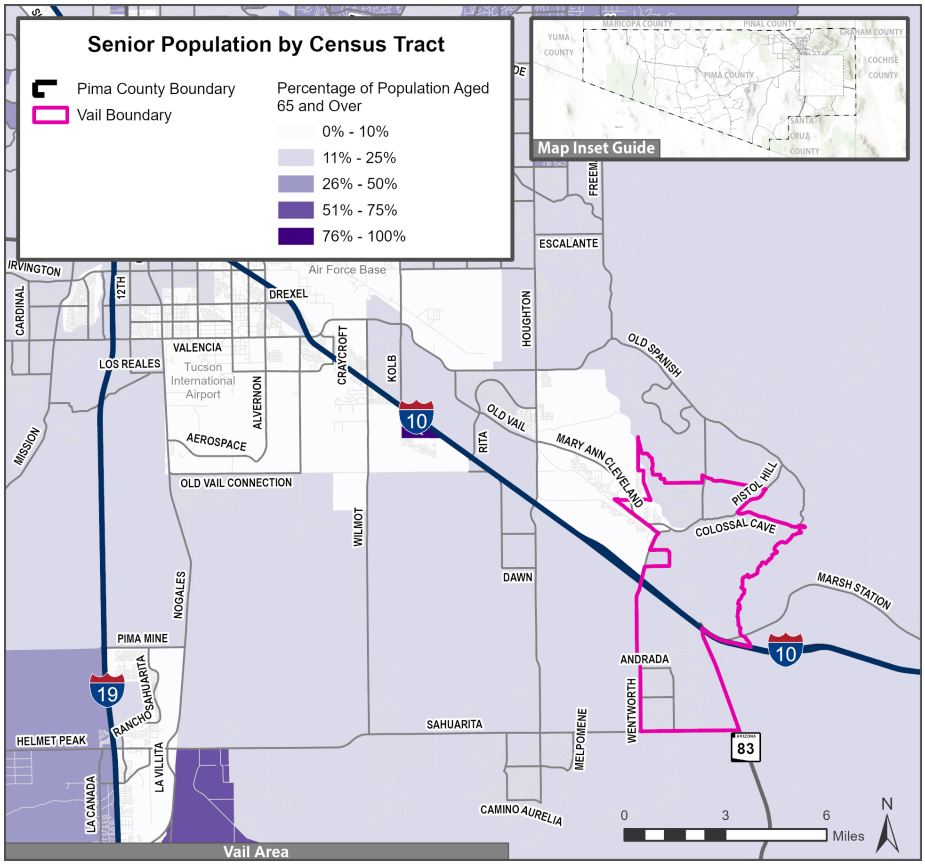
Picture Rocks

Elderly populations are more likely to be unable to drive, making them more likely to rely on public transit for their mobility needs. **Figure 8** shows the percentage of the population that is over 65 years old in the Picture Rocks area, with a higher percentage of the population aged 65 and over living west of Sandario Road.

Figure 9: Senior Population Density in Vail Area by Census Tract

Vail

The percentage of the population 65 and older in Vail is slightly lower than Picture Rocks, with most tracts having 11% to 25% senior population as seen below in **Figure 9.**



2.1.5

PEOPLE OF COLOR

Picture Rocks

Based on national trends, Black, Indigenous, and People of Color (BIPOC) populations tend to have higher rates of transit usage. For the purposes of this analysis, BIPOC status is defined as the percentage of the population that does not identify as White-only. **Figure 10** shows the percentage of the population that identifies as BIPOC in the Picture Rocks area.

Vail

Figure 11 shows the percentage of the population that identifies as BIPOC in the Vail area.

Figure 10: BIPOC Population in Picture Rocks Area by Census Tract

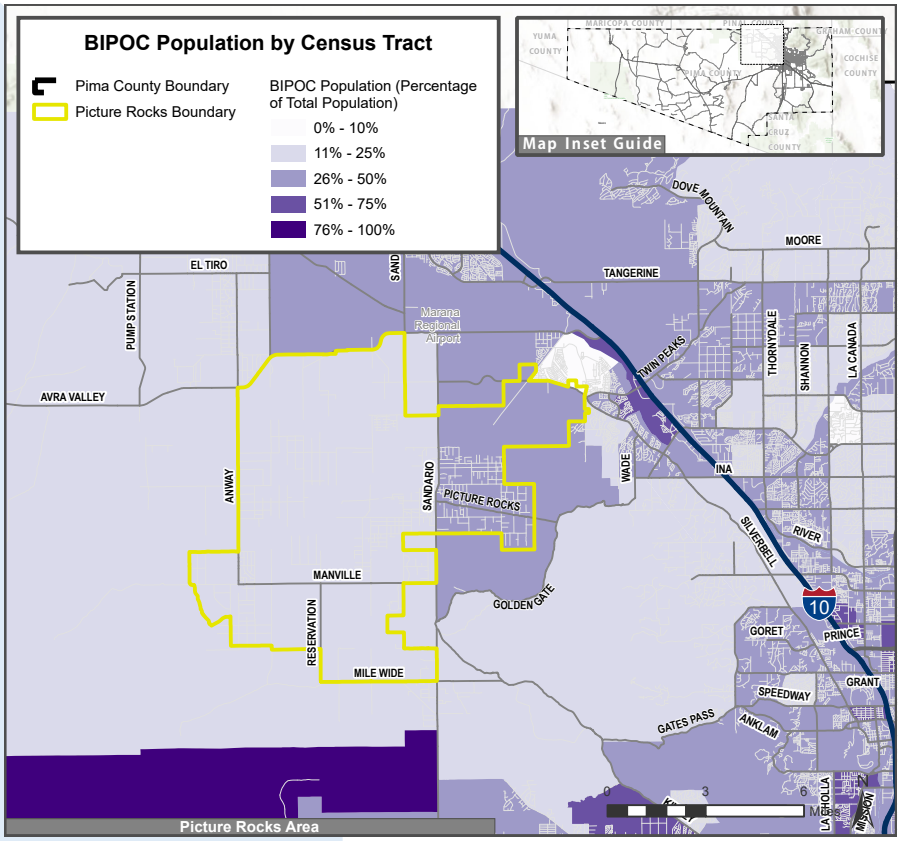
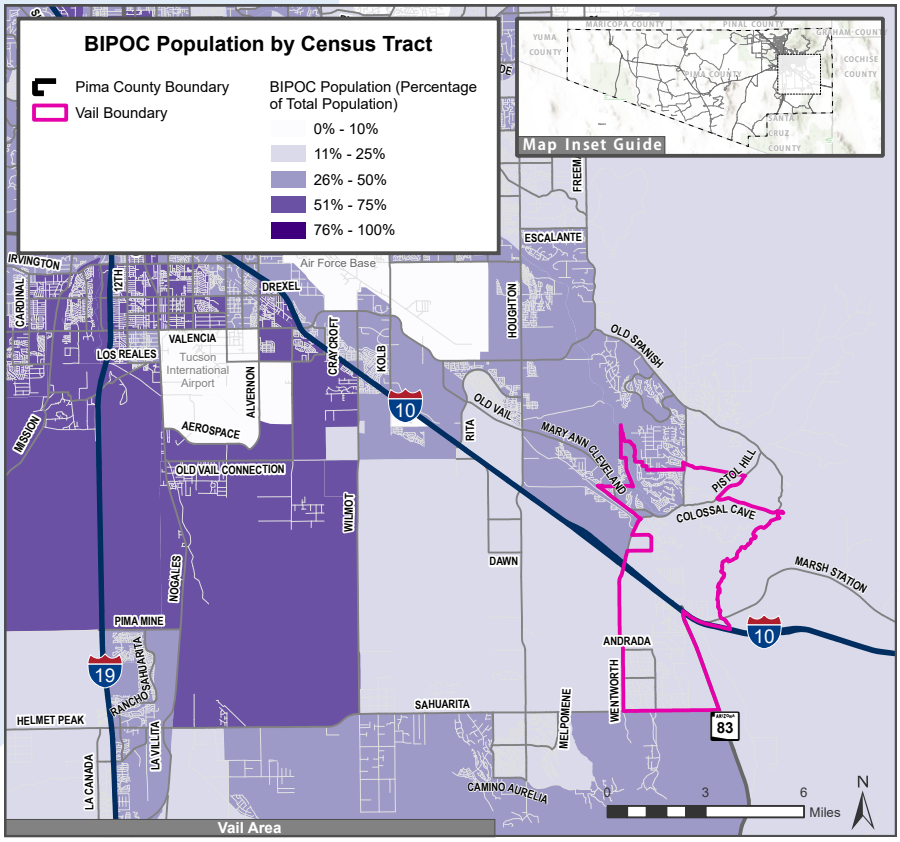


Figure 11: BIPOC Population in Vail Area by Census Tract



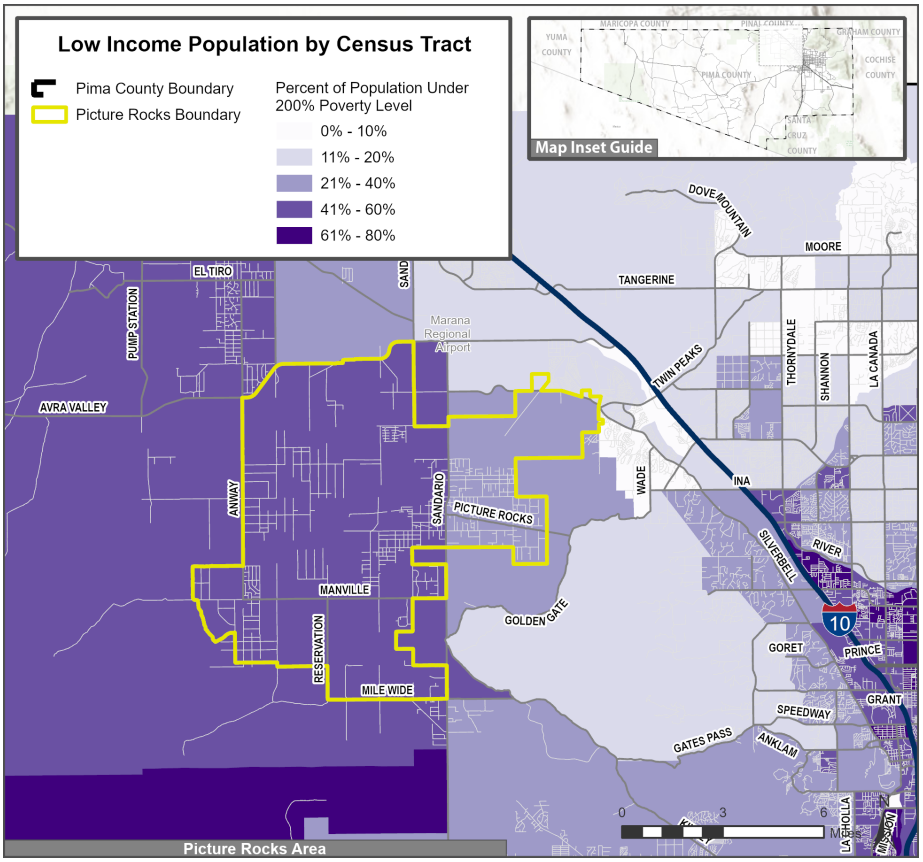


Figure 12: Low Income Population Density in Picture Rocks Area by Census Tract

2.1.6

LOW INCOME POPULATION

Picture Rocks

Personal vehicle ownership is less common among low-income populations, who rely more on public transit for their mobility needs. Improving transit for these populations improves their ability to reach community resources. **Figure 12** shows the percentage of the population under the 200% federal poverty level in the Picture Rocks area.

Figure 13: Low Income Population Density in Vail Area by Census Tract

Vail

The percentage of the population 65 and older in Vail is slightly lower than Picture Rocks, with most tracts having 11%-25% senior population as seen in **Figure 13.**

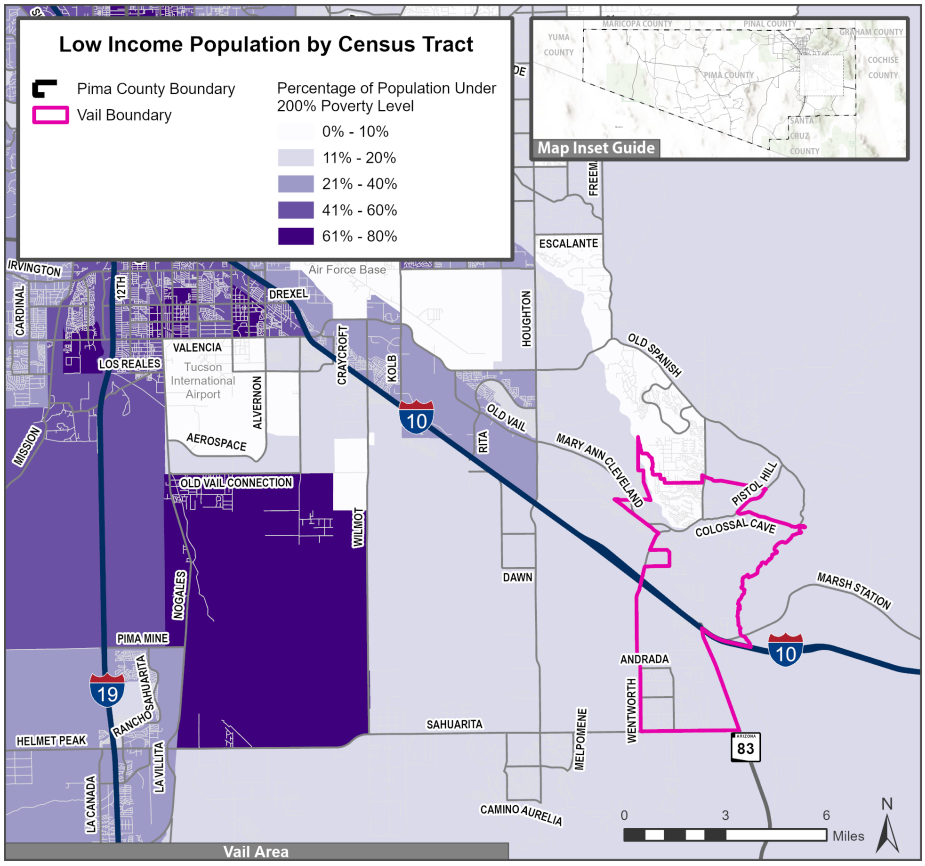


Figure 14: Limited English Proficiency in Picture Rocks Area by Census Tract

2.1.7

LIMITED ENGLISH PROFICIENCY (LEP)

Picture Rocks

People with LEP may require additional resources and support to successfully navigate the existing transportation network and access community resources. **Figure 14** shows the LEP population in the Picture Rocks area. The Picture Rocks area displays a very low percentage of LEP population.

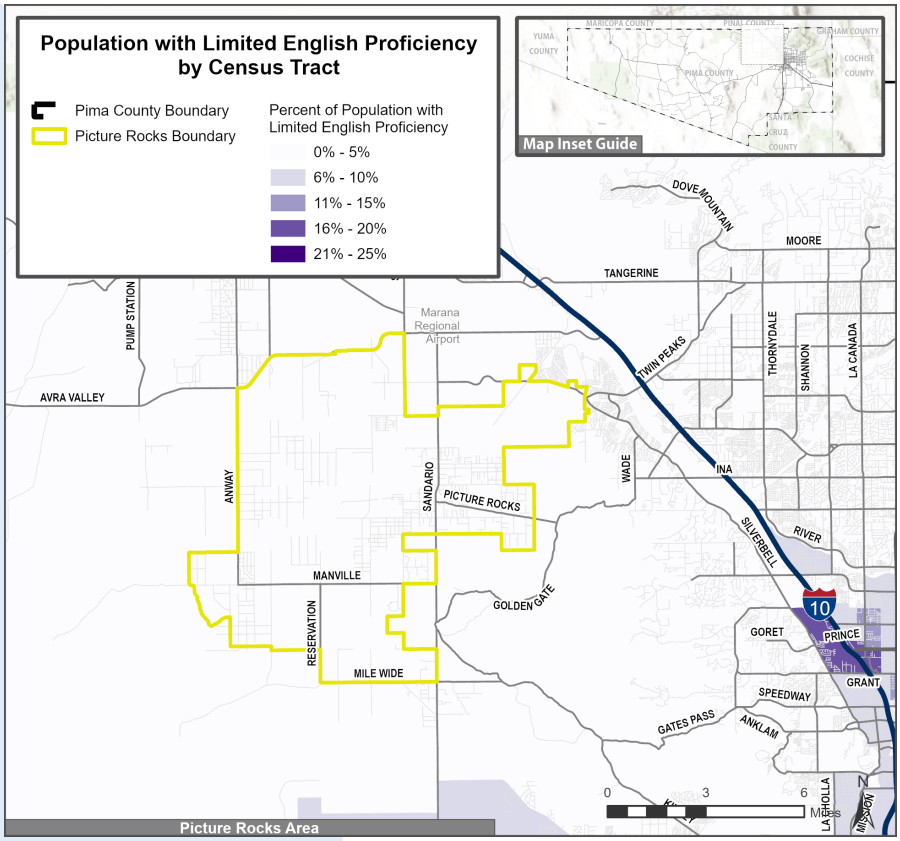
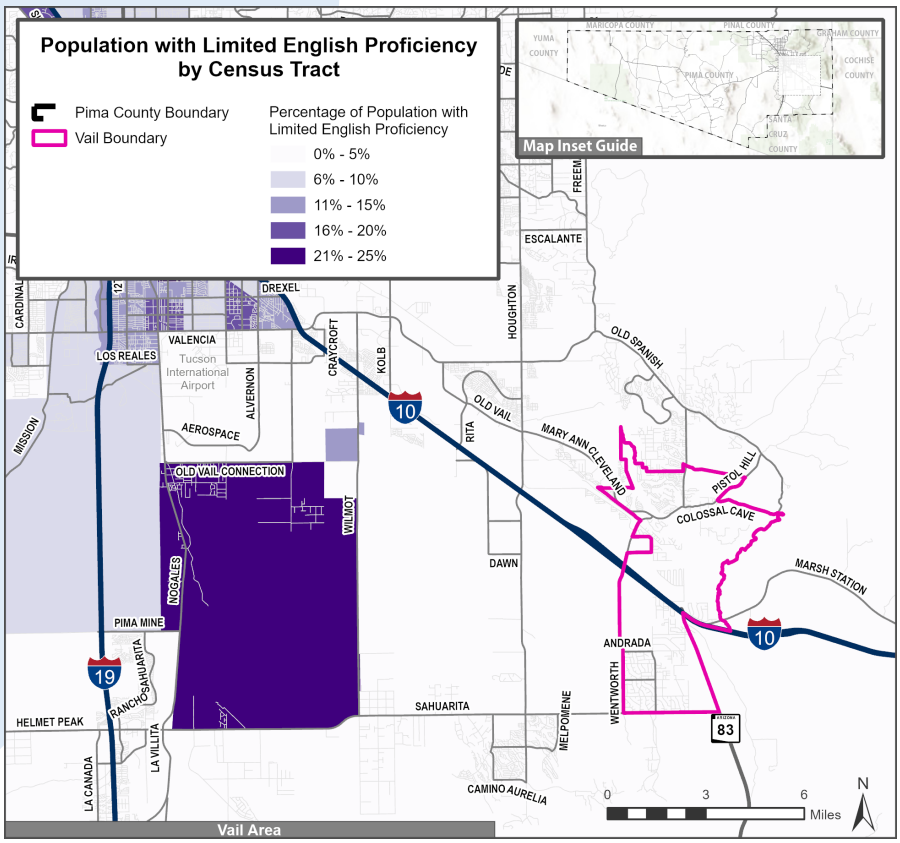


Figure 15: Limited English Proficiency in Vail Area by Census Tract

Vail

The Vail area also displays a very small percentage of LEP population **(Figure 15),** suggesting that language barriers may not be a significant concern in this community.



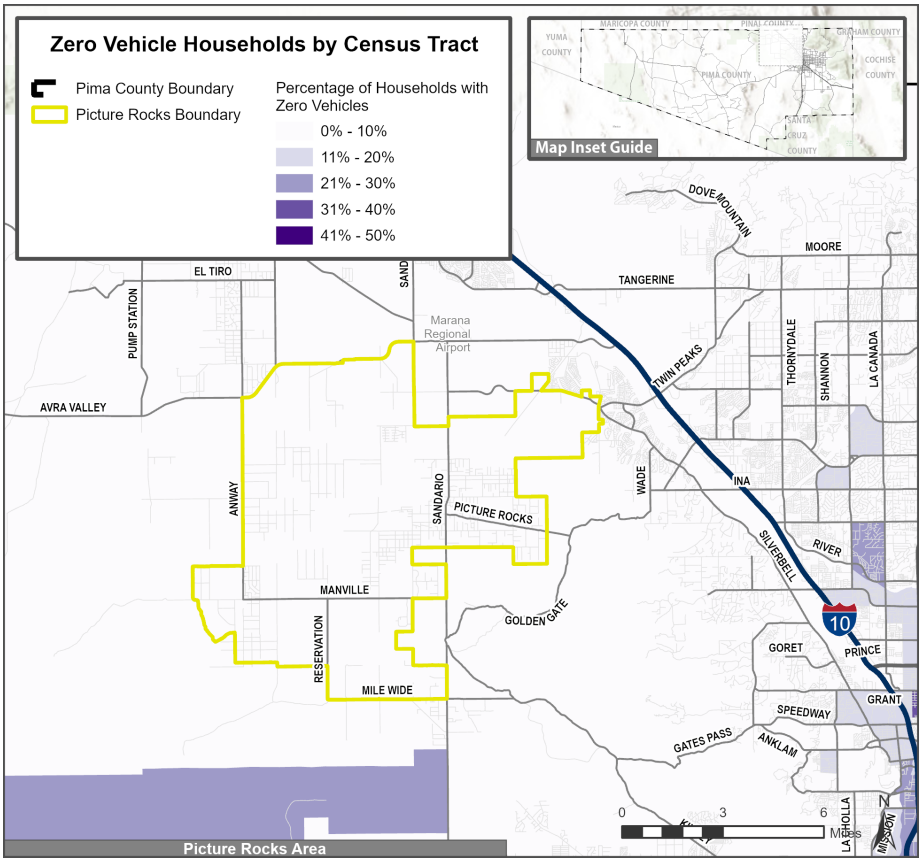


Figure 16: Zero-Vehicle Households in Picture Rocks Area by Census Tract

2.1.8

ZERO-VEHICLE HOUSEHOLDS

Picture Rocks

People living in zero-vehicle households are more likely to rely on public transit for their mobility needs. **Figure 16** maps the percentage of households with zero vehicles in the Picture Rocks area by census tract. Picture Rocks displays a very low percentage of zero-vehicle households.

Figure 17: Zero-Vehicle Households in Vail Area by Census Tract

Vail

The percentage of zero-vehicle households in the Vail area is also notably low, as displayed in **Figure 17**, indicating that most residents have access to personal transportation.

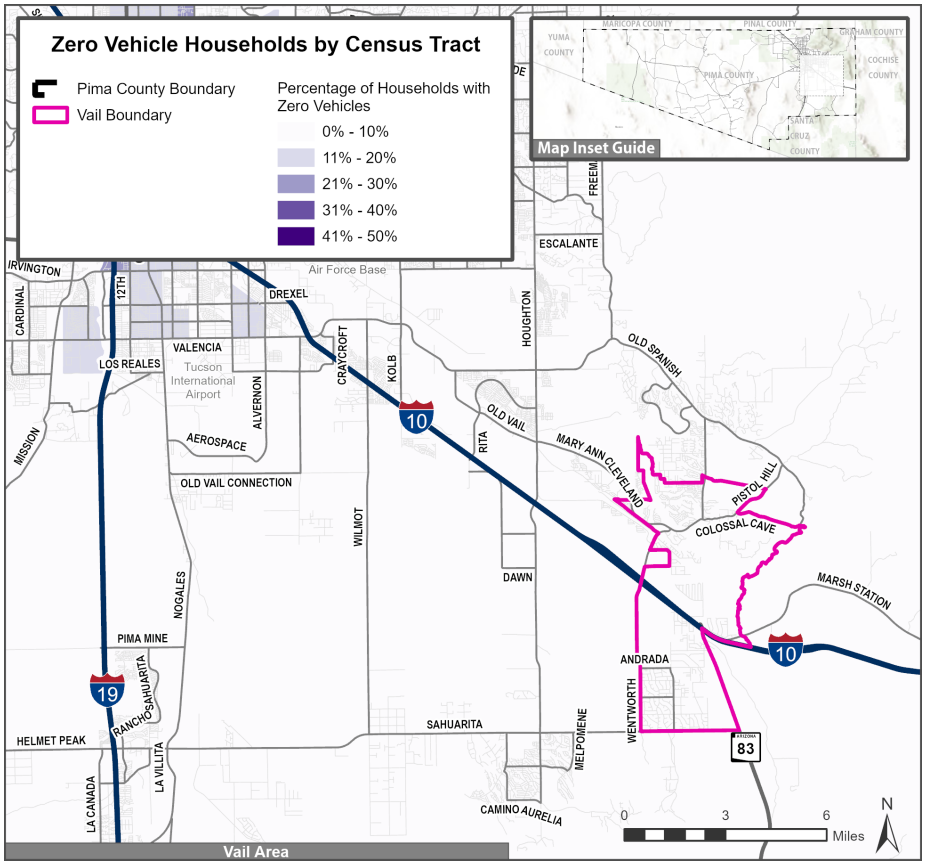


Figure 18: Transit Propensity in Pima County by Census Tract

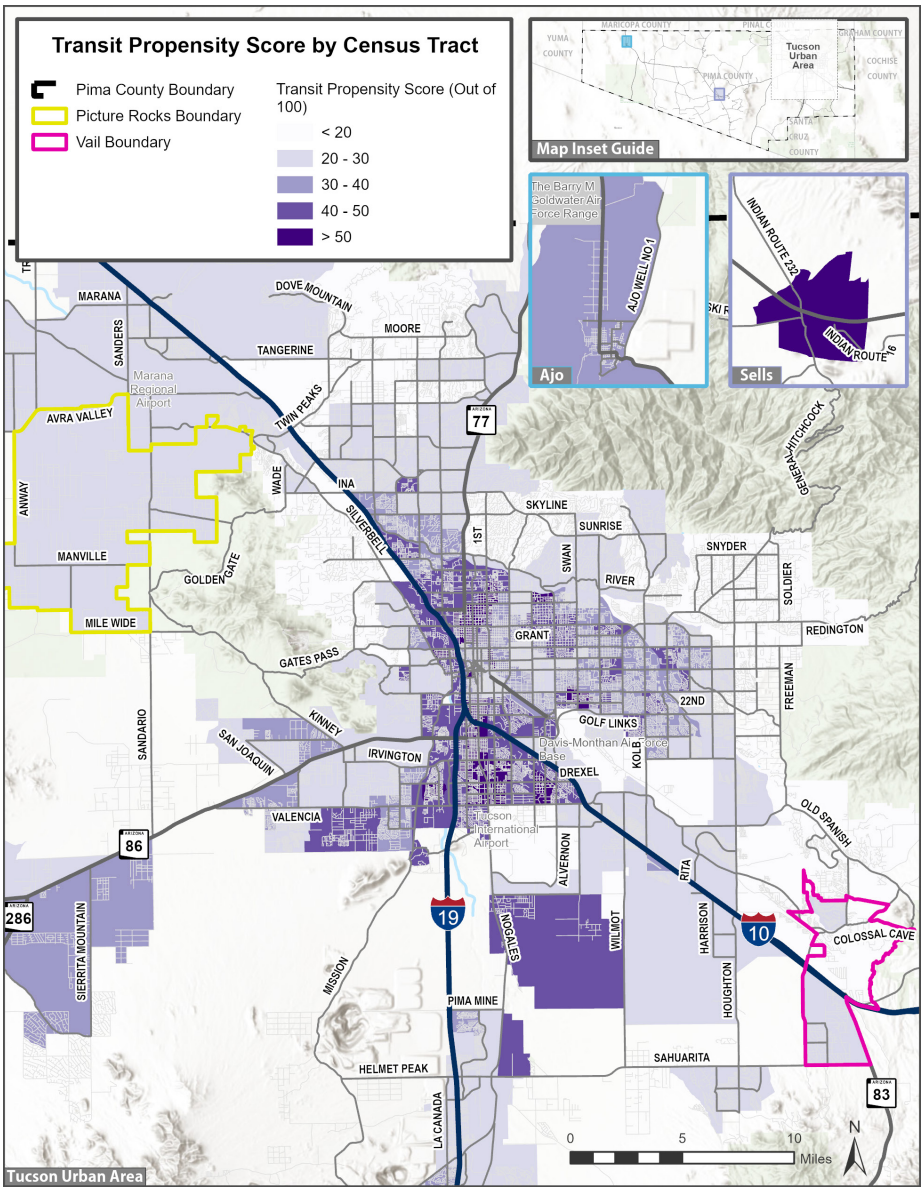


Figure 18 shows the transit propensity score by census tract for the greater Tucson region and Pima County, respectively. The neighborhoods with the highest propensity for transit are the suburbs north, east, and south of downtown Tucson. The Tohono O'odham Nation and the Pascua Yaqui Reservation also score high in this index. Picture Rocks and Vail score low in this index, suggesting that traditional fixed-route public transit is less well suited to serve these communities.

2.1.9

TRANSIT PROPENSITY SCORE

For each census tract, a transit propensity score between 0 and 100 was assigned. The transit propensity score was developed by combining demographic and socioeconomic data into one index to identify which communities have the greatest propensity to use public transit. The score combines indicators of high trip activity, such as population and job density, with socioeconomic characteristics that indicate a higher propensity to take public transit. Each factor was assigned the following weight:

25% Population Density

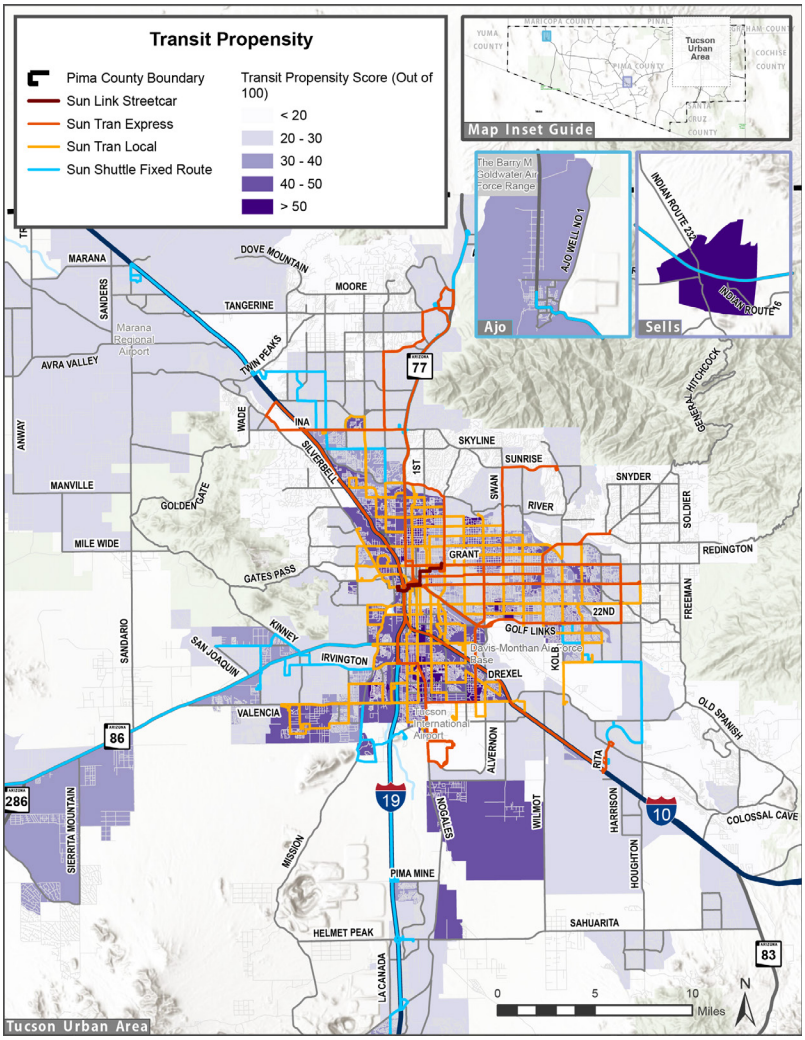
25% Job Density

50% Socioeconomic Characteristics

(youth, seniors, minorities, poverty, LEP, zero-vehicle households)

Note that a community that has a low transit propensity score such as Picture Rocks and Vail, does not necessarily indicate that it should not be served by transit, and vulnerable populations that rely on transit may exist there. In these cases, a service model that provides flexibility and responds to the needs of that community may be considered for implementation.

Figure 19: Transit Propensity by Census Tract and Existing Fixed-Route Transit in Pima County



These results suggest that while the region's core is well suited for fixed-route transit, communities on the periphery like Picture Rocks and Vail may be better served through flexible service models like microtransit.

Figure 19 shows the transit propensity score overlaid with existing fixed-route transit services in Pima County. Existing service generally provides good coverage of locations with high propensity, though service may be expanded in certain areas on the network's fringe to serve additional high-need communities. In locations with high transit propensity, Sun Tran and Sun Shuttle may examine existing service frequencies and spans to ensure the quality of transit service provided meets the needs of those communities. While most high-propensity areas are covered by fixed-route service, lower-scoring communities such as Picture Rocks and Vail still have vulnerable populations who may rely on transit. The regional context helps illustrate why the microtransit study is especially relevant for Picture Rocks and Vail, where microtransit can be considered to better meet community needs.

At the regional level, the transit propensity score highlights strong demand for transit in and around Tucson, where fixed-route service is already established. In contrast, Picture Rocks and Vail have no established transit service and are low scoring, with most census tracts scoring below 20 and only small pockets reaching 20 to 30. These results suggest that while the region's core is well suited for fixed-route transit, communities on the periphery like Picture Rocks and Vail may be better served through flexible service models like microtransit.

Figure 20 shows the transit propensity score by census tract in the Vail area. The majority of the area has a transit propensity score below 20, with only small portions along the northern and western edges reaching a score between 20 and 30, (consistent with residential development in the area). These results highlight that Vail's overall low-density development pattern and disconnected land uses have a low suitability for traditional fixed-route transit service.

Figure 20: Transit Propensity Score by Census Tract in Vail

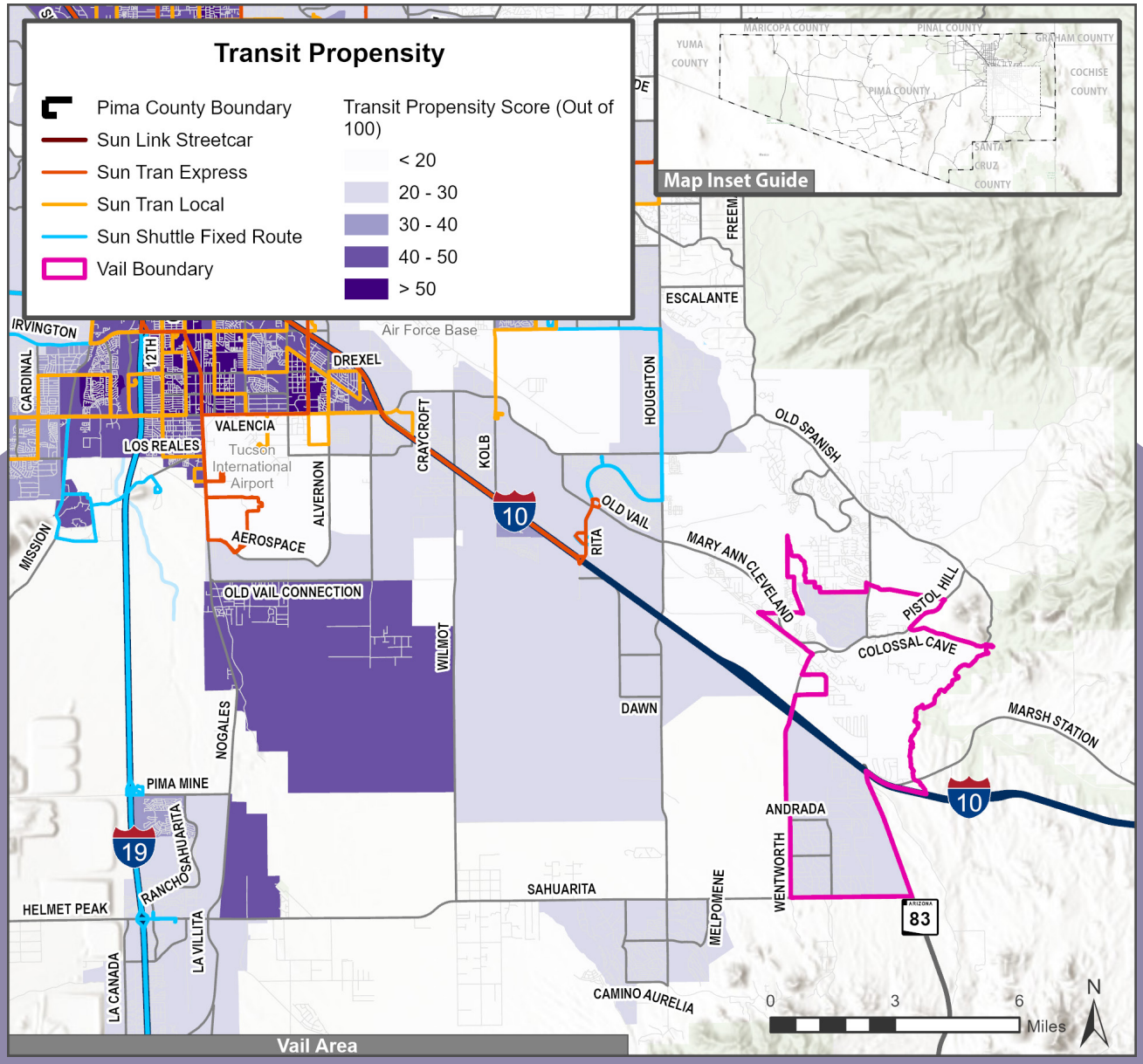
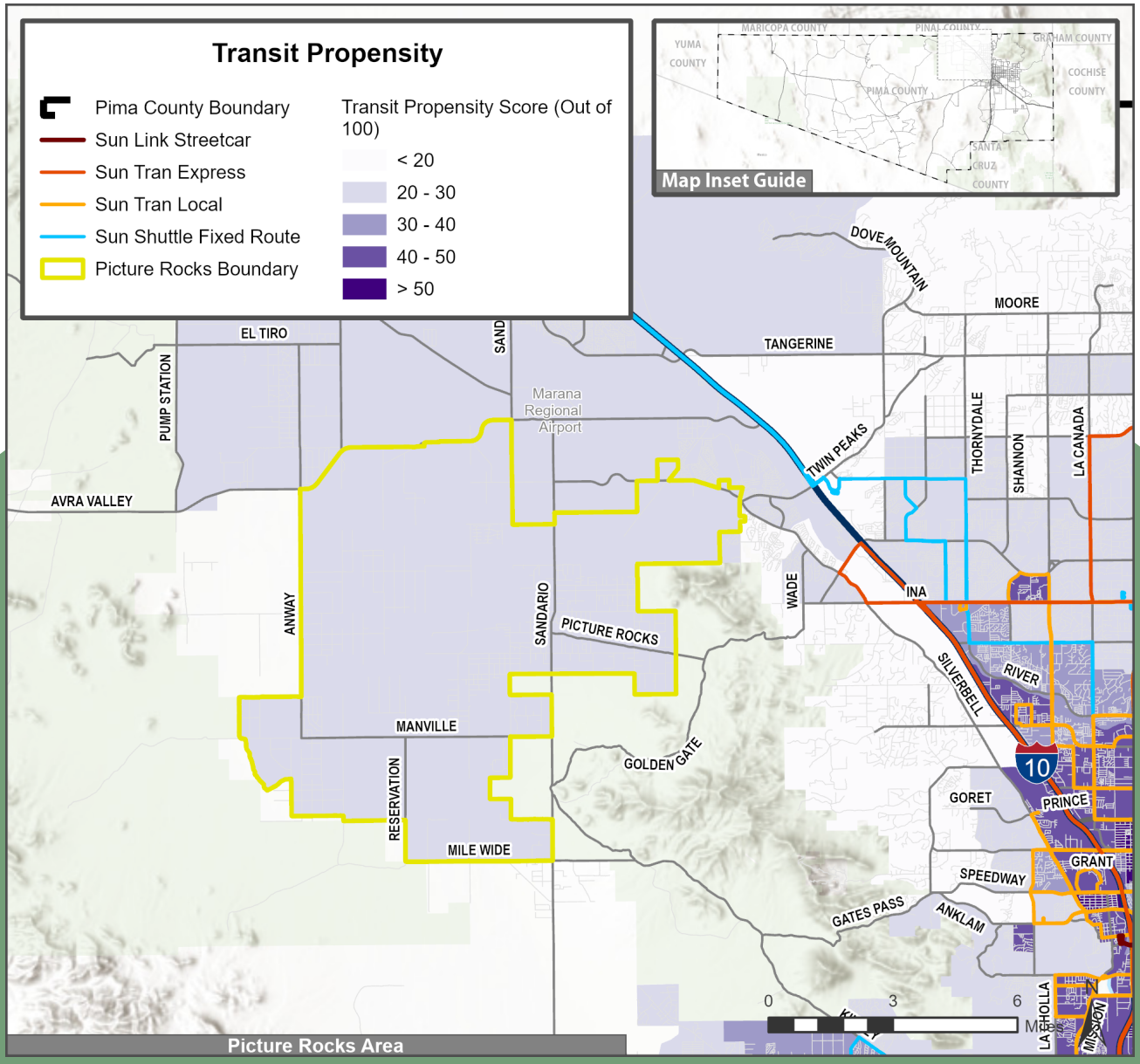


Figure 21 shows the transit propensity score by census tract in the Picture Rocks area. Nearly all census tracts within the community have a propensity score less than 30, indicating very low propensity for transit use. Similar to Vail, Picture Rocks has no existing transit service, and its dispersed, low-density development pattern makes traditional fixed-route transit less suitable for this community.

Figure 21: Transit Propensity Score by Census Tract in Picture Rocks



2.2

Travel Demand

This section analyzes travel demand trends using data from Replica, an activity-based travel demand model. Replica aggregates census data, location-based "probe" data (such as connected devices and credit card transactions), and other sources to simulate the complete activities and movements on a typical day. It provides detailed attributes of each simulated trip, including trip time of day, purpose, mode, and the demographics of the trip taker. Replica data of a typical Thursday in Fall 2023 (the most recent data release available) was used for this analysis.

Private auto is the predominant mode of travel for all trips taken within the County, comprising 87% of all trips, followed by walking and biking. Public transit makes up 1% of all trips taken.

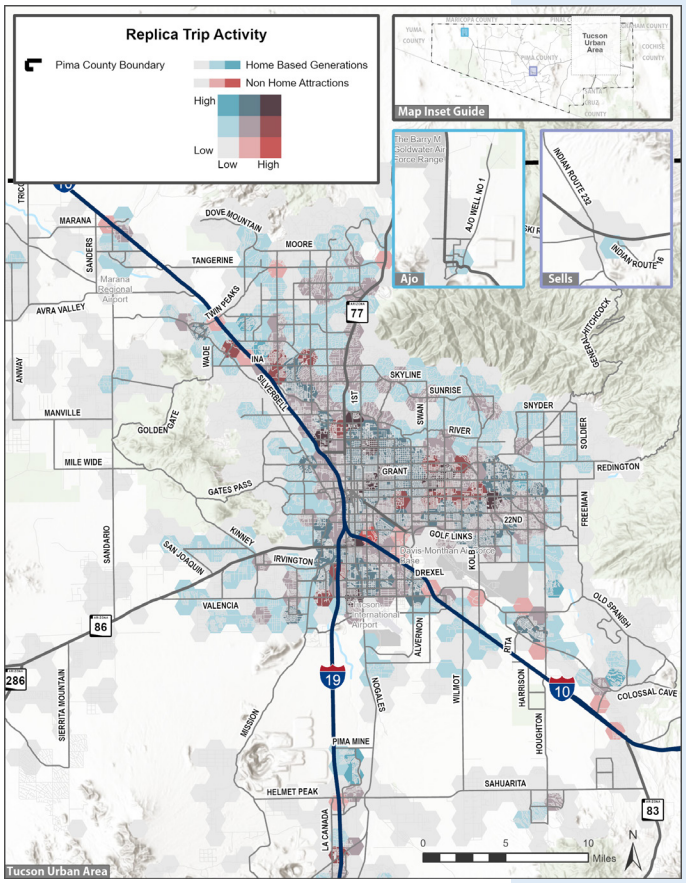


Figure 22: Replica Trip Activity by One-Square-Mile Hexbins in Tucson Urban Area

2.2.1

COUNTYWIDE OVERVIEW

Figure 22 shows a bivariate visualization of home-based trip generation and non-home trip attraction in the greater Tucson area, derived from data from Replica. The geographic unit of this map is a tessellation of one-square-mile hexagons to better show trip hotspots without considering political boundaries. Neighborhoods to the north and east of downtown show the most trip activity of both types, suggesting that there are a mix of land uses and a variety of trip purposes in these areas. The edge of the metropolitan area shows more home-based generations that are likely low-density suburban neighborhoods. Picture Rocks shows low trip activity and is mostly home-based; Vail also shows low trip activity, but has a mix of trip purposes.

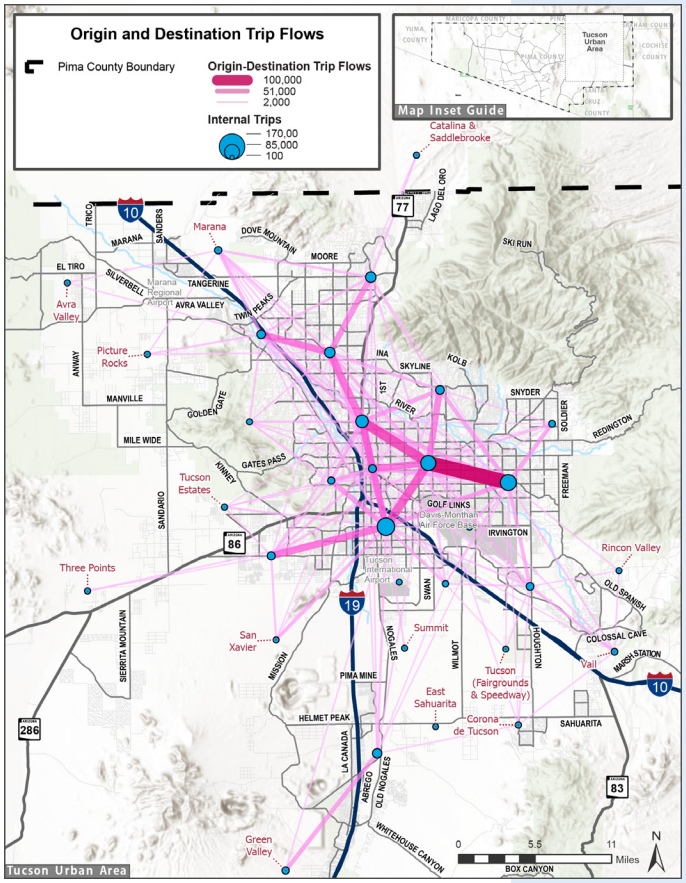


Figure 23: Origin-Destination Trip Flows Between Tucson Area Neighborhoods

Figure 23 shows the origin-destination travel flow between Tucson-area neighborhoods that reveal where trips most commonly start and end. To effectively visualize patterns in travel, broad "neighborhoods" are defined that are approximately equal in area and somewhat follow political boundaries. Trip flows within the same neighborhood are designated as "internal trips," while trip flows between neighborhoods are aggregated together as "trip flows." The results show that trip activity is dispersed over the greater Tucson area, as opposed to being centered around downtown Tucson. The largest trip-generating neighborhoods are those immediately north, east, and south of downtown Tucson. The largest trip flows tend to be shorter in distance and between adjacent neighborhoods.

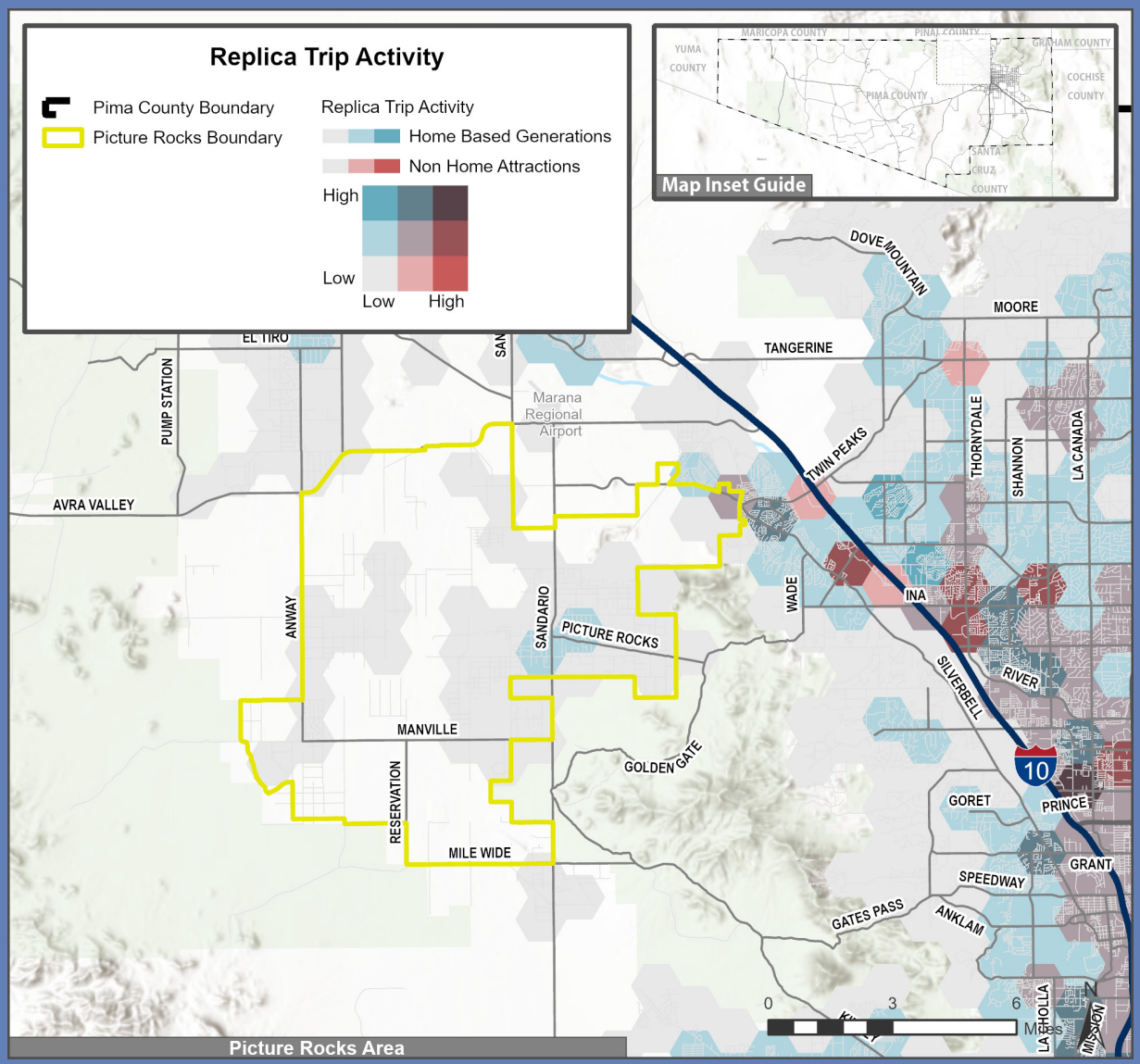
2.2.2

TRAVEL DEMAND IN PICTURE ROCKS AND VAIL

A more detailed travel demand analysis was conducted for Picture Rocks and Vail. In each community, origin-destination trip flows were aggregated to a uniform grid of one-square-mile hexbins. Normalizing the area of each geographic unit can better reveal where travel demand hotspots are and whether they align with current transit service.

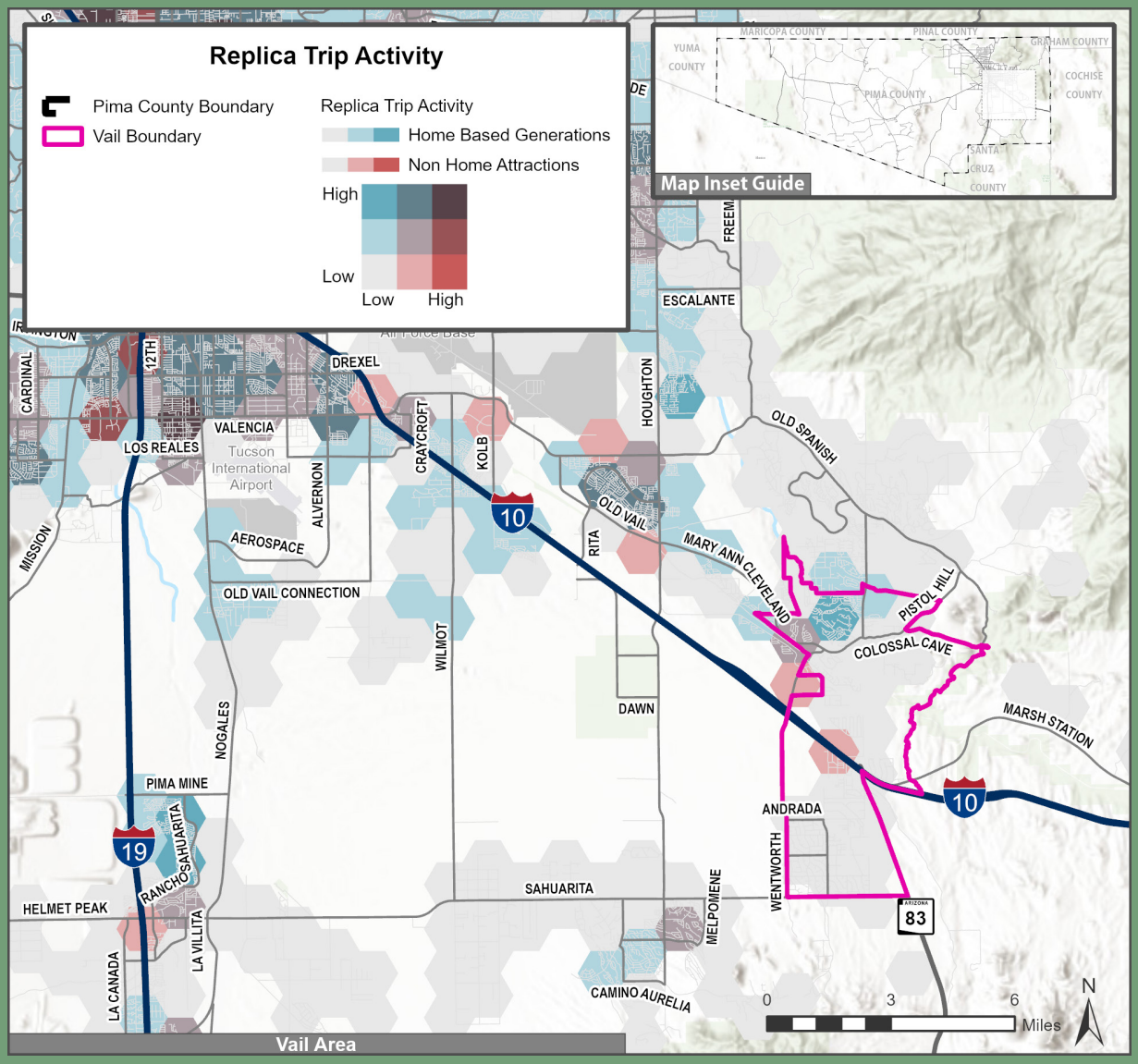
Picture Rocks trip activity is low overall, with a small pocket of home based trip activity taking place in the concentrated area of amenities in the area (convenience stores, gas stations, restaurants) at Picture Rocks Road and Sandario Road as seen in **Figure 24.**

Figure 24: Replica Trip Activity by One-Square-Mile Hexbins in Picture Rocks Area



The Vail area overall shows low trip activity (**Figure 25** below) but does show some pockets of both home-based and non-home attractions activity in the northwest corner of the community where development is most focused, along with a concentration of non-home attraction trips near the Vail School District office.

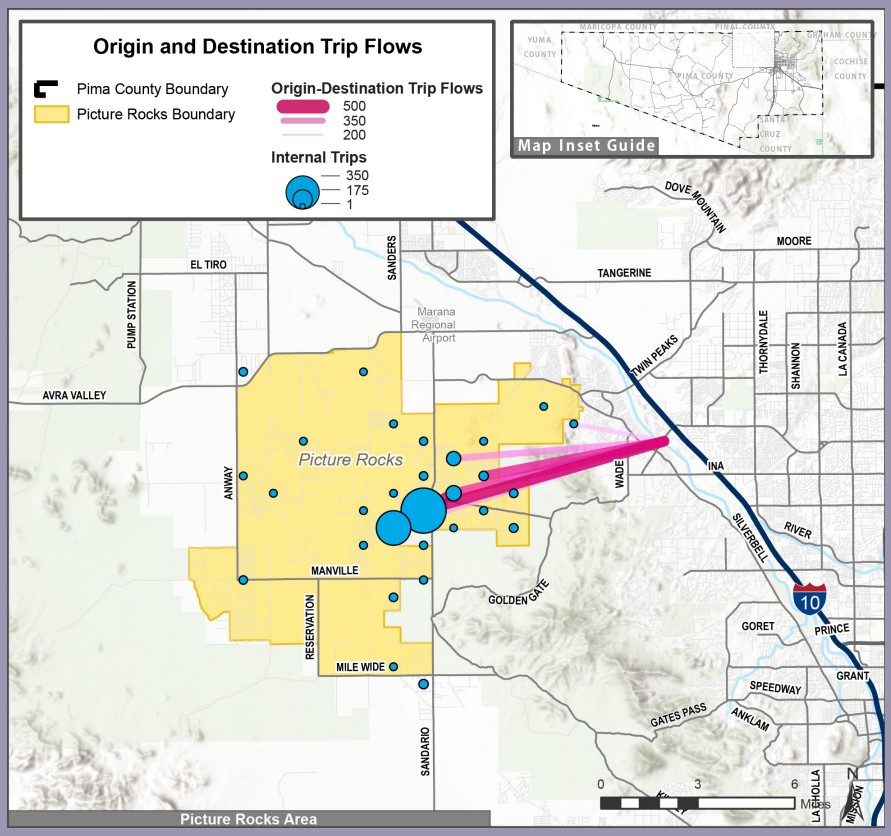
Figure 25: Replica Trip Activity by One Square-Mile Hexbins in Vail Area



In general, these areas both face transportation challenges associated with low population density.

In general, these areas both face transportation challenges associated with low population density, vast geographical spread between activity centers, lack of transportation infrastructure, and heavy reliance on personal vehicles.

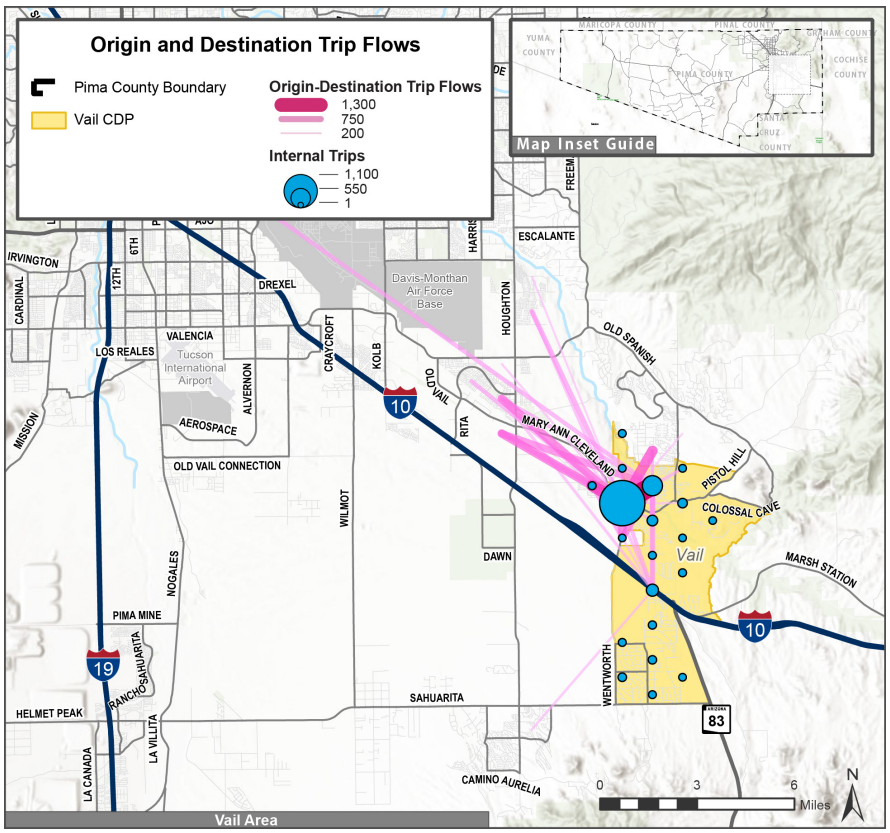
Figure 26: Origin-Destination Trip Flows in Picture Rocks Area



Picture Rocks

Approximately 44,000 trips per day start or end within Picture Rocks, which are mapped in **Figure 26.** Most trips made in this community are bound for the Arizona Pavilions Shopping Center, which contains many retail and dining destinations. Within Picture Rocks, the highest trip activity is observed near the intersection of West Picture Rocks Road and North Sandario Road, which is the residential core of the neighborhood.

Figure 27: Origin-Destination Trip Flows in Vail Area



Vail

Approximately 62,000 trips per day start or end within Vail, which are mapped in **Figure 27.** The area north of I-10 is more densely populated and generates more trips. The location with the highest trip activity is near Cienega High School and Old Vail Middle School. Trips outside of Vail are generally bound for Houghton Town Center, the nearest large retail location in the Rita Ranch neighborhood. External trips headed elsewhere include downtown Tucson, Civano, and Corona de Tucson.

2.3

Transit Needs Assessment Findings

Picture Rocks and Vail are not currently served by the regional transit network. This section highlights the strengths and challenges posed by the addition of transit services based on the existing conditions assessment.

2.3.1

PICTURE ROCKS

Picture Rocks is a low-density residential community with low transit propensity and low trip activity, which are conditions not ideal for traditional fixed-route services. In the origin-destination analysis, most trips are traveling to the nearby Arizona Pavilions Shopping Center. This suggests that a demand-responsive service that connects Picture Rocks with the shopping center may be most effective for this community; riders may also transfer to Sun Express services there to reach downtown Tucson and Oro Valley. Additionally, a demand-responsive service should connect to essential services and civic centers, such as Northwest Medical Center, Wheeler Taft Abbett Sr. Library, Marana High School, and others.

Transit service options have been previously examined in the Picture Rocks community. The RTA funded a pilot shuttle service in Picture Rocks, connecting Picture Rocks to Tucson, from October 2022 to November 2023. The pilot was initiated to determine the level of transit demand to reach destinations such as grocery stores, retail shopping, and connections to the regional transit network. Despite marketing efforts, ridership for the services did not increase over the pilot service period (averaging 22 riders a week against a goal of 75 riders a week). Additionally, with ridership at such low levels, the cost to operate the route would have far exceeded that of other Sun Shuttle routes, and the pilot was discontinued after the first year.

2.3.2

VAIL

Vail is a low-density residential community with low transit propensity and low trip activity, which are also conditions not ideal for traditional fixed-route services. Most external trips are bound for Rita Ranch, which contains large retail stores such as Walmart and Home Depot; there are also more trips bound for downtown Tucson, suggesting that it serves as a bedroom community for the employment opportunities there. Some retail exists within Vail along East Colossal Cave Road, which attracts trips from residential communities such as Civano and Corona de Tucson. A demand-responsive service connecting Vail to Rita Ranch may be most effective; connections there through Sun Express and Sun Shuttle provides access to other destinations. Neighborhoods in Vail were previously served by the AMORE pilot service, and findings from that service may be applied to implement a new transit service that best serves the needs of the larger Vail community.

SECTION 03

Transit Feasibility in Picture Rocks and Vail

The needs assessment, along with market and demographic analyses and travel demand studies, indicated that potential transit service options for Picture Rocks and Vail are limited. Factors such as low population density, modest transit propensity, and constrained travel demand — combined with geographic and infrastructure challenges — suggest that on-demand transit models are the most suitable solutions for serving these areas, rather than fixed-route transit. The feasibility of these on-demand transit models is discussed in subsections below.

3.1

On-Demand Transit Opportunity Zones

In Picture Rocks and Vail, two on-demand modes of transit — microtransit and dial-a-ride — were studied. On-demand transit enhances accessibility in these underserved areas, offering mobility without the need for a private vehicle. Additionally, it can function as a first/last mile connection to existing fixed-route transit networks.

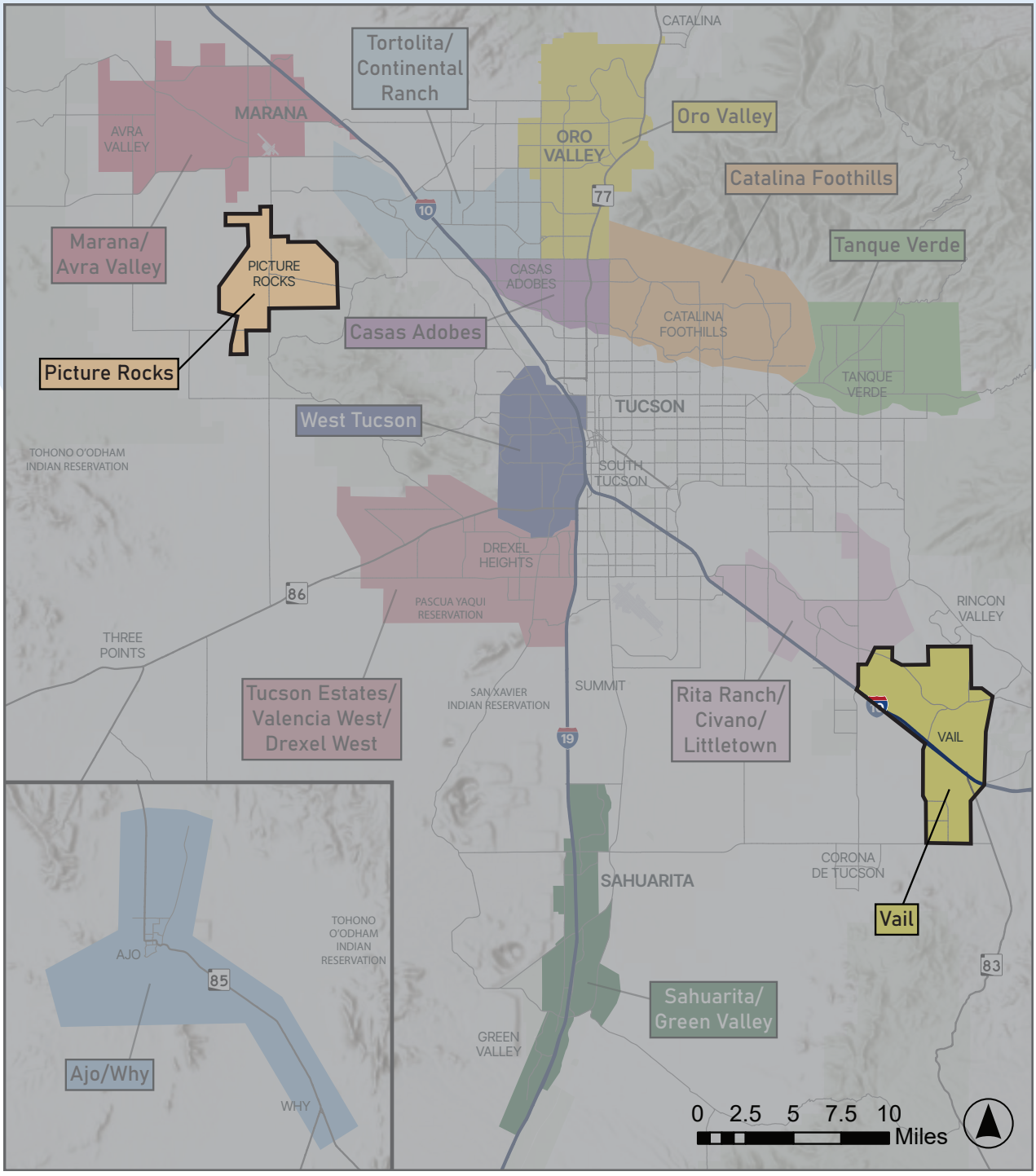
The boundaries of the opportunity zones for Picture Rocks and Vail are informed by the Existing Transit Conditions and Transit Needs Assessment analysis and are later used in this study in a simulation (described in later sections) as potential service area boundaries. Considerations during the zone design process include existing trip activity, transit propensity, presence of major trip generators, and presence (or lack of) fixed-route transit. The size of the opportunity zone balances potential trip market capture with operational efficiency. Zone boundaries are held constant between microtransit and dial-a-ride simulations for ease of comparison.

After defining the opportunity zone boundaries, external destinations, which are nearby locations outside the zone where travel would be permitted to, were identified for each zone. These destinations may be major trip generators, healthcare providers, community centers, or transit hubs, that are not included in the zone are important for potential riders to be able to travel to. External destinations should be near the zone boundary to prevent too many long-distance trips.

Each opportunity zone connects to the fixed-route transit network within the zone boundary or through an external destination. On-demand transit may be used as a first/last mile connection to fixed-route transit, improving transit accessibility by allowing potential riders to transfer between the modes. This improves ridership for both on-demand transit and fixed-route transit.

Figure 28 maps the opportunity zones used as part of this study and used in comparison to Picture Rocks and Vail. Note that the zone boundary and external destinations were created for planning purposes; further outreach to stakeholders within zone and coordination with operators should be conducted to refine the zone boundary and external destinations before deployment.

Figure 28: Location of Picture Rocks and Vail Opportunity Zones



The **Picture Rocks** zone is identified as a new service that covers the census-designated place of Picture Rocks. This zone is rural, with no major trip generators, but was identified for study due to its lack of existing transit service and the public's high need for transit. Between 2022 and 2023, Sun Shuttle Route 414P, a fixed-route pilot service, operated between Picture Rocks and Tucson Premium Outlets via West Twin Peaks Road. The service was discontinued due to low ridership. On-demand transit could re-establish transit in Picture Rocks with more flexibility for riders and the operator. External destinations that this study identified include Tucson Premium Outlets, Arizona Pavilions, and Northwest Medical Center.

The **Vail** zone is a new service that covers the census-designated place of Vail. This zone contains rural and low-density residential land uses and does not have major trip generators, though essential services and schools serving the wider community is located near the intersection of East Colossal Cave Road and East Mary Ann Cleveland Road. This zone was selected for study since it does not have any fixed-route transit service. External destinations identified for this zone include UA Tech Park, the Rita Ranch Walmart Supercenter, Rita Ranch Park and Ride, and Pima County Fairgrounds. Additionally, it is recommended that Sun Tran Route 110X be extended to the Vail zone, which can directly connect this community with downtown Tucson. Potential future expansions for this zone could include north to Rincon Valley, which is undergoing rapid housing development, and southwest to Corona de Tucson, which does not have transit service. Note that Vail neighborhoods were briefly included in the AMORE service area for the last two months of the pilot program.

3.2
Microtransit Simulation

To understand each opportunity zone's potential demand and costs under a microtransit model, this study utilized a proprietary simulation process developed by Via Transportation. Via is a microtransit operator and software provider with more than 100 microtransit deployments across the country, and their simulation process is well-validated by real-world operational data collected through their operations. Outputs of the simulation include estimated fleet requirements, associated costs, and projected performance metrics, which can inform which opportunity zones are most suited for microtransit implementation.

3.2.1

Simulation Process and Assumptions

The simulation relies on several assumptions about the microtransit's operational parameters, which define the quality of service that microtransit provides. Parameters are assumed at this stage, as they influence ridership projections. A more convenient service is expected to yield higher ridership. The list of parameters are:

01 **TRAVEL RULES**
Restrictions on the trip purposes or locations that microtransit will be permitted to serve

02 **BOOKING MODEL**
Whether pre-booking of trips would be allowed

03 **TARGET WAIT TIME**
How long passengers are expected to wait between making a trip booking request and being picked up by a vehicle

04 **BUS STOP MODEL**
Whether riders will be asked to walk to meet the vehicle for pickups and drop-offs

05 **FLEET**
Type of vehicles used to operate the service

06 **SERVICE HOURS**
What times a rider can book a trip

07 **FARE**
Fee paid by passengers to take the service

The opportunity zones have a wide range of local contexts, making a one-size-fits-all simulation inappropriate. Therefore, the zones are divided into two tiers of assumed service quality — "Weekday" and "Extended" — based on transit propensity, trip density, and ridership of existing dial-a-ride, if applicable. The parameters for the two tiers are listed below. The only difference between the two tiers is in the target wait time and service hours; all other parameters remain the same. No travel rule restrictions are placed, and a curb-to-curb bus stop model is used to provide the most convenient service for riders, given the hot climate in Pima County and the lack of pedestrian infrastructure in some areas. The fleet is assumed to be minivans as seen in **Table 2,** some of which are wheelchair accessible. Fares are assumed to be free, like current fixed-route and dial-a-ride services. The assumed parameters are not definitive and should be adjusted through stakeholder engagement should microtransit be implemented in the future.

Table 2: Microtransit Simulation Operational Parameter Assumptions

	Weekday	Extended
	No restriction	
Booking Model	**On-demand only**	
Target Wait Time	**20-25 min. 60 min. max.**	**10-15 min. 30 min. max.**
Bus Stop Model	**Curb-to-curb**	
Fleet	» **Minivans with capacity of five ambulatory passengers** » **At least 20% or one wheelchair-accessible minivan with capacity for one wheelchair and two ambulatory passengers**	
Service Hours	**Weekdays 7 a.m. - 6 p.m.**	**Weekdays 6 a.m. - 8 p.m. Weekends 9 - 6 p.m.**
Fare	**Free**	
Opportunity Zones Included	» **Marana/Avra Valley** » **Picture Rocks** » **Catalina Foothills** » **Tanque Verde, Rita Ranch/Civano/ Littletown** » **Vail/Corona De Tucson/Rincon Valley** » **Sahuarita/Green Valley**	» **Tortolita/Continental Ranch** » **Oro Valley** » **Casas Adobes** » **Tucson Estates/Drexel Heights/ Valencia West** » **West Tucson** » **Ajo/Why**

After the opportunity zones and operational parameters are defined, a ridership estimate can be generated for each zone. Via's process uses the zone's population and number of jobs, applies a capture rate assumption, and adds the ridership of any replaced transit services to estimate weekday demand. The capture rate is based on Via's proprietary demand model developed with operational parameters, socioeconomic factors (such as vehicle ownership, commute mode, and access to existing public transit), and demographic factors (such as income, percent of seniors, and percent of people with disabilities). The capture rate is validated by Via's real-world microtransit deployment. In general, zones with higher transit propensity and trip activity, as calculated in the Existing Transit Conditions and Transit Needs Assessment, will exhibit higher estimated ridership.

Table 3: Projected Microtransit Ridership by Opportunity Zone

Opportunity Zone	Service Tier	Weekday Average			Annual Medium
		Low	Medium	High	
Picture Rocks	**Weekday**	**<10**	**15**	**20**	**4,000**
Vail	**Weekday**	**15**	**40**	**60**	**10,000**

Table 3 shows the estimated weekday and annual ridership for the zones of Picture Rocks and Vail. These values represent ridership approximately a year after microtransit is implemented and riders have become accustomed to the service. Three ridership scenarios, "Low," "Medium," and "High," were developed to capture the range of potential values, where the "Medium" scenario is Via's best estimate for ridership. For these estimates it was assumed that no fares were collected. Should fares be implemented, the estimated ridership may drop closer to the "Low" scenario.

After estimating ridership, Via uses an agent-based simulation to estimate vehicle requirements and costs. The simulation uses the opportunity zone boundary, road network, ridership estimate, and operational parameters as inputs, then applies a routing optimization algorithm to determine the fleet size required to serve rider demand. This process emulates deploying the ride dispatching software in a simulated demand environment, and microtransit's performance metrics may be measured like how they would be in the real world.

The following simulation outputs are key to determining whether microtransit is a good fit for an opportunity zone:

01 **FLEET SIZE NEEDED AT PEAK**
The number of fleet vehicles required to serve rider demand at the busiest time of day, which is equivalent to the number of vehicles that the RTA should procure to implement microtransit at the opportunity zone.

02 **UTILIZATION**
The number of riders per vehicle-hour, which is a measure of service efficiency.

03 **COST EFFICIENCY**
The estimated operating cost divided by ridership. The estimated operating cost per year of the microtransit service is calculated by multiplying the annual vehicle-hours of microtransit (an output of the simulation) by an operator cost per vehicle-hour assumption that is inclusive of all operating costs. This study assumes that the RTA's operating cost is approximately $80/vehicle-hour, which is derived from the latest available data from the National Transit Database.

Other simulation outputs include:

04 **TYPICAL WAIT TIME**
The simulated duration passengers are expected to wait between making a trip booking request and being picked up by a vehicle. This is used to verify that the fleet size is meeting the operational parameters defined earlier.

05 **TYPICAL RIDE DURATION**
The simulation duration that passengers spend within a vehicle. This is mostly influenced by the size of the opportunity zones.

06 **VEHICLE-MILES TRAVELED (VMT)**
The estimated vehicle-miles resulting from the microtransit service. An estimate of change in overall VMT can be derived by comparing microtransit VMT by existing private vehicle and public transit VMT.

The methodology and results of this analysis are discussed in-depth in the Cost-Benefit Analyses section. Note that for a new microtransit zone, overall VMT is expected to increase due to vehicles traveling empty to pick up a rider, vehicles taking detours from the most direct path, and new trips being generated from the more convenient transportation service. Table 4 summarizes these key metrics for the Picture Rocks and Vail opportunity zones.

Zone	Service Tier	Annual Ridership	Fleet Size at Peak	Utilization	Cost Per Trip
Picture Rocks	**Weekday**	**4,000**	**2**	**0.7 – 1.3**	**$80**
Vail	**Weekday**	**10,000**	**2**	**2.1 – 2.7**	**$34**

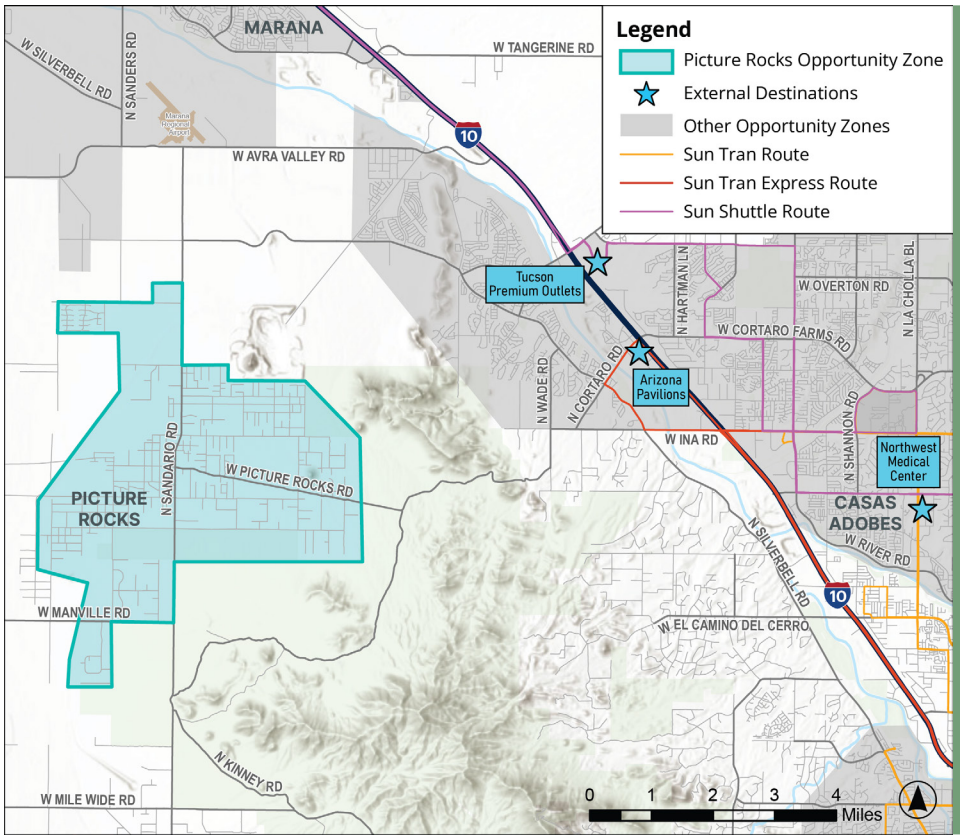
3.2.2

SIMULATION RESULTS BY OPPORTUNITY ZONE

The following sections summarize the microtransit simulation results for the Picture Rocks and Vail opportunity zones. The maps in **Figure 29** (Picture Rocks) and **Figure 30** (Vail) show the opportunity zone boundaries, external destinations, and other transit services nearby. The simulation results of all three ridership scenarios (low, medium, and high) are listed in **Table 5** for Picture Rocks, and **Table 6** for Vail.

PICTURE ROCKS (MICROTRANSIT)

Figure 29: Picture Rocks Microtransit Simulation



PROPOSED SERVICE

Simulated Service Tier

» Weekday

Transit Connections

» Sun Tran 61, 104X, 204X

» Sun Shuttle 412

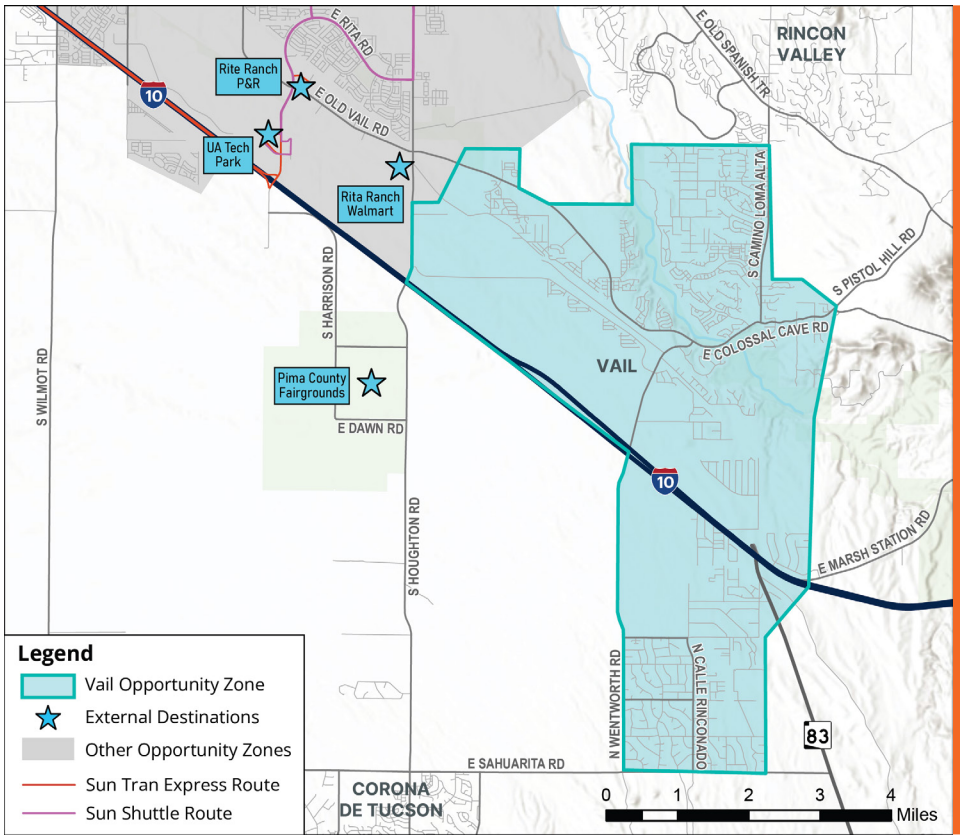
» Sun Shuttle 413
(Recommended to be replaced)

Simulation Results	Low Scenario	Medium Scenario	High Scenario
Weekday Ridership	<10	15	20
Annual Ridership	<2,000	4,000	6,000
Fleet Size Needed at Peak (Vehicles)	2	2	2
Typical Wait Time (Minutes)	10 – 14	18 – 22	12 – 16
Typical Ride Duration (Minutes)	18 – 22	22 – 26	18 – 22
Utilization (Riders per Hour)	0.2 – 0.8	0.7 – 1.3	0.7 – 1.3
Estimated Annual Cost	$200,000	$300,000	$500,000
Cost Efficiency	>$100/ride	$80/ride	$80/ride

Table 5: Picture Rocks Microtransit Simulation Results

VAIL (MICROTRANSIT)

Figure 30: Vail Microtransit Simulation



PROPOSED SERVICE

» Expansion of the Sun Tran 110X route from Old Vail Road into the Vail Community

Simulated Service Tier

» Weekday

Transit Connections

» Sun Tran 110X

» Sun Shuttle 450 (Recommended to be replaced)

Simulation Results	Low Scenario	Medium Scenario	High Scenario
Weekday Ridership	15	40	60
Annual Ridership	4,000	10,000	16,000
Fleet Size Needed at Peak (Vehicles)	2	2	3
Typical Wait Time (Minutes)	8 – 12	11 – 15	10 – 14
Typical Ride Duration (Minutes)	13 – 17	15 – 19	12 - 16
Utilization (Riders per Hour)	0.9 – 1.5	2.1 – 2.7	2.1 – 2.7
Estimated Annual Cost	$250,000	$350,000	$550,000
Cost Efficiency	$66/ride	$36/ride	$34/ride

Table 6: Vail Microtransit Simulation Results

For additional information see PAG Microtransit +Dial-a-Ride Study Full Report.

3.3

Dial-a-Ride Simulation

A simulation like the microtransit analysis described above was used to understand the potential demand and costs of a dial-a-ride service in Picture Rocks and Vail. Outputs of the simulation include estimated fleet requirements, associated costs, and projected performance metrics, which can inform which opportunity zones are most suited for microtransit implementation.

3.3.1

SIMULATION PROCESS AND ASSUMPTIONS

It is assumed that dial-a-ride would be implemented in a similar fashion to the existing Sun Shuttle Dial-a-Ride services in Marana/Avra Valley, Oro Valley, Sahuarita/Green Valley, and Ajo. The dial-a-ride is assumed to operate on weekdays only between 7 a.m. and 5 p.m. (matching the Weekday service tier hours from the microtransit analysis), provides curb-to-curb service using cutaway vans, and must be booked a day in advance. The service area used in this analysis is the same as in the microtransit simulation for ease of comparison between the two service models.

As service parameters are kept the same as the existing Sun Shuttle Dial-a-Ride service, it is assumed that new services will have a similar mode share compared to the existing services. The existing dial-a-ride mode share by zone is calculated by comparing the FY 2024 dial-a-ride ridership with the zone's total travel market, defined as the number of trips per weekday of all modes that start and end within each zone. The total travel market is derived from Replica, an activity-based travel demand model. The estimated mode share of each dial-a-ride zone is shown in **Table 7.** Mode shares range from 0.03% in Sahuarita/Green Valley to 0.49% in Ajo; the calculated mode shares are highly variable between zones due to differences in local context.

Dial-a-ride ridership in Picture Rocks and Vail is estimated by applying a mode share assumption derived from existing Sun Shuttle Dial-a-Ride data to the total travel market from Replica. The total market was found to be 4,000 trips per weekday in Picture Rocks, and 12,000 trips per weekday in Vail. Dial-a-ride ridership was estimated for three scenarios (Low, Medium, and High) to capture the uncertainty in future ridership. The mode share assumptions for the Low, Medium, and High scenarios are 0.03%, 0.07%, and 0.10%, respectively, which correspond to the estimated mode share for the existing dial-a-ride zones in the Tucson region. Ajo's mode share was not used in this analysis as the dial-a-ride service there attracts many more riders than any other zones, and the local context differs greatly from other areas in the greater Tucson region. The estimated ridership is shown in **Table 8**.

After estimating ridership, an agent-based simulation was performed to estimate the vehicle requirements and costs. The process uses the opportunity zone boundary, road network, ridership estimate, and operational parameters as inputs. Then applies a routing optimization algorithm to understand the fleet size required to serve rider demand, and outputs the same performance metrics. The routing algorithm is adjusted to account for the pre-booked nature of dial-a-ride trips. **Table 9** summarizes dial-a-ride's key performance metrics.

Table 7: Estimated Mode Share of Sun Shuttle General Public Dial-a-Ride

Sun Shuttle DAR Zone	Total Travel Market per Weekday	FY 2024 Ridership	FY 2024 Ridership per Day	Estimated Mode Share
Oro Valley	**87,000**	**22,611**	**87**	**0.10%**
Marana/Avra Valley	**18,000**	**3,083**	**12**	**0.07%**
Sahuarita/ Green Valley	**86,000**	**8,576**	**27**	**0.03%**
Ajo	**4,00**	**6,086**	**19**	**0.49%**

Table 8: Projected Dial-a-Ride Ridership by Opportunity zone

Opportunity Zone	Weekday Average			Annual
	Low	Medium	High	Medium
Picture Rocks	**1**	**3**	**4**	**800**
Vail	**4**	**8**	**12**	**2,000**

Ridership is projected to be much lower than microtransit, as dial-a-ride is a less convenient and attractive option. With the low projected ridership, two vehicles per day is sufficient to serve the dial-a-ride trip demand in all scenarios in both zones. However, vehicle operations are more predictable than microtransit since drivers can prepare for future scheduled pick-ups, rather than react to real-time trip bookings. During most times of day, the service should only require one vehicle, but the additional vehicle may be used if the first vehicle is unexpectedly put out of service, or if there are surges in demand. Picture Rocks' additional vehicle may be shared with the nearby Marana/Avra Valley dial-a-ride zone to minimize costs.

Table 9: Dial-a-Ride Simulation Key Metrics by Opportunity Zone

Zone	Annual Ridership	Fleet Size at Peak	Utilization	Cost Per Trip
Picture Rocks	800	2	1.1 – 1.5	$56/ride
Vail	2,000	2	2.5 – 2.9	$31/ride

Note that the low ridership introduces greater uncertainty in simulated performance metrics and cost projections compared to the microtransit simulation.

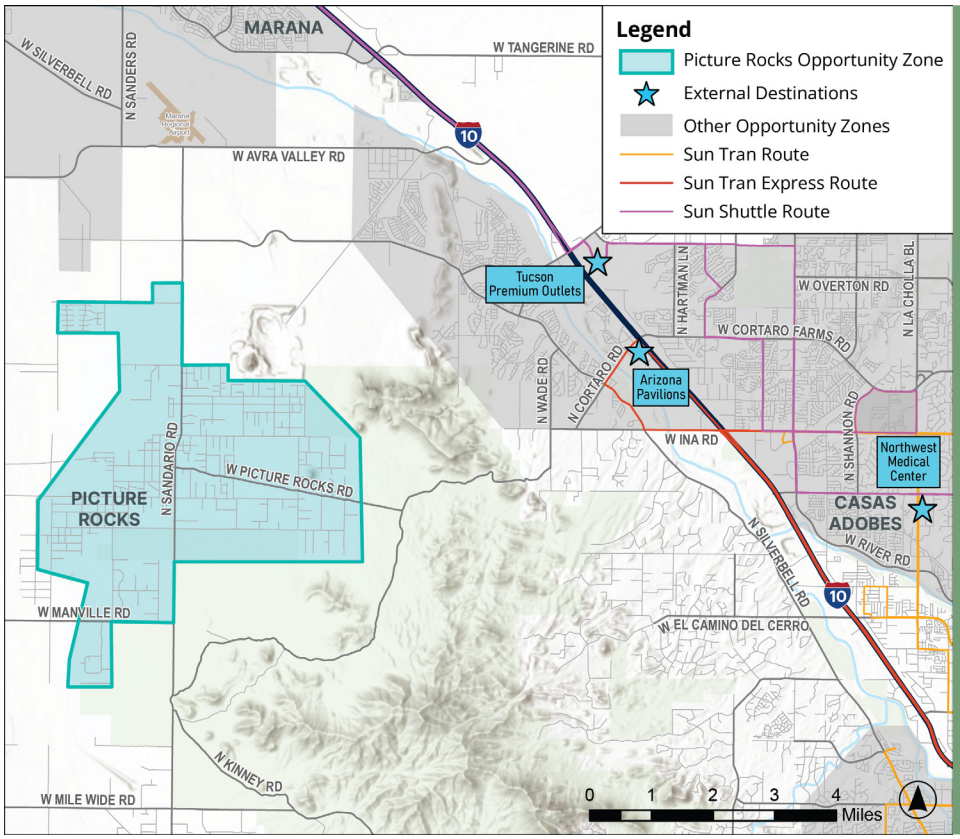
3.3.1

SIMULATION RESULTS BY OPPORTUNITY ZONE

The following sections summarize the dial-a-ride simulation results for the Picture Rocks and Vail opportunity zones. The maps in **Figure 31** (Picture Rocks) and **Figure 32** (Vail) show the opportunity zone boundaries, external destinations, and other transit services nearby. The simulation results of all three ridership scenarios (Low, Medium, and High) are listed in **Table 10** for Picture Rocks, and **Table 11** for Vail.

PICTURE ROCKS (DIAL-A-RIDE)

Figure 31: Picture Rocks Dial-a-Ride Simulation



PROPOSED SERVICE

Simulated Service Tier

» Weekday

Transit Connections

» Sun Tran 61, 104X, 204X

» Sun Shuttle 412

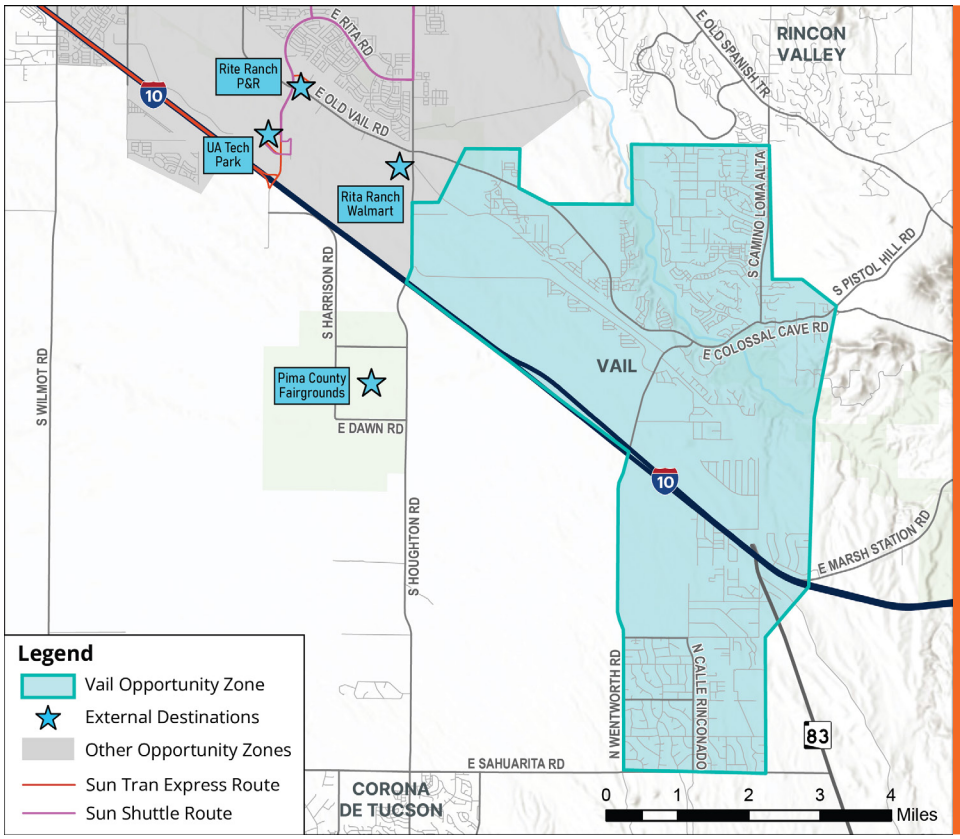
» Sun Shuttle 413
(Recommended to be replaced)

Simulation Results	Low Scenario	Medium Scenario	High Scenario
Weekday Ridership	1	3	4
Annual Ridership	300	800	1,000
Fleet Size Needed at Peak (Vehicles)	2	2	2
Typical Wait Time (Minutes)	0	0	0
Typical Ride Duration (Minutes)	10 – 14	11 – 15	11 – 15
Utilization (Riders per Hour)	1.0	1.1 – 1.5	1.8 – 2.0
Estimated Annual Cost	$21,000	$44,800	$44,000
Cost Efficiency	$80/ride	$56/ride	$44/ride

Table 10: Picture Rocks Dial-a-Ride Simulation Results

VAIL (DIAL-A-RIDE)

Figure 32: Vail Dial-a-Ride Simulation



PROPOSED SERVICE

» Expansion of the Sun Tran 110X route from Old Vail Road into the Vail Community

Simulated Service Tier

» Weekday

Transit Connections

» Sun Tran 110X

» Sun Shuttle 450 (Recommended to be replaced)

Simulation Results	Low Scenario	Medium Scenario	High Scenario
Weekday Ridership	4	8	12
Annual Ridership	1,000	2,000	3,000
Fleet Size Needed at Peak (Vehicles)	2	2	3
Typical Wait Time (Minutes)	0	0	0
Typical Ride Duration (Minutes)	8 – 12	8 – 12	8 – 12
Utilization (Riders per Hour)	1.8 – 2.2	2.5 – 2.9	2.6 – 3.0
Estimated Annual Cost	$42,000	$64,000	$87,000
Cost Efficiency	$40/ride	$31/ride	$28/ride

Table 11: Vail Microtransit Simulation Results

For additional information see PAG Microtransit + Dial-a-Ride Study Full Report.

3.4
Transit Service Implementation Considerations

As with other types of transit services, various implementation structures can be employed to deliver microtransit service and dial-a-ride. This section will describe the different key elements to consider when conceptualizing how the RTA currently delivers transit service. Since these services are conceptually similar, their implementation considerations overlap in many cases.

Even though it is possible to have different implementations across services, this study recommends using a uniform model across the county to ensure a similar riding experience across local jurisdictions.

3.4.1

SOFTWARE PLATFORM

Currently, booking systems for on-demand and dial-a-ride transit in Pima County varies by service. While most services offer phone reservations, there is little consistency in booking apps and websites between services. This variety of booking processes adds complication for riders if traveling through multiple parts of the county or across different services. An opportunity exists to create an easier-to-understand system that is more convenient for riders and more consistent across services. Dial-a-ride deployments in Picture Rocks and Vail should have a software platform consistent with the rest of the county.

As a technology-enabled service, microtransit relies on a robust software platform that allows on-demand trip booking and dispatch. There are three major components to microtransit's software platform: a public-facing interface (mobile app, website, and/or call center) that allows riders to book rides and track real-time vehicle locations; a vehicle dispatch software that automatically calculates how to most efficiently route vehicles to serve requested trips; and a driver-facing interface that navigates drivers to pick up and drop off locations. These three components should work seamlessly with one another for a smooth experience for riders and drivers. Additionally, the platform should keep ride history and have a method to easily extract performance measures for monitoring system performance.

In some cases, on-demand scheduling is an add-on module to other transportation management software (TMS) used for traditional dial-a-ride services. This means that a system with dial-a-ride service may be able to upgrade to a microtransit model while retaining their current transportation management software. This could be the case for the RTA, as the RTA has recently selected and procured RideCo as its software platform that incorporates both on-demand and dial-a-ride capabilities.

Public outreach for this project included input from communities around the region to gather information on the best ways to enhance on-demand transportation and support future implementation in areas considered for transit expansion, such as Picture Rocks and Vail. Feedback and areas for improvement regarding the existing booking platform included:

- **Minimizing human error by automating dispatching where possible**
  Some older platforms require manual scheduling, which is more labor intensive and may not be most efficient. Several newer platforms have more automatic scheduling and dispatching, helping avoid additional errors.
- **Reliability of real-time updates**
  Drivers expressed that delayed real-time updates could cause mix-ups between drivers or give drivers incorrect routing. This is not typically offered for dial-a-ride trips, but it will be a great addition that will improve the customer experience.
- **Difficulty in identifying rural pickup locations**
  Drivers noted that in rural communities, addresses may not effectively communicate where riders would like to be picked up, and alternatives such as landmarks or mileposts may be more convenient for riders.
- **Trip histories**
  Sun On Demand's original software didn't incorporate ways to track and record trips histories, making monitoring system performance difficult.
- **User-friendliness of the rider-side interface (app, website, etc.)**
  This includes ease of scheduling, trip planning, tracking, and (if applicable) payment. Drivers indicated that a potential new feature is offering alternative trip times if the initial request cannot be booked. Riders have also expressed appreciation for the ability to track vehicles in real-time.

Public-Facing Interface

For riders to book trips and receive trip updates, the primary interface should be a mobile app, which is most convenient for typical riders. However, alternatives such as a website and a call center should be provided to keep microtransit and dial-a-ride accessible to all, especially for seniors and people without smartphone or internet access.

Technical capabilities of the mobile app and website in both microtransit and dial-a-ride service models should include:

- The service area boundary overlaid on a map to understand where transit services are offered
- Ability to input trip starting and ending locations and book a ride
- Ability to display information about the vehicle, such as license plate and driver name
- Real-time updates, such as estimated wait and travel times, and vehicle locations on a map
- Multimodal trip planner with step-by-step instructions to assist riders to transfer onto other modes, such as fixed-route transit, micromobility services, and Transportation Network Companies (TNC)
- TNC (Uber, Lyft, and Taxi) integration to allow for overflow bookings when microtransit is at capacity or when the demand response services are not available
- Ability for employers and call center staff to book trips on behalf of riders
- Ability to indicate disability status to ensure an accessible vehicle is dispatched when needed
- Ability to add notes to assist drivers navigating to pick up and drop off locations
- Ability to collect fares through card payments and flexibility in the type of fare, such as flat fares, distance-based fares, and dynamic fares. While transit is currently free in Pima County, the software should have this capability in case fares are implemented in the future

Mobile apps generally come in one of two forms: integrated within a standard transit agency app with all transit services available, or standalone apps dedicated solely to microtransit or dial-a-ride.

This study recommends limiting the number of pre-booked (microtransit only) trips allowed, or restricting the ability to pre-book a trip, to those with ADA needs.

3.4.2

PRE-BOOKING TRIPS

Under a dial-a-ride model, all trips are pre-booked. Trips are usually booked at least one day in advance, though same-day booking may be available if vehicles have capacity.

Microtransit may also allow riders to book trips earlier in advance. Pre-booking provides more certainty to riders as it minimizes the wait and travel times that riders experience; however, too many pre-booked trips reduce the available capacity to serve on-demand trips, which diminish the system's ability to serve these trips in a timely manner. To ensure microtransit has the capacity to serve trips on-demand trips, this study recommends limiting the number of pre-booked trips allowed or restricting the ability to pre-book a trip to those with ADA needs. Additionally, the ability to book a TNC or taxi ride for overflow could also be used to ensure riders are not left behind during peak demand periods where microtransit vehicles may not be available.

3.4.3

STAFFING AND PROCUREMENT

Different methods of staffing and procurement include:

- **SOFTWARE-AS-A-SERVICE (SaaS)**
  Agencies operate the service using agency-owned vehicles and employed operators but purchase scheduling and dispatching software to manage trip booking, vehicle dispatching, and payment.
- **TURNKEY**
  Private contractors are hired to provide vehicles, operators, and software platform.

The RTA currently uses a turnkey model to deliver the Sun Shuttle and dial-a-ride services but relies on TNCs to deliver trips when it is at capacity. This study recommends that the RTA continue using a turnkey model but should minimize the use of TNCs by ensuring that enough vehicle capacity is provided to serve all trip demand. The study recommends dial-a-ride services to continue operating under the turnkey model.

Microtransit's software platform is generally not developed by agencies but purchased as part of a Request for Proposals (RFP) process. If a turnkey model is used, the RFP for software is recommended to be combined with the RFP for contractors to ensure that contracted staff are familiar with the software platform. Alternatively, there are also purchasing cooperatives and cooperative agreements that allow member agencies to purchase directly from registered vendors using pre-designed contracts that meet state and federal cooperative bidding requirements.

This study recommends that the RTA continue using a turnkey model but should minimize the use of TNCs by ensuring that enough vehicle capacity is provided to serve all trip demand.

3.4.4

PERMITTED PICKUP AND DROP-OFF LOCATIONS

Aside from curb-to-curb service, agencies may choose to place additional restrictions on pick-up and drop-off locations, depending on the goals of the service, such as:

- **Corner-to-corner:** This model requires riders to walk to the nearest major intersection within a maximum distance. A corner-to-corner service streamlines operations by reducing vehicle travel distance and time but may discourage riders from taking microtransit.
- **Node-based:** This model only permits travel between predetermined nodes, which are usually major trip or activity centers. A node-based model streamlines operations and lowers operating cost but leads to lower ridership due to decreased convenience.
- **Transit connections only:** This model requires the microtransit trip to either start or end at a fixed-route transit stop, which dedicates the service to be a first/last mile connection. This model will result in less ridership.

The RTA's dial-a-ride service operates curb-to-curb service with the specification that trips must begin and end within the designated service area boundary, or at one of the key destination nodes outside of the boundary. This study recommends that future transit services follow the same model for the greatest rider convenience, especially considering the high temperatures in the region and incomplete pedestrian facilities outside of urban areas.

3.4.5

FARE POLICY

As of the completion of this study, all transit services in Pima County are fare free since March 2020. Collecting fares introduces additional revenue for agencies but may result in lower ridership. If agencies decide to collect fares in the future, microtransit and dial-a-ride should use a similar fare structure with fixed-route transit. Methods that fares can be paid include through the mobile app or website with a card payment, or on-board with cash, voucher, or reloadable transit cards (such as the SunGO card).

3.4.6

BRANDING

Branding refers to the public-facing identity of the service, which includes the name, logo, colors, visual design, and other components that make up how riders distinguish between services. Currently, dial-a-ride and on-demand services in Pima County are delivered under three brands: Sun On Demand for microtransit in the City of Tucson, Sun Shuttle Dial-A-Ride for public dial-a-ride, and Sun Van for paratransit services. This study recommends any future microtransit zones to use the Sun On Demand brand for microtransit services and Sun Shuttle dial-a-ride for public dial-a-ride for consistency across the county.

3.4.7

ACCESSIBILITY

As a public transit service, microtransit and dial-a-ride services are required to meet the accessibility requirements as outlined by the Americans with Disabilities Act (ADA).

App Accessibility

To keep transit services accessible, booking trips should be possible through the mobile app, a website, and a call center, which allow those without smartphone or internet access to still ride the service. The mobile app and website should have accessible features for those with hearing and visual impairments, such as text-to-speech and high display contrast. The apps used for microtransit and dial-a-ride services must meet Web Content Accessibility Guidelines (WCAG) standards, including features for screen-readers. A clear and concise tutorial should be provided in the app and website to help guide unfamiliar riders through the app. User testing of the app and website before rollout can help identify that the user interface is intuitive to use. The app and website should also provide the ability to indicate disability status, which will dispatch accessible vehicles to serve that rider when requested. These features must be incorporated in the procurement documents, to ensure providers meet the requirements.

Data Privacy

Data privacy is a concern when implementing transit services and procuring technology to schedule and manage trips. There are mitigation strategies that should be put in place and incorporated in the procurement documents when the agencies initiate the procurement process.

01 **PRIVACY-BY-DESIGN**
Integrating privacy considerations into the design and development of microtransit and dial-a-ride systems from the outset.

02 **DATA COLLECTION**
Collecting only the data necessary for service provision.

03 **ANONYMIZATION AND AGGREGATION**
Protecting user privacy by anonymizing or aggregating data before sharing or making it public.

04 **ENCRYPTION**
Protecting data at rest and in transit with encryption technologies.

05 **ACCESS CONTROLS**
Implementing strict access controls to limit who can access sensitive data.

06 **TRANSPARENCY AND USER CONSENT**
Providing clear and transparent information to users about data collection practices and obtaining consent where required.

07 **USE TECHNOLOGY AUDITORS AND EXPERTS**
Conducting regular audits to ensure compliance with data privacy regulations, identify potential vulnerabilities, and engage legal counsel to ensure compliance with regulations and best practices.

08 **DATA SUBJECT ACCESS REQUESTS (SARS)**
Implementing processes to handle SARs, allowing individuals to access, correct, or delete their personal data.

It is recommended to use the ADA paratransit eligibility in determining if the individual will be better served by ADA paratransit and if microtransit can safely fulfill the request.

Vehicle Accessibility

Any transit service that is implemented must provide accessible vehicles to individuals with disabilities, but not all the vehicles need to be accessible. Some vehicles in service should be wheelchair accessible, which will require them to be outfitted with ramps or lifts. Typically, accessible microtransit vans will have space to carry one wheelchair and at least two ambulatory riders. Not all microtransit vehicles are required to be ADA accessible, but there must be adequate accessible vehicles in service to provide riders with disabilities with an equivalent quality of service as ambulatory passengers. This study recommends having at least 20% of vehicles in service to be accessible per service area, and one accessible vehicle to always be in service per service area.

Though not all microtransit users are individuals with disabilities, drivers must be trained to handle situations when riders with various needs require assistance. ADA training must be provided for all drivers, as required by law.

It is recommended to use the ADA paratransit eligibility in determining if the individual will be better served by ADA paratransit and if microtransit can safely fulfill the request.

Dial-a-ride service vehicles are typically larger than the ones used for microtransit service and therefore incorporate the ability to carry wheelchairs.

General Accessibility

This study recommends curb-to-curb service be provided, which will pick-up and drop-off passengers nearest to their starting and ending locations. However, some passengers may require additional door-to-door service if they are unable to safely walk to and from the curb themselves. The booking method should allow riders to specify their pickup and drop off needs such that a driver can help. Drivers should be provided with training to understand how to assist these riders.

If the RTA implements microtransit or dial-a-ride services, it will be important to continue involving stakeholders from Picture Rocks and Vail that represent individuals with disabilities in the planning process, this way barriers can be identified early in the process and addressed during potential implementation.

3.4.8

Microtransit and Dial-a-Ride Key Performance Indicators

After implementation of microtransit or dial-a-ride, consistent monitoring will help the RTA understand if the service meets regional goals and help identify improvement countermeasures if necessary. Key performance indicators (KPIs) were identified through gathering information from the RTA on current objectives for transit service in the County, examining best practices industry-wide, and determining measurable metrics from available data sources. Target values based on the County's regional context are proposed for each KPI.

The most important KPIs to monitor include:

01 **RIDERSHIP**
High ridership indicates that the service provides a useful form of mobility for residents. Ridership is impacted by many factors, including the number of residents and jobs in the service area, whether the service includes places riders want to go, demographic and socioeconomic characteristics of the community, service quality, fares, and marketing. It can take 6 to 12 months for ridership to mature on a new service. Ridership targets should be set to meet the service goals and needs of the community and balance available resources to fund the service.

02 **EFFICIENCY**
To ensure the transit service delivers value-for-money, the agency should set targets for the efficiency of the service. A high efficiency service ensures providers are maximizing the use of vehicles and funding resources. Efficiency is typically measured through utilization (passenger boardings per vehicle-hour) and cost efficiency (operating cost per passenger trip).

03 **QUALITY OF SERVICE**
Quality of service includes aspects of the rider experience of whether the service meets rider's expectations. The quality-of-service impacts ridership: high-quality service is more likely to attract new riders and retain existing riders. Agencies must balance providing a high quality of service with the available funding and transit needs of the community. Quality of service KPIs include quantitative metrics, such as wait time and on-time performance, and perceived experience, informed through post-ride surveys.

04 **ACCESSIBILITY**
Riders with disabilities are often dependent on on-demand transit services and may require wheelchair-accessible vehicles. To track whether the service meets these needs, it is recommended to compare KPIs across riders with disabilities, in particular riders that require a wheelchair-accessible vehicle. KPIs, such as wait time and seat availability should be the same (or within a reasonable margin of difference) for riders requiring wheelchair accessible vehicles and riders with no specific vehicle requirements.

05 **EQUITY**
To evaluate whether disadvantaged communities have equal access to a service, the demographics of riders can be compared to the demographics of the community. Tracking rider demographics are often done in surveys which can be distributed to riders in the app.

Table 12: Key Performance Measures - Microtransit

Metric Category	KPI	Description	Suggested Target Values
RIDERSHIP	Passenger boardings	The number or average number of passenger boardings in a given time period, e.g., boardings per hour. It is recommended that ridership be looked at by time of day, day of week, and total by month and year.	Ridership is dependent on a variety of factors and will vary from zone to zone. The RTA should use the ridership estimates from this study to set reasonable targets for each zone.
	Trips per rider	The average number of trips taken by a single rider in a given time period, e.g., average trips per week or month.	Average trips per rider per month: » **High-performing: >20** » **Average: 5 - 15** » **Low-performing: <5** Target range may vary depending on service use cases. For example, services targeted to commuters may have more repeat riders than services targeted to shopping or medical appointments.
EFFICIENCY	Productivity	Number of passenger boardings per weekday vehicle revenue hour. Higher productivities indicate greater efficiency in a service.	Passengers per vehicle hour: » **High-performing: >6** » **Average: 3 - 6** » **Low-performing: <3** Productivity in lower density areas typically have an average productivity of 2 - 4 passengers per vehicle hour.
	Cost per passenger trip		Cost per passenger trip: » **High-performing: <$15/passenger trip** » **Average: $15 - $30/passenger trip** » **Low-performing: >$30/passenger trip**

Table 12 lists recommended KPIs of the future microtransit service and **Table 13** shows the recommended KPIs for dial-a-ride to monitor and suggests initial target values.

Metric Category	KPI	Description	Suggested Target Values
QUALITY OF SERVICE	Shared ride duration percentage	Percentage of passenger ride time in which the vehicle is occupied by more than one passenger .	Percentage of ride time: » **High-performing: > 40%** » **Average: 10% - 40%** » **Low-performing: 10%**
	Wait time (on-demand services only)	The average time a passenger waits between requesting a trip and a vehicle arriving at the designated picked up spot (for on-demand services).	Percentage of ride time: » **High-performing: <15%** » **Average: 15% - 20%** » **Low-performing: >25**
	Seat availability	The percentage of trip requests where a valid trip proposal was offered to.	Percentage of requests: » **High-performing: >95%** » **Average: 90% - 95%** » **Low-performing: 90%** Seat Availability in lower density areas may have a lower average between 85% - 95%.
	Customer satisfaction	The average rating provided by passengers ranked from one to five stars (one being very unsatisfied, five being very satisfied). Typically, riders are asked in the rider-app after their trip is completed to rank their experience.	Percentage of ride time: » **High-performing: >4.8** » **Average: 4.6 - 4.8** » **Low-performing: < 4.6**
	Ride duration	The average time a passenger spends in a vehicle from the time they are picked up to the time they are dropped off.	Depends on the service design. Larger zones or zones with many travel destinations allowed outside of the zone will have longer average ride durations. The RTA should use the estimates from the simulations to set reasonable targets for each zone. In general, shorter trips allow a better service quality, more efficient service, and a higher seat available rate.
AIR QUALITY/ VMT SAVED		Percent of emission reduction comparing average projected emissions of private car travel in zones and microtransit emissions.	Greenhouse Gas Emissions per passenger mile: » **Number of miles traveled per vehicle per trip, day, week**

Table 13: Key Performance Measures – Dial-a-ride Metric Category

Metric Category	KPI	Description	Suggested Target Values
RIDERSHIP	Passenger boardings	The number or average number of passenger boardings in a given time period, e.g., boardings per hour. It is recommended that ridership be looked at by time of day, day of week, and total by month and year.	Ridership is dependent on a variety of factors and will vary from zone to zone. The RTA should use the ridership estimates from this study to set reasonable targets for each zone.
	Trips per rider	The average number of trips taken by a single rider in a given time period, e.g., average trips per week or month.	Average trips per rider per month: » **High-performing: >20** » **Average: 5 - 15** » **Low-performing: <5** Target range may vary depending on service use cases. For example, services targeted to commuters may have more repeat riders than services targeted to shopping or medical appointments.
EFFICIENCY	Productivity	Number of passenger boardings per weekday vehicle revenue hour. Higher productivities indicate greater efficiency in a service.	Passengers per vehicle hour: » **High-performing: >3** » **Average: 2** » **Low-performing: <1**
	Cost per passenger trip		Cost per passenger trip: » **High-performing: <$31/passenger trip** » **Average: $34/passenger trip** » **Low-performing: >$39/passenger trip**

Metric Category	KPI	Description	Suggested Target Values
QUALITY OF SERVICE	Wait time	The average time a passenger waits between requesting a trip and a vehicle arriving at the designated picked up spot (for on-demand services).	Minutes: » **High-performing: < 30** » **Average: 30 - 40** » **Low-performing: >45**
	Customer satisfaction	The average rating provided by passengers ranked from one to five stars (one being very unsatisfied, five being very satisfied). Typically, riders are asked in the rider-app after their trip is completed to rank their experience.	Percentage of ride time: » **High-performing: >4.8** » **Average: 4.6 - 4.8** » **Low-performing: < 4.6**
	Ride duration	The average time a passenger spends in a vehicle from the time they are picked up to the time they are dropped off.	Depends on the service design. Larger zones or zones with many allowed travel destinations outside of the zone will have longer average ride durations. The RTA should use the estimates from the simulations to set reasonable targets for each zone. In general, shorter trips allow a better service quality, more efficient service, and a higher seat available rate.
AIR QUALITY/ VMT SAVED		Percent of emission reduction comparing average projected emissions of private car travel in zones and microtransit emissions.	Greenhouse Gas Emissions per passenger mile: » **Number of miles traveled per vehicle per trip, day, week**

SECTION 04

Title VI and Service Equity Analysis

This section documents the Service Equity Analysis performed for the recommended transit expansion. Service Equity Analyses are a requirement of the Federal Transit Administration (FTA) under Title VI of the Civil Rights Act of 1964, which prohibits the recipients of federal assistance from discrimination based on "race, color, or national origin." The purpose of the analysis is to determine, before implementing any major service change, whether the planned change would have a disparate impact on protected classes. Although low-income populations are not a protected class under Title VI, the FTA also requires transit providers to determine whether low-income populations would bear a disproportionate burden (or if non-low-income populations would receive a disproportionate benefit) from a proposed major service change. FTA's Title VI regulations, including the guidelines for conducting Service Equity Analyses, are available for reference in FTA Circular 4702.1B.

4.1

PAG/RTA Policies

PAG/RTA annually updates their Title VI Implementation Plan to align with requirements established by the Arizona Department of Transportation on behalf of FHWA and FTA. This plan defines the procedures and policies for non-discriminatory planning, programming, and project implementation. Relevant to the equity analysis, the Title VI program provides policy definitions for Major Service Changes, Disparate Impact (regarding impacts affecting racial or ethnic minorities), and Disproportionate Burden (regarding impacts affecting low-income populations).

4.1.1

MAJOR SERVICE CHANGE POLICY

The Federal Transit Administration (FTA) requires all Tucson transit providers to define what major service changes include; only "major service changes" are subject to a service equity analysis. Typically, a major service change stems from the elimination of a route, a reduction in a portion of a route, rerouting an existing route, etc. PAG/RTA considers the following criteria as a major service change:

- Any project that increases or decreases route revenue miles by 25% or more compared to the previous fiscal year
- Any project that increases or decreases route revenue hours by 25% or more compared to the previous fiscal year

4.1.2

DISPARATE IMPACT POLICY

The Disparate Impact Policy sets a threshold to determine if a service or fare change disproportionately affects minority populations compared to non-minority populations. For the intention of this analysis, "Minority" is defined as any individuals who do not identify as white and non-Hispanic or Latino. This includes the following racial and ethnic groups, based on classifications from the U.S. Census: Black/African American, American Indian/Alaska Native, Asian, Hawaiian Native/Pacific Islander, Other, Two or More Races, and Hispanic, Latino or Spanish origin.

While PAG/RTA itself does not have stated Title VI policies and procedures related to disparate impacts, Sun Tran, the City of Tucson's major transit service provider, states that "A disparate impact occurs if a proposed fare or major service change requires a minority population to bear adverse effects by twenty percent (20%) or more than the adverse effects borne by the non-minority population."[1] For this analysis, PAG/RTA will be using the 20% threshold used by Sun Tran.

10.2.3

DISPROPORTIONATE BURDEN POLICY

While PAG/RTA itself does not have stated Title VI policies and procedures related to disproportionate impact, Sun Tran, the City of Tucson's major transit service provider, states that "a disproportionate burden occurs if a proposed fare or major service change requires a low income population to bear adverse effects by twenty percent (20%) or more than the adverse effects borne by the non- low income population."[2] For this analysis, PAG/RTA will be using the 20% threshold used by Sun Tran. The PAG/RTA Title VI program does not specify a local definition or threshold for "low-income." Therefore, for this analysis, "low-income" is defined as 150% or less of the federal poverty guideline amount, in alignment with federal standards.

[2] City of Tucson, Sun Tran, "Title VI Program," Revised June 2021, Page 54. Accessed May 23, 2025. Retrieved from Appendix A - 2022 FTA Certifications.pdf.
[3] City of Tucson, Sun Tran, "Title VI Program," Revised June 2021, Page 54. Accessed May 23, 2025. Retrieved from Appendix A - 2022 FTA Certifications.pdf. (Second citation)

4.1.4

ANALYSIS

Methodology

A count of the total, low-income/ non-low-income, and minority/ non-minority populations were measured for the communities of Picture Rocks and Vail to reflect populations that could be affected by the potential expansion of transit, as there is currently no service provided to either community.

Disparate Impact Analysis

The results of the analysis indicate there is no disparate impact on minority populations for Picture Rocks and Vail given the lack of current transit service status in those communities. **Table 14** displays the minority and non-minority populations of Picture Rocks and Vail measured for potential for transit expansion.

Disproportionate Burden Analysis

The results of the analysis indicate that there is no disproportionate burden caused by the removal of transit service routes from Picture Rocks and Vail given the lack of current transit service status in those communities. **Table 15** displays the low-income and non-low-income populations for Picture Rocks and Vail.

Table 14: Comparison of Minority Populations – Disparate Impact

	Total Population	Minority Population	% Minority	Non-Minority Population	% Non-Minority
Picture Rocks Service Area *Transit Expansion*	**24,092**	**8,107**	**34%**	**15,985**	**66%**
Vail Service Area *Transit Expansion*	**29,253**	**9,547**	**33%**	**19,706**	**67%**

Table 15: Comparison of Low-Income Populations – Disproportionate Burden

	Total Population	Minority Population	% Minority	Non-Minority Population	% Non-Minority
Picture Rocks Service Area *Transit Expansion*	**24,092**	**4,400**	**18%**	**19,692**	**82%**
Vail Service Area *Transit Expansion*	**29,253**	**2,974**	**10%**	**26,279**	**90%**

Public Engagement

As part of the City of Tucson's Title VI engagement process, public comment is required on service changes prior to implementation for Sun Tran, Sun Van, or Sun Link. The policy requires at least 14 days of notice before holding the public hearing and must include a description of the proposed changes. This process complies with Title VI by ensuring all public transit decisions consider all riders, specifically those of minority and low-income populations.

4.2 Conclusion

4.2.1 SUMMARY OF FINDINGS

Because there is currently no transit service offered in Vail or Picture Rocks, the Equity Analysis found that neither Vail nor Picture Rocks would experience a disparate impact on minority populations or a disproportionate burden on low-income populations if microtransit or dial-a-ride service were introduced into their communities. Picture Rocks has a minority population makeup of 34% and a low-income population makeup of 18%, while Vail's minority population is 33% and its low-income population is significantly lower at roughly 10%. These differences suggest that while both communities have similar proportions of minority residents, Picture Rocks has a higher share of low-income residents who could potentially benefit from improved access to transit.

4.3

Additional Analysis of Impact

Further analysis was completed outside of Title VI to identify any disparate impact on seniors (those 65 and older) and Areas of Persistent Poverty. Areas of Persistent Poverty are areas, census tracts in this case, that have had a poverty rate of 20% or higher during the last three decades.

Impact to Senior Population

The proposed service expansion improves access to seniors. This is highlighted in **Table 16** which shows that transit expansion will increase for the senior population in both Picture Rocks and Vail. Despite representing less than 20% of the population for both areas, introducing transit service in both areas will be an improvement for senior populations within each community.

Areas of Persistent Poverty

The proposed service expansion has no effect to Areas of Persistent Poverty (AoPP) for Picture Rocks and Vail, as the percent of AoPP populations for both communities is zero as displayed in **Table 17** below.

Table 16: Impact to Senior Populations

	Total Population	Minority Population	% Minority	Non-Minority Population	% Non-Minority
Picture Rocks Service Area *Transit Expansion*	24,092	4,590	19%	19,502	81%
Vail Service Area *Transit Expansion*	29,253	4,166	14%	25,087	86%

Table 17: Impact to Areas of Persistent Poverty

	Total Population	Minority Population	% Minority	Non-Minority Population	% Non-Minority
Picture Rocks Service Area *Transit Expansion*	24,092	0	0%	24,092	100%
Vail Service Area *Transit Expansion*	29,253	0	0%	29,253	100%

SECTION 05

Public and Stakeholder Engagement Summary

PAG/RTA had a robust public engagement process for the Microtransit Service Area Analysis and the associated Transit Feasibility Study for Picture Rocks and Vail. Picture Rocks and Vail were emphasized in this engagement plan and efforts were made to specifically correspond with these two unique communities on the potential for transit service in those areas.

Rounds of engagement took place throughout the months of October 2024 and March 2025. This section of the report describes the format and results of these meetings and workshops.

5.1

Stakeholder Engagement

There were different types of meetings held, both in person and virtual, to gather the thoughts and opinions of the Technical Advisory Committee (TAC) and key stakeholders, including jurisdictional staff and community representative focus groups. Summaries of these meetings are below in **Table 18.**

Meeting Type	Date
TAC Meeting #1	**Oct. 23, 2024**
TPC Meeting #1	**Dec. 18, 2024**
TAC Meeting #2	**March 18, 2025**
Citizens for Picture Rocks Community Focus Group	**March 18, 2025**
TPC Meeting #2	**March 19, 2025**
Vail Community Focus Group	**March 19, 2025**

5.1.1

FOCUS GROUPS

Community and Agency Representatives

The project team met with community partners and jurisdictional representatives which included:

» Citizens for Picture Rocks

» Vail Chamber of Commerce, Vail School District, and area developers

Across all community and agency groups, there was a clear demand for improved, accessible, and reliable transit services, with microtransit emerging as one key solution for addressing gaps in coverage, service hours, and rider needs.

The Citizens for Picture Rocks focus group meeting was held as an effort to garner feedback from the community after having very little participation from the Picture Rocks open house event for the public in October of 2024. The focus group approach provided quality feedback representative of the community. Some feedback included comments on the general nature of dial-a-ride service and availability. Some attendees were under the impression that dial-a-ride could only be used for medical or handicapped transport. The focus group also provided feedback regarding interest in how the service would eventually be paid for and what happened to the pilot service that previously existed in Picture Rocks.

The Vail Community focus group also provided quality feedback representative of the community. Notable feedback included the observation that with a newly opened hospital on Houghton Road there are now two hospitals, a high school, and the Pima County Fairgrounds in the area that serve as destinations for future microtransit service. The focus group also provided feedback indicating that the community may not be comfortable with transit because there is little exposure and familiarity with it currently. Feedback also indicated that safety is a concern, and traditional transit is currently viewed as inconvenient and inefficient.

Across all community and agency groups, there was a clear demand for improved, accessible, and reliable transit services, with microtransit emerging as one key solution for addressing gaps in coverage, service hours, and rider needs. Funding uncertainty was a common theme; communities questioned how expanded services could be sustained. Rural and underserved areas, including Picture Rocks, voiced a strong desire for better options particularly for essential trips like grocery shopping, healthcare visits, and commuting to work.

Stakeholders also expressed a desire for clear communication and advertising regarding how exactly the project will supplement residents' current public transportation options. Communities recognized the need for public education efforts to help residents understand microtransit benefits over current services, taxis, and ride-sharing options. Stakeholder input from business owners revolved around transportation challenges impacting workforce availability. A cautious yet optimistic tone prevailed throughout discussions, with an emphasis on ensuring new transit solutions that effectively meet the needs of residents, improve connectivity, and provide sustainable, safe, and accessible options for those who rely on public transportation.

A survey taken during a TAC meeting revealed that riders would prefer more frequency and more routes to connect to existing destinations. Frequent riders are familiar with the destinations, but would prefer to have more options for when they can come and go.

5.1.2

TECHNICAL ADVISORY COMMITTEE (TAC)

Throughout the study, the project management team presented in-person and virtually to the project's TAC. This is comprised for formal group meetings and individual meetings with representatives as needed.

A survey taken during a TAC meeting revealed that riders would prefer more frequency and more routes to connect to existing destinations based on the familiarity of representatives with their communities. Frequent riders are familiar with the destinations but would prefer to have more options for when they can come and go.

TAC members also expressed a need for additional resources, and their top desires were for affordable transit services for vulnerable populations and more convenient service options (shorter wait times, online booking/payment, curb to curb service). When asked where PAG/RTA should focus their efforts, the majority of TAC members responded with "local microtransit zones that connect the local community and integrate with express routes."

5.1.3

PAG TRANSPORTATION PLANNING COMMITTEE (TPC)

Throughout the study, the project management team presented in-person and virtually to PAG's TPC.

The TPC expressed the need for routes to key locations outside of the proposed microtransit zones presented at the time, which was incorporated in the final recommendations. They also reinforced the importance of ensuring the public involvement team getting the opinions of people with disabilities and people who don't speak English.

They were supportive of the study but questioned how it could be implemented. The TPC discussed refining service boundaries based on demand and determining the logistics of implementation through each jurisdiction.

Funding, whether from general funds or regional funds, was a question the committee were interested in learning more about. Safety and security of the riders and drivers was also discussed.

5.2

General Public Outreach

The public outreach focused on events held at places where people are. The public outreach events for Picture Rocks and Vail are listed in **Table 19** below. This outreach effort also included two public surveys that were available at these events and also on the PAG website.

5.2.1

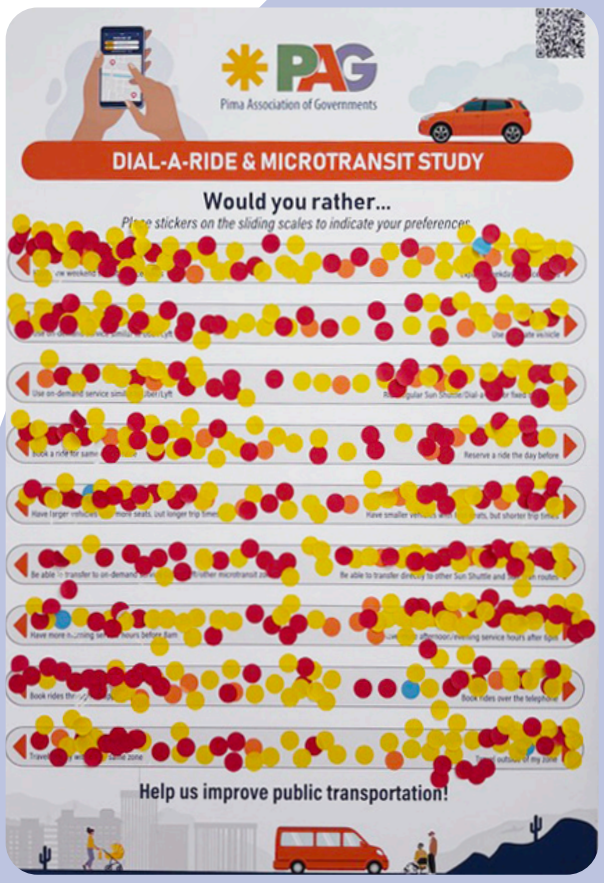
OPEN HOUSE EVENTS

Open houses were held at key locations. These events engaged with the community members where they already were, and were accessible accommodating all members the community including, but not limited to: limited English proficiency populations, Spanish-speaking community, people with disabilities, no vehicle households, low-income populations, foreign-born populations and older adult populations.

Project information and materials were brought to each event and available in both English and Spanish. In-person translation was provided as needed. Snack foods were provided to help draw people to the event table/booth to help solicit meaningful conversations and discussions.

Table 19: Public Outreach Meetings

Event	Date
Vail Public Library Open House	**Oct. 22, 2024**
Picture Rocks Community Center Open House	**Oct. 23, 2024**



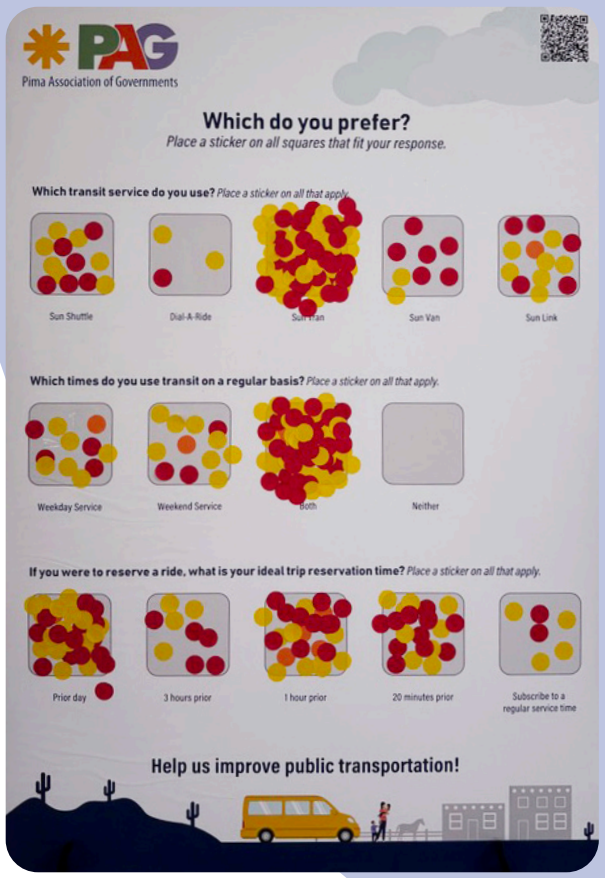


Figure 33: Vail Open House

Open Houses took place at the following locations/events for Picture Rocks and Vail:

- W. Anne Gibson Esmond Station Library
- Picture Rocks Community Center

Overarching issues/requests that were heard from the community at these open house events included:

- Understanding of how microtransit service will be paid for
- General understanding of what microtransit is and how it differs from on-demand transportation options
- Vail has a large percentage of retired population with a high need for ADA accessible transportation
- A need for transportation services that serve the local community, and connects community members to local destinations

As previously mentioned, public participation for both events was minimal. In an effort to garner feedback from the community, a more focused approach was implemented as a focus group meeting for the Citizens for Picture Rocks on March 18, 2025. During round one of engagement, at the public meetings, there were two surveys completed on site, with some attendees stating they completed the survey online.

Picture Rocks Survey Results

The online survey tailored for the Picture Rocks community garnered two responses. The respondents did however express interest in using microtransit services. Desired destinations for express, on-demand service from Picture Rocks included the City of Tucson, the City of South Tucson, the Town of Marana, the Town of Oro Valley, and unincorporated areas of Pima County. More specifically, access to the hospital and other medical services was requested.

The Vail-specific survey was also promoted at Vail Fest on November 2, 2024, one of the community's largest events. This included a diverse mix of residents and business owners. Attendees could take a flyer with information about the study and survey, and they also had the opportunity to take the survey on-site.

Vail Survey Results

A total of seven unique responses were received by the Vail community. Notably, 71% of respondents expressed interest in utilizing microtransit services, while 29% indicated they were not interested. When asked about preferred destinations for express, on-demand bus service departing from Vail, respondents identified the City of Tucson and the Tucson International Airport as key locations.

5.2.2

OVERALL PROJECT SURVEYS

Two main project surveys were developed and made available in English and Spanish. The first survey was promoted in October 2024. It was used to gather a basic understanding of current travel in the identified study areas and the public's desire and need for improvement. The second survey was promoted in March 2025 and was focused on specific solutions/improvements the public would like to see. Multiple "would you rather" questions were asked to narrow down improvement options and ultimately inform the study recommendations.

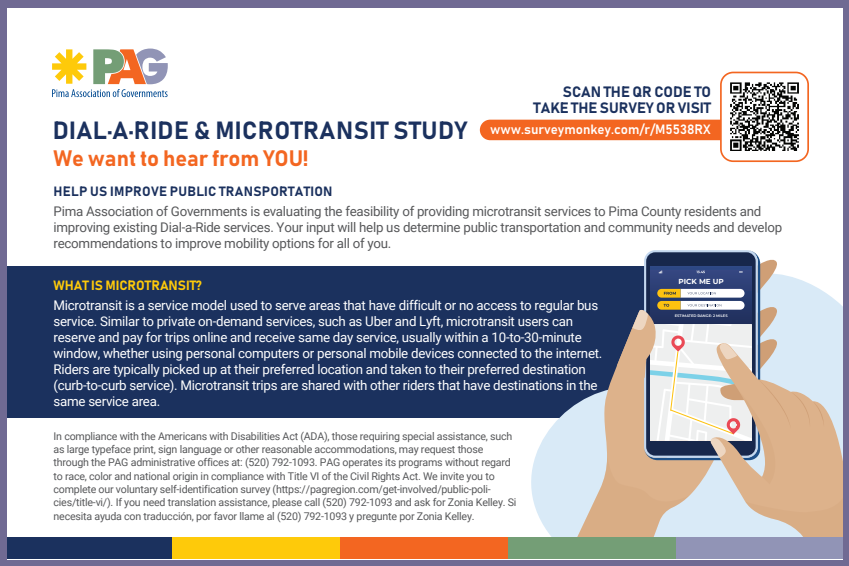
For the first survey, 71% of respondents expressed interest in using microtransit services.

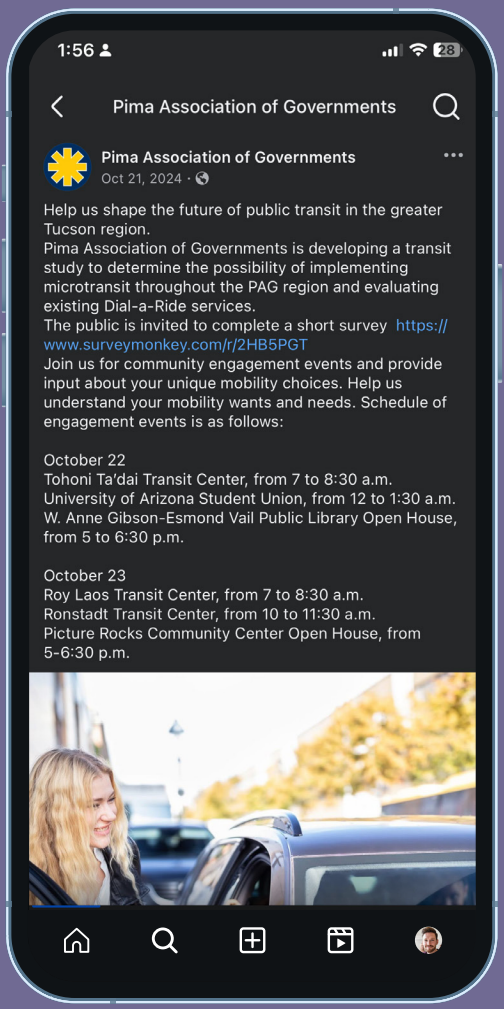
5.2.3

ADVERTISING MATERIALS

Project flyers, press releases, and social media posts were developed for this project. Each served to highlight the study and included a call to action for soliciting feedback from the public. QR codes with links to the project survey were included. Printed materials were produced in both English and Spanish.

Figure 34 & 35: Advertisement Materials





SECTION 06

Cost-Benefit, VMT, and Air Quality Analyses

The study determined the cost-benefit of the recommended transit service improvements and their impact on air quality for Picture Rocks and Vail. Below is a detailed analysis of these two elements.

6.1 Cost-Benefit, VMT, and Air Quality Analyses

Cost-benefit analyses focused on the most substantial capital and operational costs associated with microtransit and dial-a-ride deployment in Picture Rocks and Vail. These are discussed in the following subsections.

6.1.1 CAPITAL COST

The most substantial capital cost associated with microtransit or dial-a-ride vehicle deployment is the cost of vehicles. To estimate vehicle costs, approaches varied by vehicle type:

- For microtransit vans, manufacturer's suggested retail prices (MRSPs) were examined in two sources for three minivan models that were widely available in the U.S. during 2025. [3, 4] These included the Chrysler Pacifica, Honda Odyssey, and Kia Carnival. All were from model year 2025 and all models were gasoline-powered vehicles (versus hybrids, battery electric vehicles [BEVs], or plug-in hybrid electric vehicles [PHEVs]).
- For dial-a-ride shuttles, PAG provided vehicle cost estimates.[5]

The most substantial capital cost associated with microtransit or dial-a-ride vehicle deployment is the cost of vehicles.

Microtransit Vehicle Cost

MSRPs ranged from a low of $36,800 to $38,235 for the Kia Carnival to a high range of $42,450 to $44,445 for the Chrysler Pacifica. Across all models and sources, the average cost for a model year 2025 gasoline-powered minivan in 2025 was approximately $41,197 (see **Table 20**).[6]

Minivan options include hybrid vehicles (which combine an internal combustion engine [ICE] with an electric motor and a battery pack) and plug-in hybrid electric minivans (which combine an ICE with an electric motor and a larger battery pack that is recharged by plugging into an external power source such as a wall outlet or charging station). Plug-in hybrid electric minivans are typically associated with higher upfront costs and lower operating costs than comparable ICE vehicles. There were three hybrid and plug-in hybrid minivans widely available in the U.S. for model year 2025: the Chrysler Pacifica (PHEV), Kia Carnival (Hybrid), and the Toyota Sienna (Hybrid). The average MSRP for these three vehicles was approximately $43,862, less than 10 percent more than the average cost of conventional minivan models. [7]

Dial-a-Ride Shuttle Buses

PAG provided a cost estimate for gasoline-powered shuttle buses of approximately $250,000.

Table 20: Base Model Prices and Average Price for Minivans by Drivetrain Type (Model Year 2025)

	Gasoline-Powered		Hybrid or PHEV		
Make/Model	Edmunds*	MotorTrend	Edmunds*	MotorTrend	Type
Chrysler Pacifica	**$42,450**	**$44,445**	**$51,055**	**$51,055**	**PHEV**
Honda Odyssey	**$41,920**	**$43,670**	-	-	-
Kia Carnival	**$36,800**	**$38,235**	**$40,800**	**$41,895**	**Hybrid**
Toyota Sienna	-	-	**$39,185**	**$39,185**	**Hybrid**
Lowest-Cost Model Average (across all models and sources)		**$41,197**		**$43,863**	

**Uses existing FY 2024 Sun Shuttle Dial-a-Ride ridership instead of Via model*

[4] *Edmunds.com, Inc., 2025. Best Minivans of 2025 and 2026. n.d. Retrieved from https://www.edmunds.com/minivan/.*

[5] *Stoklosa, A. and B. Hernandez, 2025. The Best Minivans to Buy in 2025. MotorTrend, March 21, 2025. Retrieved from https://www.motortrend.com/features/best-minivans-to-buy.*

[6] *Note some of these vehicles may require aftermarket modifications (or "upfitting") to support paratransit services. Associated costs have not been addressed herein.*

[7] *Note the Chrysler Pacifica PHEV would require an electric vehicle charger. Associated costs have not been addressed herein.*

Total Capital Cost for Vehicles

To determine the grand total capital cost of conventional gasoline microtransit vehicles for Picture Rocks and Vail, the average minivan cost was multiplied by the number of microtransit vehicles required for each zone (from simulation results) to yield the vehicle cost per zone. The same approach was applied for dial-a-ride vehicles. Simulation results suggest Picture Rocks and Vail would each require two microtransit vehicles or two dial-a-ride vehicles per zone.

For microtransit, the cost for two gasoline-powered vehicles would be approximately $82,393 per zone while the cost for two hybrid or PHEV microtransit vehicles would be $87,725 per zone (see **Table 21**). For dial-a-ride, the cost for two gas-powered shuttle buses would be approximately $500,000.

To determine the grand total capital cost of hybrid and PHEV microtransit vehicles across all zones, the average hybrid/PHEV minivan cost of approximately $43,863 was multiplied by the number of microtransit vehicles required for each zone (from simulation results) to yield the vehicle cost per zone. Costs ranged from approximately $87,725 in the four zones with two hybrid vehicles or PHEVs vehicles each up to a high of approximately $350,900 in zones with eight vehicles each. Zone-specific estimates were totaled to yield the grand total estimated capital cost for PHEV/hybrid microtransit vehicles of approximately $2,456,300 (see **Table 21**), approximately 6.5 percent higher than for conventional gasoline-powered microtransit vehicles.

Table 21: Number of Vehicles and Vehicle Cost by Drivetrain Type, 2025

		Estimated Vehicle Cost (based on average cost per vehicle)		
Zone	Number of Vehicles	Gas-Powered Microtransit ($41,197)	Hybrid/PHEV Microtransit ($43,863)	DAR Vehicles (Gasoline Shuttle Bus) ($250,000)
Picture Rocks	**2**	**$82,393**	**$87,725**	**$500,000**
Vail	**2**	**$82,393**	**$87,725**	**$500,000**
Grand Total Vehicle Cost	**4**	**$164,787**	**$175,450**	**$1,000,000**

6.1.2

OPERATING COST

Operating costs for microtransit and dial-a-ride were based on the simulation discussed in the section. The estimated operating costs for Picture Rocks and Vail are listed in **Table 22** for microtransit, and **Table 23** for dial-a-ride. The simulation estimates the annual vehicle-hours required to meet projected microtransit demand, which is multiplied by an all-inclusive operating cost assumption of $80 per vehicle-hour to yield total operating cost. The $80 per vehicle-hour assumption includes all direct and indirect costs, including labor, fuel, maintenance, insurance, utilities, etc., and is derived from the latest data acquired from the National Transit Database.

Table 22: Estimated Microtransit Annual Operating Cost by Opportunity Zone

Zone	Service Tier	Annual Operating Cost
Picture Rocks	**Weekday**	**$300,000**
Vail	**Weekday**	**$330,000**
Total		**$630,000**

Table 23: Estimated Dial-a-Ride Annual Operating Cost by Opportunity Zone

Zone	Annual Operating Cost
Picture Rocks	**$44,000**
Vail	**$64,000**
Total	**$108,000**

6.1.3

BENEFITS

Microtransit and dial-a-ride vehicles may offer financial benefits when compared to traditional transit solutions. For example, microtransit and dial-a-ride vehicles have lower costs for acquisition, operations, and maintenance than buses as well as potentially lower costs for operator salaries (versus bus drivers with specialized licenses). Shifting trips from other modes (such as transit buses and private passenger vehicles) to microtransit or dial-a-ride vehicles may also achieve reduced carbon dioxide (CO_2) emissions from vehicle tailpipes. Because expanded fixed-route transit service paired with either microtransit or dial-a-ride services would be new services in Picture Rocks and Vail (versus replacing other forms of transit), offering either would result in a net increase in emissions.

The U.S. Environmental Protection Agency (EPA) publishes periodic estimates of the social cost of greenhouse gas emissions in U.S. dollars. In this context, "social cost" refers to a monetary estimate of the economic damage caused by releasing CO_2 into the atmosphere. The value attempts to represent the total cost to society of each additional ton of carbon emissions. Societal costs include including impacts on health, agriculture, property damage, and so on. The EPA published its most recent update to these estimates in November 2023. At that time, the projected near-term social cost of CO_2 emissions in the U.S. in 2025 was $212 per metric ton.[8, 9]

While the gasoline shuttle buses used for dial-a-ride services have higher emissions than microtransit vehicles, the total VMT would be much higher for microtransit services in Picture Rocks and Vail than for dial-a-ride services because microtransit is expected to attract higher ridership. As such, emissions would be higher for microtransit services versus dial-a-ride services in these zones. Therefore, adding microtransit service with expanded fixed-route transit service in Picture Rocks and Vail has a higher social cost of CO_2 than adding dial-a-ride service with expanded fixed-route transit service (approximately $23,002 annually versus $18,427, respectively).[10] Emissions from these services are discussed in further detail in the **Social Cost of Carbon section (6.3.3).**

[8] *U.S. EPA, 2023. Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances. National Center for Environmental Economics, Office of Policy and Climate Change Division, Office of Air and Radiation. Docket ID No. EPA-HQ-OAR-2021-0317. Washington, DC, November 2023. Retrieved from https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf.*

[9] *The EPA includes high, central, and low estimates for the near-term social cost of CO_2 emissions; these analyses use the central estimate.*

[10] *Footnote Needed*

6.2
Vehicle Miles Traveled (VMT) Analysis

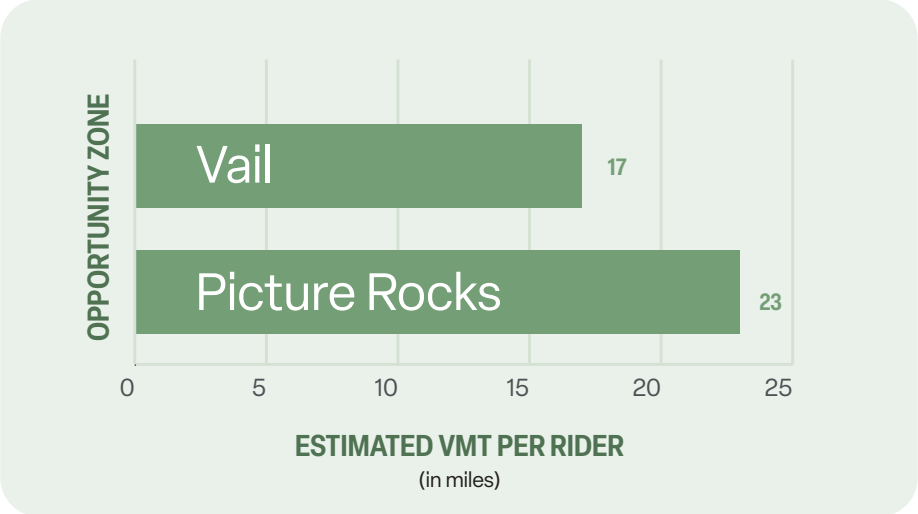
An analysis of the change in annual vehicle miles traveled (VMT) was conducted for each opportunity zone to understand microtransit's impact on the environment and the transportation network. For each opportunity zone, two VMT scenarios were calculated: the future scenario, which is the sum of VMT of microtransit or dial-a-ride and corresponding fixed-route transit modifications, and the baseline scenario, which is the sum of the avoided VMT that the new service replaces. The change in VMT is the difference between the baseline and future scenarios. The following subsections describe how VMT values were calculated in detail.

6.2.1
FUTURE SCENARIO

Microtransit and dial-a-ride's VMT was estimated through the simulation process as described in the section. Unlike fixed-route transit that has a constant VMT, on-demand transit has a variable VMT based on day-to-day travel demand.

For this study, an estimate of VMT per rider for Picture Rocks and Vail under both microtransit and dial-a-ride models was derived from the simulation results, which are listed in **Table 24.** These estimates were derived by dividing the total fleet vehicle-miles by the projected ridership; therefore, these estimates will factor in distance for grouped trips and distance accrued when the vehicle is empty (leaving or returning to the depot, traveling empty to pick up a passenger). The VMT value is influenced by zone design and travel patterns: larger zones will attract longer trips that increase VMT per rider, and trip demand that can be grouped will permit more shared trips that decrease VMT per rider. VMT estimates are the same between microtransit and dial-a-ride models since they are similar operationally.

Table 24: Estimated Annual Average Microtransit VMT per Rider by Opportunity Zone



Vail also has recommended fixed-route transit modifications. The VMT associated with this modification equals the distance of the additional service multiplied by the number of trips per year.

Table 25 and **Table 26** summarize the Annual VMT in future scenario by opportunity zone for microtransit and dial-a-ride, respectively.

Table 25: Microtransit Future Scenario Annual VMT

	Microtransit		Bus Modification	
Zone	Ridership	Microtransit VMT	New Bus VMT	Total VMT of Future Scenario
Vail	**11,000**	**187,000**	**6,240**	**193,240**
Picture Rocks	**4,000**	**92,000**	**-**	**92,000**

Table 26: Dial-a-Ride Future Scenario Annual VMT

	Dial-a-Ride		Bus Modification	
Zone	Ridership	DAR VMT	New Bus VMT	Total VMT of Future Scenario
Vail	**2,000**	**34,000**	**6,240**	**40,240**
Picture Rocks	**800**	**18,400**	**-**	**18,400**

6.2.2

BASELINE SCENARIO

The baseline scenario VMT is entirely composed of new transit trips, as seen for microtransit in **Table 27** and Dial-a-Ride in **Table 28,** which are existing trips currently taken in a private vehicle and new trips generated. As neither Vail nor Picture Rocks have existing transit service, there are no trips shifted from existing transit services.

It is assumed that 20% of new transit trips are newly generated trips that were not previously possible, such as riders that do not have access to or cannot operate a private vehicle; this proportion was estimated from Via's other microtransit deployments. The remaining 80% are assumed to have shifted modes from private vehicles to microtransit or dial-a-ride. The avoided VMT of newly generated trips is zero. The avoided VMT of existing trips taken on a private vehicle is estimated through Replica, a travel-demand model. The average private vehicle distance per trip was calculated for all private vehicle trips that fit the origin-destination travel rules of the opportunity zone and then multiplied by the number of trips to estimate the avoided VMT from private vehicles.

Table 27: Microtransit New Transit Trips Annual VMT

	Newly Generated Trips	**Mode Shift from Private Vehicle**				
Zone	Trip Count	Trip Count	VMT per Trip	Total VMT	Total New Transit Trips	Total VMT of New Transit Trips
Vail	**2,200**	**8,800**	**4.62**	**40,656**	**11,000**	**40,656**
Picture Rocks	**800**	**3,200**	**6.37**	**20,384**	**4,000**	**20,384**

Table 28: Dial-a-Ride New Transit Trips Annual VMT

	Newly Generated Trips	**Mode Shift from Private Vehicle**				
Zone	Trip Count	Trip Count	VMT per Trip	Total VMT	Total New Transit Trips	Total VMT of New Transit Trips
Vail	**400**	**1,600**	**4.62**	**7,392**	**2,000**	**7,392**
Picture Rocks	**160**	**640**	**6.37**	**4,077**	**400**	**4,077**

6.2.3

OVERALL CHANGE IN VMT

Table 29 and **Table 30** show the overall change in VMT by opportunity zone for microtransit and dial-a-ride, respectively. New microtransit or dial-a-ride deployments are not always expected to result in a decrease in VMT, especially when compared to travel on private vehicles, as there is some distance accrued when vehicles are traveling empty to a pickup and vehicles may detour to pick up or drop off other riders. Opportunity zones that have a lower impact on VMT tend to have higher productivity, meaning that it is operationally efficient and carries more riders per distance traveled.

Table 29: Change in Microtransit Annual VMT by Opportunity Zone

Zone	Total VMT of Future Conditions	Total VMT of New Transit Trips	Change in VMT
Vail	**193,240**	**(40,656)**	**+152,584**
Picture Rocks	**92,000**	**(20,384)**	**+71,616**

Table 30: Change in Dial-a-Ride Annual VMT by Opportunity Zone

Zone	Total VMT of Future Conditions	Total VMT of New Transit Trips	Change in VMT
Vail	**40,240**	**(7,392)**	**+32,848**
Picture Rocks	**18,400**	**(4,077)**	**+14,323**

6.3

Air Quality Analysis

Emissions associated with new were estimated for expanded fixed-route bus service in Vail along with new microtransit service or dial-a-ride service in Picture Rocks and Vail. Emissions estimates include the following pollutants:

- **Nitrogen Oxides (NOx)**: a group of reactive gases that contribute to air pollution including nitric oxide (NO) and nitrogen dioxide (NO_2). They can be produced from burning fuels and react with volatile organic compounds (VOCs) to form ground-level ozone.
- **Volatile Organic Compounds (VOCs):** organic chemicals that can evaporate into the air and contribute to air pollution. They react with NOx to form ground-level ozone.
- **Particulate matter with aerodynamic diameter of 2.5 micrometers (µm) or smaller (PM2.5):** these small particles pose a substantial health as they can be inhaled deep into the lungs and potentially enter the bloodstream. They are linked to various health problems, including respiratory and cardiovascular issues.
- **Particulate matter with aerodynamic diameter of 10 µm or smaller (PM10):** these are often referred to as "coarse particles" and can include soot, dust, salt, and other materials. Exposure to high concentrations of PM10 can result in health impacts ranging from coughing to asthma and bronchitis to high blood pressure, heart attacks, and premature death.
- **CO_2 equivalent:** a standardized unit of measurement used to compare the global warming potential of different greenhouse gases in terms of the amount of CO_2 that would have the same effect.

To estimate pollutant emissions, three steps were taken:

01 Estimate total new emissions from microtransit and expanded bus service

02 Estimate avoided emissions from trips replaced by microtransit and expanded bus service (including trips that would otherwise have been taken via dial-a-ride vehicles, transit buses, and private vehicles)

03 Combine the two preceding estimates to yield overall net emissions associated with the new and expanded services

The following subsections describe these steps in detail. The last subsection provides further detail regarding the social cost of CO_2 emissions estimates described in the Cost-Benefit Analyses section above.

6.3.1

TAILPIPE CO_2 EMISSIONS FROM MICROTRANSIT BUS SERVICE

Estimating annual tailpipe emissions for the new and expanded services involves converting VMT for each service type to each of the pollutants based on conversion factors provided by PAG.[11] PAG developed these factors using the U.S. EPA's Motor Vehicle Emission Simulator (MOVES), which estimates air pollution emissions for criteria air pollutants, greenhouse gases, and air toxics for mobile sources (on-road and nonroad vehicles). Conversion factors differ for each pollutant by vehicle type and fuel type and are expressed in grams of emissions per mile. This conversion factor can be seen in **Table 31.**

Table 31: Emissions Conversion Factors

	Vehicle Type and Fuel Type				
Pollutant	Shuttle Bus (Diesel)	Shuttle Bus (Gasoline)	Fixed-Route Transit Bus (Compressed Natural Gas)	Microtransit Van (Gasoline)	Average Commuter Vehicle (Gasoline)
NOx	**10.085**	**1.044**	**0.945**	**0.297**	**0.217**
VOC	**0.508**	**2.000**	**0.697**	**0.367**	**0.316**
PM10	**0.526**	**0.132**	**0.100**	**0.039**	**0.039**
PM2.5	**0.359**	**0.073**	**0.019**	**0.010**	**0.010**
CO_2e	**1,729.18**	**1,510.45**	**1,939.91**	**428.17**	**377.84**

Microtransit

For each pollutant, VMT was multiplied by the relevant conversion factor (to express the pollutant in grams) then divided by 1,000,000 to convert grams into metric tons. As shown in **Table 32**, new gasoline-powered microtransit van service in Picture Rocks and Vail results in approximately 0.083 metric tons of NOx, 0.102 metric tons of VOCs, 0.011 metric tons of PM10, 0.03 metric tons of PM2.5, and approximately 119 metric tons of CO_2e emissions annually.

Table 32: Annual Emissions Associated with Microtransit Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.056**	**0.069**	**0.007**	**0.002**	**80.07**
Picture Rocks	**0.027**	**0.034**	**0.004**	**0.001**	**39.39**
Total Annual Emissions	**0.083**	**0.102**	**0.011**	**0.003**	**119.46**

[11] *U.S. EPA, 2023.*

Microtransit

As shown in **Table 33,** new dial-a-ride service in Picture Rocks and Vail results in approximately 0.055 metric tons of NOx, 0.105 metric tons of VOCs, 0.007 metric tons of PM10, 0.004 metric tons of PM2.5, and approximately 79.15 metric tons of CO_2e emissions annually.

Table 33: Annual Emissions Associated with Dial-a-Ride Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.035**	**0.068**	**0.004**	**0.002**	**51.36**
Picture Rocks	**0.019**	**0.037**	**0.002**	**0.001**	**27.79**
Total Annual Emissions	**0.055**	**0.105**	**0.007**	**0.004**	**79.15**

Expanded Fixed-Route Bus Service

In Vail, the expanded fixed-route bus service relies on a transit bus powered by compressed natural gas (CNG). Estimating CO_2 emissions for this vehicle follows the same approach as used for microtransit and dial-a-ride services above except using the emissions conversion factors associated with a CNG transit bus.

Expanded fixed-route bus service in Vail results in estimated emissions of 0.006 metric tons of NOx, 0.004 metric tons of VOCs, 0.001 metric tons of PM10, less than 0.001 metric tons of PM.5, and approximately 12.11 metric tons of CO_2e annually (see **Table 34**).

Table 34: Annual Emissions Associated with Expanded Fixed-Route Bus Service in Vail

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail (CNG transit bus)	**0.006**	**0.004**	**0.001**	**< 0.001**	**12.11**

Table 35: Annual Emissions Associated with Microtransit Service (Picture Rocks and Vail) and Expanded Fixed-Route Bus Service in Vail

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.061**	**0.073**	**0.008**	**0.002**	**92.17**
Picture Rocks	**0.027**	**0.034**	**0.004**	**0.001**	**39.39**
Total	**0.089**	**0.107**	**0.012**	**0.003**	**131.57**

Overall Pollutant Emissions from New Microtransit and Expanded Fixed-Route Bus Services

The above estimates for microtransit service in Picture Rocks and Vail as well as for expanded fixed-route bus service in Vail were combined to yield an overall estimate of emissions for these new services of approximately 132 metric tons of CO_2e annually, as shown in **Table 35.**

Table 36: Annual Emissions Associated with Dial-a-Ride Service (Picture Rocks and Vail) and Expanded Fixed-Route Bus Service in Vail

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.041**	**0.072**	**0.005**	**0.003**	**63.46**
Picture Rocks	**0.019**	**0.037**	**0.002**	**0.001**	**27.79**
Total	**0.061**	**0.109**	**0.008**	**0.004**	**91.25**

Overall Pollutant Emissions from New Dial-a-Ride and Expanded Fixed-Route Bus Services

The above estimates for dial-a-ride service in Picture Rocks and Vail as well as for expanded fixed-route bus service in Vail were combined to yield an overall estimate of emissions for these new services of approximately 132 metric tons of CO_2e annually, as shown in **Table 36.**

6.3.2

AVOIDED POLLUTANT EMISSIONS

Deploying microtransit or dial-a-ride service and enhancing fixed-route bus service generates new sources of emissions, but these services may be offset by avoided emissions from trips that would otherwise have been taken via other modes. Because neither dial-a-ride nor transit bus service are currently available in Vail or Picture Rocks, use of microtransit, dial-a-ride, or enhanced fixed-route bus service in these zones offset trips in personal passenger vehicles only.

Avoided Emissions from Replaced Trips – Microtransit and Expanded Fixed-Route Bus Services

To estimate avoided emissions associated with private vehicle trips replaced by trips via microtransit or expanded bus service, private vehicle miles traveled were multiplied by the conversion factors associated with the average gasoline-powered commuter vehicle from **Table 31.** Results suggest microtransit and expanded bus services replacing private vehicle trips in these zones yielded approximately 23 metric tons of avoided CO_2e emissions annually (**Table 37**). The table shows negative numbers because the estimates represent avoided emissions (i.e., emissions that would have occurred from private vehicles if microtransit and expanded bus services were not available). Private vehicle trips were reduced by the new and expanded services in both zones.

Table 37: Avoided Annual Emissions from Private Vehicle Trips Replaced with Trips via Microtransit and Expanded Fixed-Route Bus Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**(0.009)**	**(0.013)**	**(0.002)**	**(<0.001)**	**(15.36)**
Picture Rocks	**(0.004)**	**(0.006)**	**(0.001)**	**(<0.001)**	**(7.70)**
Total Annual Emissions	**(0.013)**	**(0.019)**	**(0.003)**	**(0.001)**	**(23.06)**

Avoided Emissions from Replaced Trips – Dial-a-Ride and Expanded Fixed-Route Bus Services

To estimate avoided emissions associated with private vehicle trips replaced by trips via dial-a-ride or expanded bus service, private vehicle miles traveled were multiplied by the conversion factors associated with the average gasoline-powered commuter vehicle from **Table 31.** Results suggest dial-a-ride and expanded bus service replacing private vehicle trips in these zones yielded approximately 4 metric tons of avoided CO_2e emissions annually (**Table 38**). The table shows negative numbers because the estimates represent avoided emissions (i.e., emissions that would have occurred from private vehicles if dial-a-ride and expanded bus services were not available). Private vehicle trips were reduced by the new and expanded services in both zones. Avoided emissions from expanded fixed-route bus service combined with dial-a-ride service are lower than when combined with microtransit service because VMT for dial-a-ride vehicles would be lower than for microtransit services.

Private vehicle trips were reduced by the new and expanded services in both zones.

Table 38: Avoided Annual Emissions from Private Vehicle Trips Replaced with Trips via Dial-a-Ride and Expanded Fixed-Route Bus Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**(0.002)**	**(0.002)**	**(<0.001)**	**(<0.001)**	**(2.79)**
Picture Rocks	**(0.001)**	**(0.001)**	**(<0.001)**	**(<0.001)**	**(1.54)**
Total Annual Emissions	**(0.002)**	**(0.004)**	**(<0.001)**	**(<0.001)**	**(4.33)**

6.3.3

OVERALL NET EMISSIONS

To estimate net annual emissions for Picture Rocks and Vail, emissions from the new or expanded services were combined with avoided emissions from replaced private vehicle trips.

Table 39: Net Annual Emissions from Private Vehicle Trips Replaced by Microtransit and Expanded Bus Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.053**	**0.060**	**0.006**	**0.002**	**76.81**
Picture Rocks	**0.023**	**0.027**	**0.003**	**0.001**	**31.69**
Total Annual Emissions	**0.076**	**0.087**	**0.009**	**0.002**	**108.50**

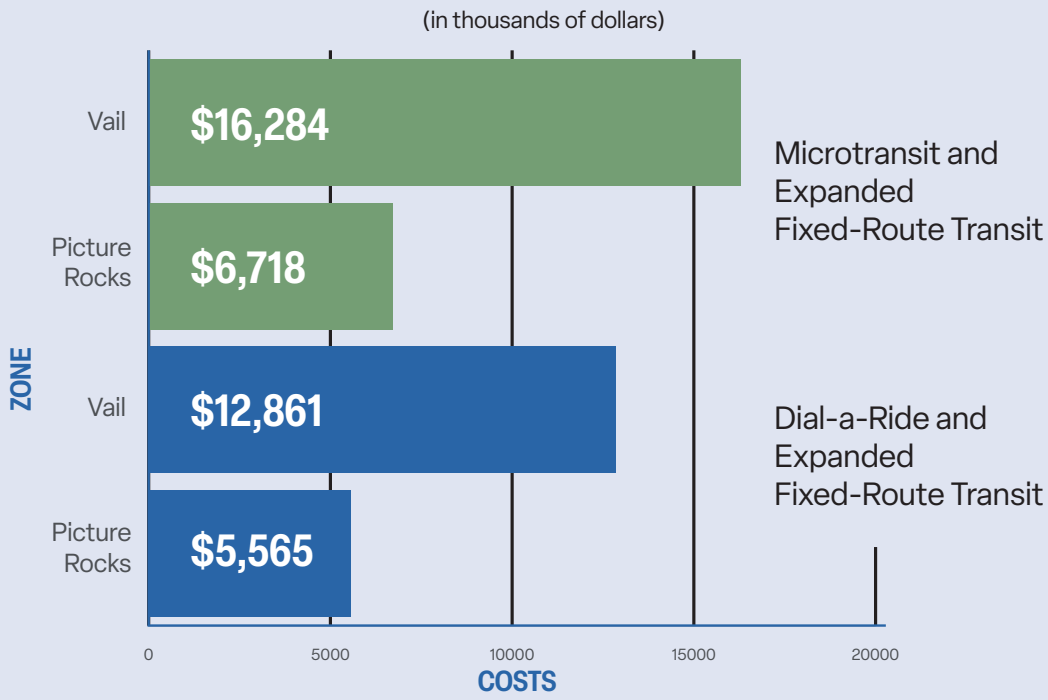
Net Emissions from New Dial-a-Ride and Expanded Fixed-Route Bus Services

Emissions from the new or expanded services (dial-a-ride and fixed-route transit) were combined with avoided emissions from replaced private vehicle trips to estimate net annual emissions. The results are listed in **Table 40.** These new or expanded services would increase emissions in both zones for all pollutants (NOx, VOCs, PM10, PM2.5, and CO_2e). Overall CO_2e emissions would increase by approximately 87 metric tons annually.

Table 40: Net Annual Emissions from Private Vehicle Trips Replaced by Dial-a-Ride and Expanded Bus Service

	Pollutant (in Metric Tons)				
Zone	NOx	VOC	PM10	PM2.5	CO_2e
Vail	**0.040**	**0.070**	**0.005**	**0.003**	**60.67**
Picture Rocks	**0.018**	**0.036**	**0.002**	**0.001**	**26.25**
Total Annual Emissions	**0.058**	**0.106**	**0.007**	**0.004**	**86.92**

Table 41: Annual Social Cost of Tailpipe CO_2 Emissions from Microtransit and Expanded Bus Service, 2025



TOTAL OVERALL SOCIAL COST:

Microtransit and Expanded Fixed-Route Transit: **$23,002.37**

Dial-a-Ride and Expanded Fixed-Route Transit: **$18,426.87**

Social Cost of Carbon

As explained in the Cost-Benefit Analysis section above, CO_2 emissions have a social cost since they cause economic damage such as impacts on health and agriculture as well as property damage and so on. When these costs are considered, the emissions reductions resulting from transition toward microtransit vehicles and expanded bus service may have monetary value from a societal perspective.

The EPA's most recent estimate of the social cost of CO_2 emissions in the U.S. is from 2023 and includes projected costs for later years. Based on these data, the projected near-term social cost of CO_2 emissions in 2025 is $212 per metric ton.[12, 13]

Adding transit service in Picture Rocks and Vail and expanding fixed-route bus service in Vail increases tailpipe CO_2e emissions in both zones under both microtransit and dial-a-ride service models. This results in an increase in CO_2e emissions across all zones valued at approximately $23,002 annually based on the U.S. EPA's projected 2025 social cost of CO_2 emissions (**Table 41**). For new dial-a-ride service in both zones and expanded fixed route bus service in Vail, tailpipe CO_2e emissions also increase in both zones at a value of approximately $18,427 annually. In **Table 39** and **Table 40,** positive numbers represent increased emissions and negative numbers represent emissions reductions. In **Table 41,** positive numbers represent costs and negative numbers represent savings.

[12] As noted previously, these analyses rely on the EPA's central estimate of the near-term social cost of CO_2 emissions (versus the low or high estimates).

[13] MISSING CITATION

SECTION 07

Recommendations

The needs assessment illustrates the gaps in service that exist in both Picture Rocks and Vail. Having the opportunity to request a ride the same day, receive curb-to-curb service, and connect to important destinations was something that appealed to these communities and key stakeholders when asked about their preferences, as shown in the public involvement summary.

Picture Rocks and Vail both score low in the transit propensity index with limited trip activity, making them poorly suited for traditional fixed-route bus service or neighborhood circulators. Fixed-route service is most effective in areas with concentrated demand and high potential for frequent boarding activity to remain efficient and cost-effective. These attributes are currently not present in Vail or Picture Rocks. Neighborhood circulators, while more flexible, still require consistent local trip generation within a compact service area to justify fixed schedules and regular stops. In Picture Rocks, for example, the origin-destination trip flow analysis revealed that most trips are focused on a single destination (Arizona Pavilions Shopping Center) rather than being distributed across a variety of destinations. This characteristic is a limiting factor to the effectiveness of the circulator model. Similarly, the limited commerce opportunities and dispersed residential patterns in Vail make it difficult to plan a circulator service capable of capturing meaningful daily ridership for this type of service.

While commuter service is also an inefficient fit for Picture Rocks, it is recommended to be extended to Vail. Express service is most effective with high-volume directional travel between residential neighborhoods and major employment centers during peak commute hours. Picture Rocks demonstrated low ridership in the 414P Picture Rocks Sun Shuttle pilot program, which ended in 2023, indicating that even subsidized peak-period commuter service could struggle to attract sufficient ridership. In both communities, the existing land use and travel patterns do not support the service frequency, ridership volumes, or fare recovery needed to justify traditional transit such as fixed-route. However, flexible demand-responsive options like microtransit and dial-a-ride could be better suited to respond to the unique access needs and lower-density conditions of these communities.

Fixed-route service is most effective in areas with concentrated demand and high potential for frequent boarding activity to remain efficient and cost-effective. These attributes are currently not present in Vail or Picture Rocks.

Based on the needs assessment, public feedback, and planning analysis, it is recommended to consider on-demand transit services implementation in Picture Rocks and Vail.

Picture Rocks

The zone has the lowest ridership out of all zones identified for Pima County, leading to the lowest utilization and highest cost per rider out of all zones analyzed. However, there is a high need for transit services following the termination of Sun Shuttle Route 414P. Public input indicated that transit service is needed as residents have no other options. The RTA could initiate transit service in Picture Rocks as dial-a-ride and convert to microtransit in the future as ridership grows.

Vail

Public and stakeholder engagement indicated that Vail has a high need for transit services, which do not currently exist. However, this zone is projected to have lower ridership and longer trips compared to other zones.

7.1

Implementing Transit Services

Two important factors in implementing microtransit services are the operational and capital costs. Below is the cost by zone and the total investment once the services that will be replaced are considered in the calculation.

7.1.1

MICROTRANSIT OPERATIONAL COSTS

Operational costs have been calculated for each zone based on the current operating cost of $80/revenue-hour as seen in **Table 42.**

Table 42: Microtransit Operational Costs

Zone	Phasing	Operating Cost
Vail	**Medium Term**	**$350,000**
Picture Rocks	**Medium Term**	**$300,000**
Total		**$650,000**

7.1.2

MICROTRANSIT CAPITAL COSTS

Effective microtransit service requires smaller vehicles to provide service. This is due to the shorter trips where the software groups similar origins and destinations and guarantees faster trips for the riders. The following table shows the capital costs of acquiring vehicles as seen in **Table 43.**

Table 43: Microtransit Capital Costs

Zone	Phasing	Number of Vehicles	Operating Cost
Vail	**Medium Term**	**2**	**$82,000**
Picture Rocks	**Medium Term**	**2**	**$82,000**
Total			**$164,000**

7.1.3

DIAL-A-RIDE OPERATIONAL COSTS

The table below shows the operational costs of providing dial-a-ride services for Picture Rocks and Vail. The base cost is $80/revenue-hour as shown in **Table 44.**

Table 44: Dial-a-Ride Operational Costs

Zone	Phasing	Operating Cost
Vail	**Medium Term**	**$64,000**
Picture Rocks	**Medium Term**	**$44,000**
Total		**$108,000**

7.1.4

DIAL-A-RIDE CAPITAL COSTS

The following table shows the capital costs of acquiring vehicles for dial-a-ride services. It is assumed that the RTA will use cut-aways shuttles for these services as seen in **Table 45.**

Table 45: Dial-a-Ride Capital Costs

Zone	Phasing	Number of Vehicles	Operating Cost
Vail	**Medium Term**	**2**	**$500,000**
Picture Rocks	**Medium Term**	**2**	**$500,000**
Total			**$1,000,000**

7.1.5
IMPLEMENTATION CONSIDERATIONS

The implementation of microtransit or dial-a-ride service requires agencies to make some decisions related to the type of service they want to use, software, storage, coordination, funding and others, as shown below.

Staffing and Procurement Model

As discussed in Section 3, microtransit and dial-a-ride is typically operated with a software as a service (SaaS) or turnkey model. Some agencies use some elements of each model to take advantage of fleet, software, equipment, personnel, etc. This study recommends that the RTA operate microtransit or dial-a-ride under a turnkey model, similar to how it currently operates Sun Shuttle services. The operator should provide vehicles, staff and software. Ongoing hourly costs will decrease as fleet size increases because fixed costs are spread among the revenue hours.

An effective microtransit or dial-a-ride service should include a robust software platform as discussed in the Service Models section.

Software

An effective microtransit or dial-a-ride service should include a robust software platform as discussed in the Service Models section. The rider-facing interface should be a mobile app and website that includes a multimodal trip planner, real-time vehicle updates, payment, and other features in an easy-to-use and accessible user interface. A call center option should be provided for riders without smartphone or internet access. The software platform should also be capable of tracking ride histories and extra performance metrics for easy monitoring.

Because the RTA already hires a turnkey provider, it is recommended that the contract includes the on-demand app and technology to operate the proposed transit service. The app needs to have the option to add new and modify existing service areas to respond quickly to needs anywhere in the county.

Infrastructure Improvements

To implement reliable transit service in areas like Picture Rocks, roadway upgrades are essential. Loose gravel, uneven surfaces, and dust reduce safety, damage vehicles, and disrupt service reliability. Improvements such as paving, grading, and dust control would enhance safety, lower maintenance costs, and ensure consistent transit access for this community. Unpaved and deteriorated roads hinder the implementation of reliable transit service.

Vehicle Storage

Microtransit typically uses vans to provide service, which have more flexible storage space requirements compared to cutaway shuttles and buses. It is recommended to store vehicles close to where they will provide service to reduce deadhead miles. This will also allow the provider to allocate additional vehicles when needed and to respond timely to issues in service. Agreements could be made with agencies or shopping centers/parking garages to facilitate vehicle storage and staging.

Fares

Transit in Pima County has been operating fare-free since the COVID-19 pandemic. If fares are reinstated, microtransit or dial-a-ride fares are recommended to match the fares of other fixed-route and dial-a-ride services. The RTA should also consider free transfers from to and from fixed-route and other transit services to encourage transit usage.

Marketing and Outreach

Successful transit programs across the County highlight the importance of marketing and outreach, especially since on-demand transit is a newer transit service that potential riders may be unfamiliar with. An effective marketing and outreach campaign should be conducted before and after the service launch that generates awareness and excitement. The campaign should also explain how to ride microtransit or dial-a-ride, which can help reduce riders' anxiety in trying a new service.

Agency Coordination and Partnerships

In general, the RTA will oversee operating the microtransit or dial-a-ride service, requiring only internal coordination with fixed-route services. If on-demand transit service is extended beyond the boundaries to reach zones operated by Sun Tran or Oro Valley, it is recommended to coordinate these services with those agencies to offer seamless transfers and enhanced experiences.

Additionally, it is recommended that the RTA coordinates with social service agencies, volunteer services and the school district when implementing microtransit or dial-a-ride and adjust service if needed.

Funding

Currently, the RTA relies on a combination of funding sources, including local sales taxes, Federal Transit Administration (FTA) 5307 and 5311 funds, and Arizona Department of Transportation (ADOT) contributions. For nearly two decades, the RTA has supported countywide transit operations through these funds. If these funding sources become unavailable, both the RTA and other transit service providers will need to reassess the structure and priorities of the county's transit system to align with community needs and available resources.

For Fiscal Year 2025, the current transit funding allocation for the greater Tucson region stands at $31.6 million. Voters will have the opportunity to consider the new half-cent sales tax and associated RTA Next plan in the election anticipated for March 2026. While future funding levels remain uncertain, advancing the RTA Next initiative will be essential to support the proposed improvements. Without these funds, a comprehensive reevaluation of transit operations and investment priorities across the county will be necessary.

Successful transit programs across the county highlight the importance of marketing and outreach.

7.1.6
IMPLEMENTATION ROADMAP

Two types of services have been identified as suitable to serve Picture Rocks and Vail, microtransit and dial-a-ride. Operationally, these services are similar, they both operate in a defined zone, provide curb-to-curb service, need advance reservation, etc. In terms of their implementation, they also follow similar paths. **Table 46** (next page) shows the implementation activities recommended for each one of them.

Table 46: Implementation Roadmap

01 PLANNING

Step	Estimated Duration	Microtransit	Dial-a-Ride
Develop a Data Management Plan (DMP) to specify data collected, ownership, storage, sharing, and security	**2-3 Months**	✓	✓
Develop an Equity and Accessibility Plan (EAP) to address how transit services will be accessible to populations with disabilities, unbanked populations, and populations without access to internet and/or smartphones	**2-3 Months**	✓	✓
Select which transit service zone(s) to implement	**2-3 Months**	✓	✓
Decide if the service will be launched as a pilot or regular service	**1-2 Months**	✓	✓
Conduct rider education sessions and publicize information through the website, traditional media, and social media prior to launch	**3 Months**	✓	✓

02 DESIGN

Step	Estimated Duration	Microtransit	Dial-a-Ride
Select the microtransit service model, either the recommended turnkey model, SaaS, or a combination of the two	**1-2 Months**	✓	
Determine fare structure for the transit services, if needed	**1-2 Months**	✓	✓
Update the Rider Guide to reflect the selected service zone(s), operating days and hours, fares, and guidelines for riding	**2-3 Months** following selection of microtransit vendor	✓	✓

Table 46: Implementation Roadmap (continued)

03 PROCUREMENT

Step	Estimated Duration	Microtransit	Dial-a-Ride
Develop a Request for Proposals for microtransit software and app if operating the service directly. If using the current turnkey provider, amend the contract to include microtransit service. If using a new turnkey provider, develop a Request for Proposals for microtransit turnkey operations. Turnkey services should include the microtransit software and app.	**3-5 Months**	✓	
Develop a Request for Proposals for dial-a-ride services if operating the service directly. If using the current turnkey provider, amend the contract to include dial-a-ride service. If using a new turnkey provider, develop a Request for Proposals for dial-a-ride turnkey operations. Turnkey services should include the demand response software.	**3-5 Months**		✓
Procure vehicles with required technology (e.g., tablets) if operating services directly	**3-5 Months**	✓	✓
If operating the services directly, hire drivers (including spare drivers) and one supervisor	**3-6 Months**	✓	✓
Print updated Rider Guides, update website	**1 Month Before Launch**	✓	✓

Table 46: Implementation Roadmap (continued)

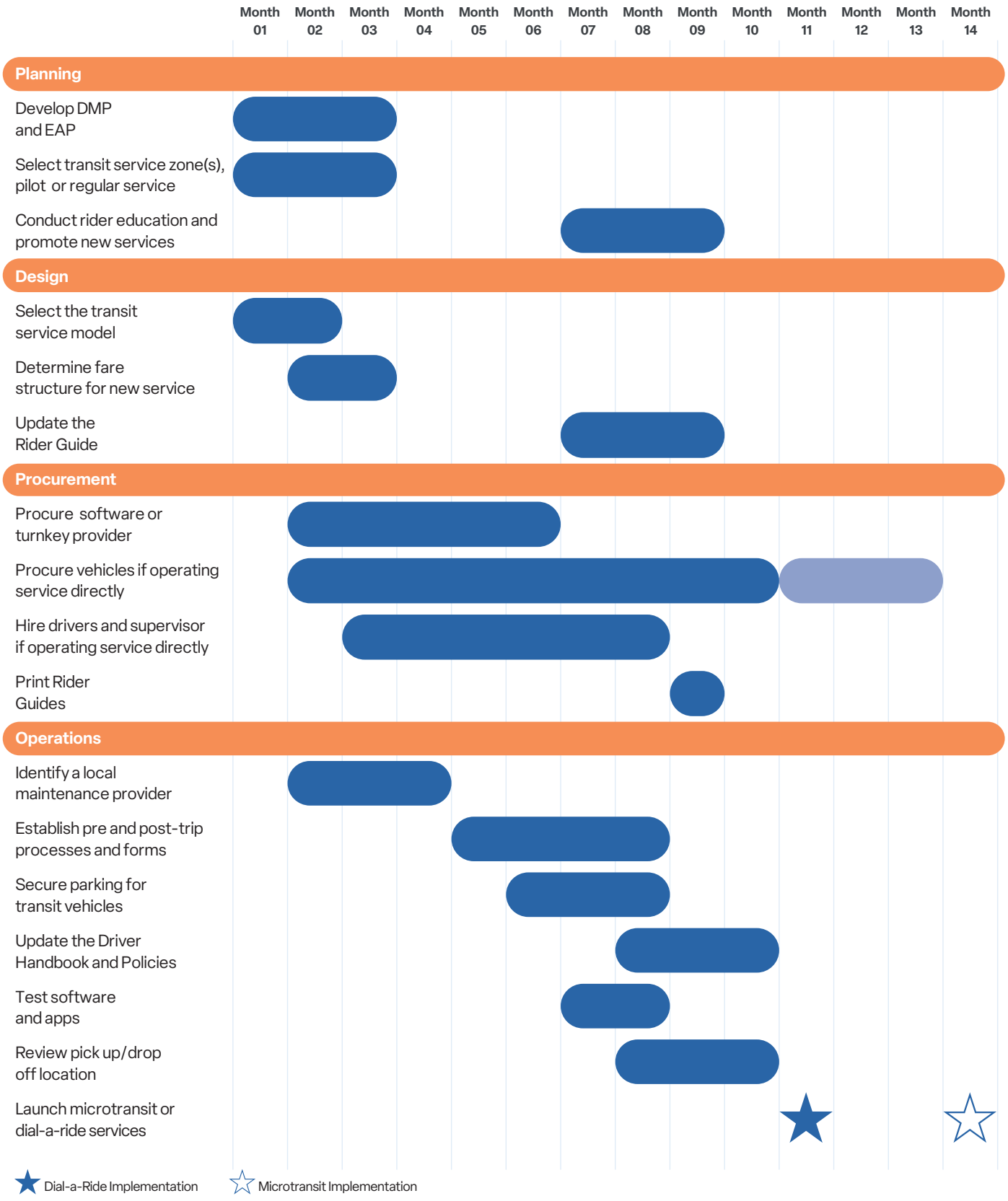
04 OPERATIONS

Step	Estimated Duration	Microtransit	Dial-a-Ride
Identify a local maintenance provider for transit vehicles	**2-3 Months**	✓	✓
Establish the pre-trip and post-trip inspection process and forms for drivers	**2-3 Months**	✓	✓
Secure parking locations for the vehicles	**2-3 Months**	✓	✓
Update the driver handbook and policies to reflect new services	**2-3 Months**	✓	✓
Test dispatcher microtransit platform, driver microtransit application, rider app, and call center process	**1-2 Months**	✓	
Test dispatcher dial-a-ride platform, driver application, rider app (if any), and call center process	**1-2 Months**		✓
Review pick up/drop off locations generated by the microtransit software that may be unsafe or unsuitable, and remove them from the platform	**2-3 Months**	✓	

05 MONITORING

Step	Estimated Duration	Microtransit	Dial-a-Ride
Collect data on transit services performance	**2-3 Months**	✓	✓
Assess transit services for improvements based on operational data, surveys, and stakeholder input	**2-3 Months**	✓	✓

Figure 36: Implementation Roadmap Timeline



7.1.7
PILOT PROJECTS

One of the most effective ways to determine whether microtransit or dial-a-ride is the right solution for the community is to implement a pilot project. These are limited in duration and provide information to the agency to refine the service, extend it, or eliminate it.
As the RTA considers where to implement the pilot projects, the Technical Committee could assist in helping them identify the zones that would be most suitable. Given its defined boundaries, existing travel patterns, and desired destination points like the Arizona Pavilions Shopping Center and the Northwest Medical Center, Picture Rocks is a suitable candidate for the implementation of a microtransit or dial-a-ride pilot project. A pilot in this area would allow the RTA to evaluate the service, vehicle storage logistics, software performance, and rider response in a low-risk, high-learning environment. As identified in the feasibility study, the previous fixed-route pilot in Picture Rocks demonstrated limited demand for traditional service, reinforcing the need to test more flexible options that can better align with the community's needs.

To be effective, the pilot should run for at least six months, with a strong preference for a full year, to allow time for outreach, rider adoption, and meaningful data collection. Close coordination with community and stakeholders will be essential to maximize impact of this service. This pilot would serve as a value-proving ground for how microtransit or dial-a-ride can serve low-density, low-demand communities and inform future rollouts other areas.

7.1.8
OTHER TRANSIT OPTIONS THAT WILL COMPLEMENT TRANSIT SERVICES

There is an opportunity to connect the Vail zone to downtown Tucson with Sun Tran route 110X. Currently Route 110X - Rita Ranch-downtown Express, runs twice a day from downtown Tucson to the Old Vail Park-and-Ride. This fixed route express service (**Table 47**) is approximately 17 miles long (one way) and operates Monday through Friday at a peak commuter time schedule with a total trip time of approximately 35-45 minutes (one way).

Table 47: Route 110X Northbound/Southbound Schedule

AM	Route 110x M-F/Southbound	PM
635	**6th Ave at Pennington**	**510**
641	**Congress at Granada (NW)**	**517**
710	**Old Vail Park and Ride**	**550**
722	**Old Vail Park and Ride**	**555**
--	**UA Science & Tech Park**	**558**
745	**6th Ave at Pennington**	**630**
751	**Congress at Granada (NW)**	**636**

Figure 37: Potential Route 110X Extension to Vail

Route 110X would be the most reasonable route to extend transit service into Vail to provide a connection to Tucson. The route could still utilize its current end of line stop at Old Vail Park-and-Ride and continue service into Vail along Old Vail Road with minimal re-routing as featured below. The Safeway shopping center located on Colossal Cave Road and Mary Ann Cleveland Way would be an optimal option to serve as the new end of line as depicted in the figure below. This extension would add roughly seven miles to the route and approximately 15 minutes to the travel time (one way) making the trip from downtown Tucson to Vail approximately 50-60 minutes. To operate this weekday service twice a day with the extension, two buses would be required.

SECTION 08

Conclusion

The findings of this study demonstrate that even though the existing transit network in the greater Tucson region covers the locations with the most demand, there are still unmet transit needs around the region. Areas like Picture Rocks and Vail fall into this category. Even though these communities do not meet traditional transit criteria for service, there is a need for residents within these communities to have mobility and connectivity to resources when personal vehicle travel is not possible. Exploring options outside of traditional transit service to meet the needs of these communities is important, and to make dial-a-ride or microtransit service viable options for these areas, investments will need to be made.

In terms of technology, the current software (RideCo) that Sun Shuttle uses for scheduling and managing dial-a-ride trips is sufficient for microtransit. Microtransit relies heavily on the ability to group similar trips. However, this is a cost that the service operator will incur as part of the turn-key operational contract.

In general, the simulations show that microtransit is a viable alternative for Picture Rocks and Vail, where there are no transit options currently. Similarly, dial-a-ride services could be considered for these communities and could be implemented first and transitioned to microtransit later. Service in these two areas requires capital and operational cost investments described above, which could be covered partially by the RTA Next referendum that will take place in spring 2026.

Air quality analyses demonstrated negligible impact to net emissions of transportation-related air pollutants resulting from implementation of microtransit or dial-a-ride in Picture Rocks and Vail.

Transit service models such as microtransit and dial-a-ride are great tools that can be considered to bring transit to areas that are difficult to serve with traditional transit service, provide mobility alternatives to vulnerable populations, and improve the quality of life of the residents of Pima County.

In general, the simulations show that microtransit is a viable alternative for Picture Rocks and Vail, where there are no transit options currently.