

1. CALL TO ORDER

1.1 Roll Call:

Chair Kent Ellsworth called the meeting to order at 10:00 a.m. With roll call taken via ZOOM teleconference, a quorum was established.

1.2 Introduction of members and guests:

There were no guests in attendance.

2. PUBLIC FORUM:

There were no public comments.

3. APPROVAL OF MINUTES FROM PREVIOUS MEETINGS:

3.1 The Committee unanimously approved the meeting minutes for October 24, 2022.

4. REGULAR BUSINESS:

4.1 Transit Marketing Update:

Vice Chair Segner led a discussion on tactics that could be employed to enhance the current marketing efforts for the Sedona Shuttle transit system. The following action items were identified by the group as potential strategies that can be pursued to expand the current marketing efforts:

- More presence by city and chamber staff needed at the concierges meeting.
- Touch visitors at least five times
- Increase signage in hotel rooms
- Increase social media presence through the lodging SM channels
- Transition from marketing outreach to user interface
- Tighten up interface between Lodging Council and the STR companies
- Place Shuttle info in the STR(s)
- Billboards I-17 (Day trippers)
- Increase Airport signage
- Information kiosks at all city parking lots (Microtransit)
- Microtransit stickers
- Partner with Groom shuttle to include Sedona shuttle marketing materials
- Static screen for hotel closed circuit TV system to market shuttle.
- Link SedonaShuttle.com from hotel websites

City staff will share this information with the Transit Marketing Group. As the marketing effort is fiscally constrained for this program, that group will identify which of these steps can be initially pursued.

4.2 TH Shuttle Discussion & Possible Recommendations:

Committee Member TenBroek proposed a number of recommended changes concerning the trailhead shuttle program, (attached).

Weber acknowledged that the Committee is empowered to recommend any change to the transit system, however, could not support discontinuing the Lines 14 and 15 as proposed. In addition to imposing controls on illegal parking and lessening traffic congestion in and around the affected trailheads, the central aim of deploying the shuttles was also to mitigate pedestrian safety issues along the roadways leading up to that trailheads.

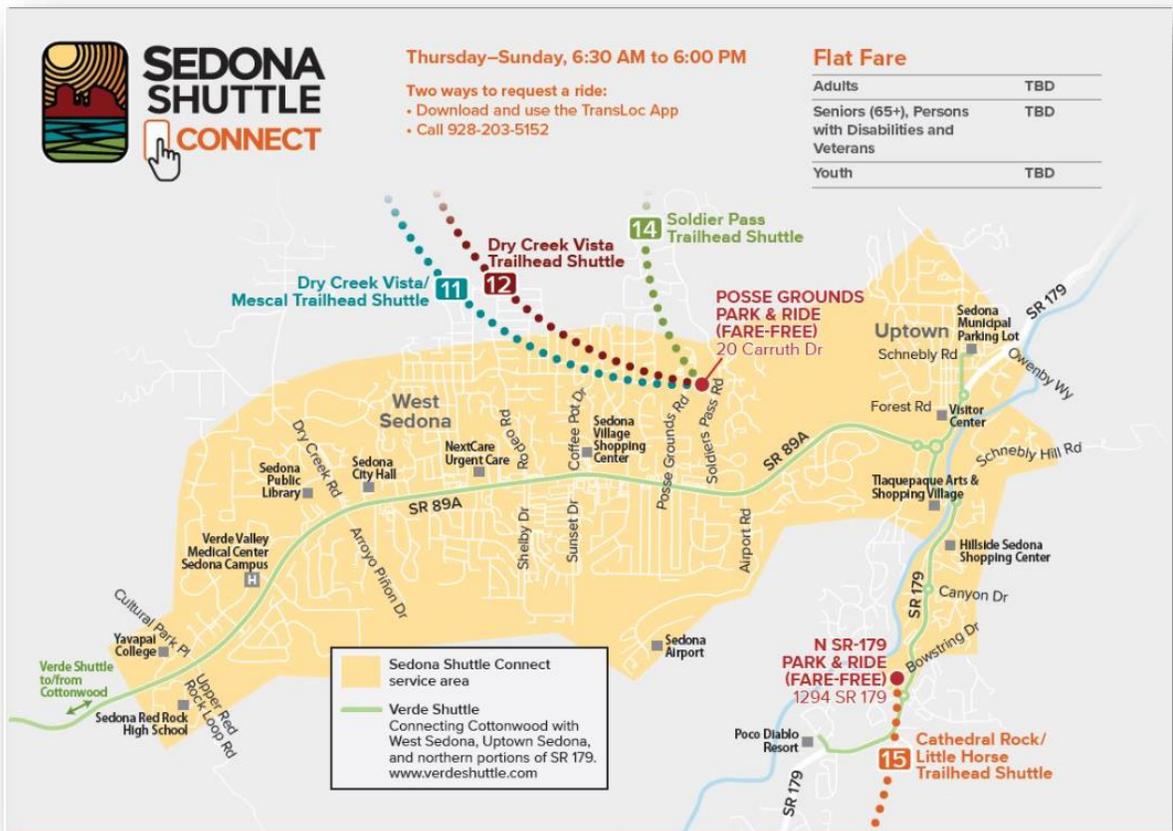
Committee Member Romig suggested that a park & ride be developed on existing USFS land southeast of Back O' beyond which could be accessible from SR 179. He suggested that the Cathedral Rock trailhead could be connected via the exiting trail network to the park & ride, which also could be served by the shuttle system. He proposed that this would solve the pedestrian issues that are still occurring (*while to a lesser degree*) on Back O' Beyond Rd.

The Committee discussed the information presented however opted not to put forth any specific recommendations at this time.

4.3 Sedona Shuttle Connect (MicroTransit - Demand Response) presentation:

Weber provided a brief overview of the proposed Sedona Shuttle Connect (Microtransit) demand response system. The information included findings from the TransLoc MicroTransit simulation (attached). Based upon the results of the simulation the service would include the following:

- Up to four vehicles in revenue service Thursday – Sunday between 06:30 a.m. to 6:00 p.m. *Note: Deploying to this level is intended to maintain an average fifteen-minute wait time from time of request to vehicle arrival.*
- Service zone would extend $\frac{3}{4}$ of mile either side of SR 89A from west of Red Rock Loop Rd to Owenby Wy in uptown. Note the zone would include connections to all Trailhead Shuttle Park & Rides.



Other considerations for the new service include:

- Passengers would be able to schedule the service, via mobile App, website, or with a live reservationist.
- All TH Shuttle Park & Ride locations will be free fare zones.
- Emerging Information technology to potentially be included to apply predictive analytics to allow pre-positioning of unassigned vehicles in anticipation of the next service request.
- Fare structure for the Sedona Shuttle Connect service is out for public comment. Public comment will close on January 9, 2023.

5. REPORTS & INFORMATION ITEMS:

5.1. MV Transportation Inc service update (Bruce Morrow GM Division 536)

Mr. Morrow was not in attendance due to illness. Weber provided the following update:

Since the service launched the trailhead shuttles have logged 184,647 boardings in 146 days of actual service. Additionally, the system has maintained a productivity of 30 passengers per vehicle revenue hour to date.

6. FUTURE AGENDA ITEMS & NEXT MEETING DATE

6.1 Future Agenda Items: The committee and city staff requested that the following agenda items be added to the agenda for the next meeting:

Add to Regular Business:

1. Sedona Shuttle Connect Update
2. Public Transit Summit
3. Line 11/12 – Parking Plan Update
4. Line 15 – Pattern Change and flag stop at SR 179 & Chapel.

6.2 Next Meeting Date: The committee agreed to hold the next STAC meeting on **Wednesday December 28, 2022, at 10:00 a.m.** via ZOOM

7. ANNOUNCEMENTS AND RECOGNITIONS:

Weber announced that there will be no shuttle service on Thanksgiving Day. Regular service will resume on Friday November 25th.

Also, there will be no service on Christmas day. However, the shuttle will run on New Year's Day.

8. ADJOURN:

With no further business to discuss, Chair Ellsworth adjourned the meeting at 11:51 a.m.

PREPARED BY:



Transit Administrator
City of Sedona

Attachments:

- Sedona Trailhead Shuttle Recommended Changes
- City of Sedona Microtransit Demand Response Simulation-June 2021

NEXT MEETING DATE: WEDNESDAY DECEMBER 28, 2022
NEXT MEETING TIME: 10:00 A.M.
VENUE: ZOOM

Please check online at <https://sedonashuttle.com/transit-advisory-committee/> for future meeting dates, agendas, Zoom conference login credentials and other information.

The City of Sedona operates its programs and services without regard to gender, religion, age, sexual orientation or race, color, national origin or disability in accordance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990 (ADA). Any person who believes she or he has been aggrieved by any unlawful discriminatory practice under Title VI may file a complaint with the City of Sedona. For additional information on the city's Title VI program and complaint procedures please navigate to <https://sedonashuttle.com/title-vi-policy/>

Upon request, The City of Sedona shall provide written materials in appropriate alternative formats, including disability-related modifications or accommodations, auxiliary aids, or services to enable individuals with disabilities to participate in public meetings. Please send a written request, including your name, mailing address, phone number, description of the requested materials, and preferred alternative format or auxiliary aid or service at least three working days prior to the meeting at the address below.

If information is needed in another language, contact (928) 203-5199. *Para información en Español llame: Victor Estrada, Right-of-Way Specialist, (928) 204-7800.

Public comments may be submitted for any item on the agenda by contacting the city of Sedona: Mail: Attn: Transit Administrator, 102 Roadrunner Dr., Sedona AZ, 86336 Website: <https://SedonaShuttle.com/> FAQ & More/ Contact-Us/ • Email: sedonashuttle@sedonashuttle.gov • Phone: (928) 203-5086

Sedona Trailhead Shuttle Recommended Changes

Mark TenBroek for the
SEDONA TRANSIT ADVISORY COMMITTEE

November 17, 2022

Rationale for Trailhead Shuttle

- ▶ Reduce the number of cars that cause congestion
- ▶ Address the cars parked dangerously close to the sides of roads once the trailhead lots become full
 - ▶ Soldier Pass
 - ▶ Cathedral Rock (Back O' Beyond)
- ▶ Manage use of sensitive trails
- ▶ Reduce environmental impact of vehicles by reducing miles driven (Carbon footprint)

Where is the Trailhead Shuttle currently operating?

- ▶ Route 11 – Dry Creek Vista/Mescal
- ▶ Route 12 – Dry Creek Vista
- ▶ Route 14 – Soldier Pass
- ▶ Route 15 – Cathedral Rock/Little Horse



USFS Permit Trailhead Daily Limits

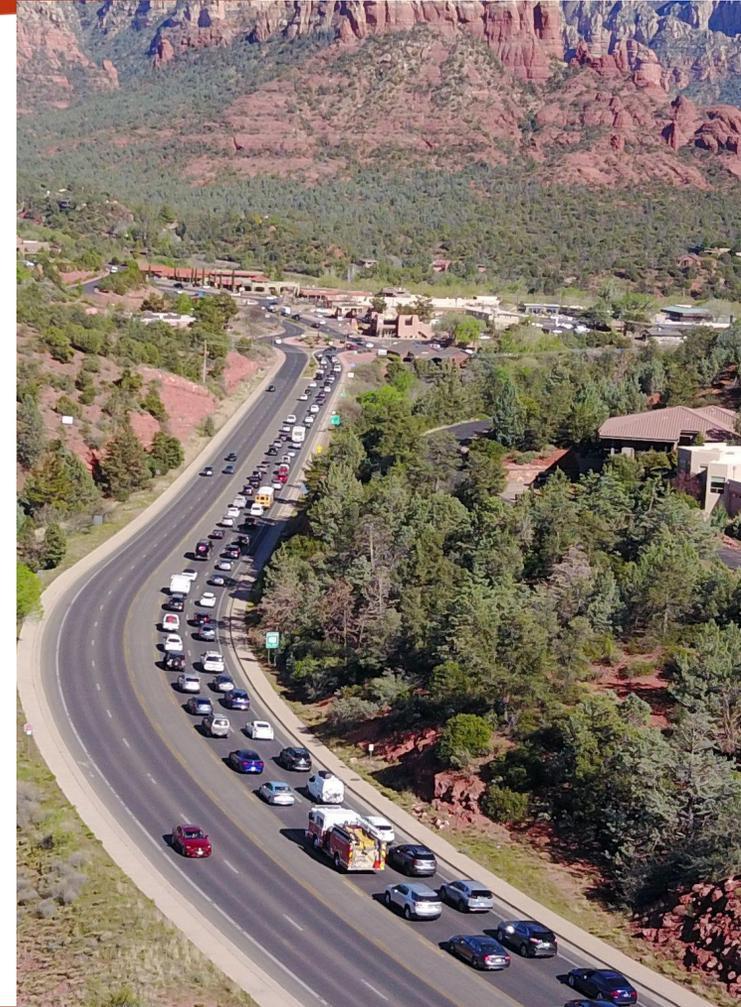
● Cathedral Rock	600
● Dry Creek Vista	500
● Little Horse	500
● Mescal	300
● Soldiers Pass	<u>300</u>
● TOTAL	2,200

Notes:

8:00 AM to 6:30 PM operations
Cathedral Rock Parking closed
Soldiers Pass Parking closed

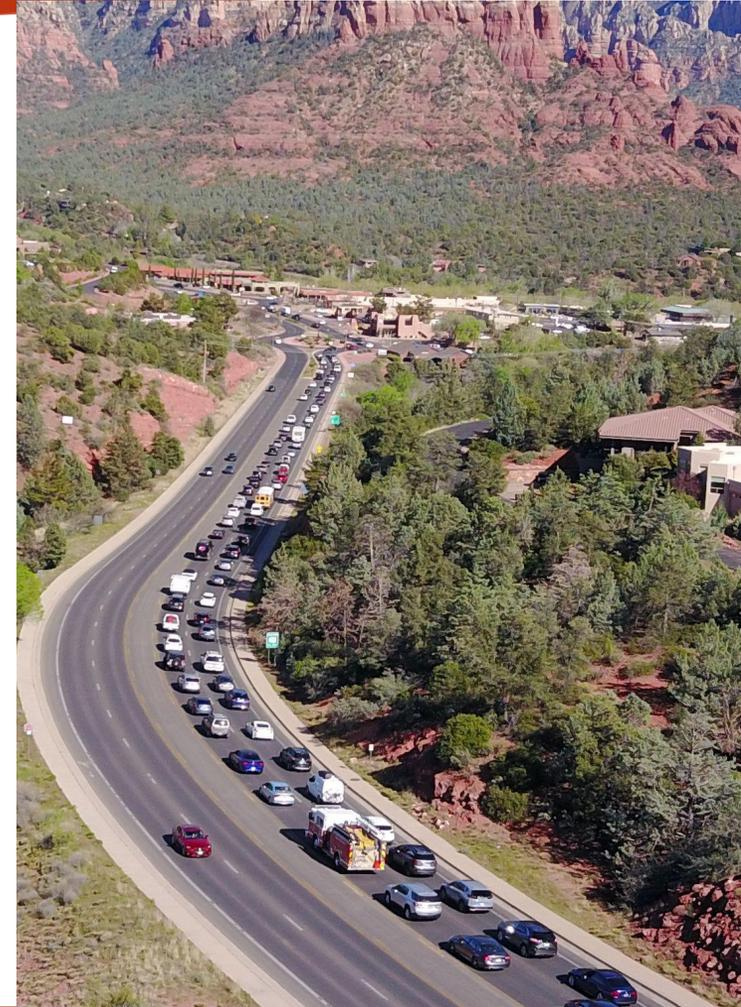
Overall Findings, Trailhead Shuttle:

- ▶ Shuttle is operating on a fixed route and schedule basis from fixed parking locations
- ▶ The Trailhead Shuttle sees highest use during March - May, and September - November
- ▶ Much more limited use in the remaining 7 months with available trailhead parking
- ▶ Limited use of Trailhead Shuttle to the Route 11/12 Trailheads
- ▶ Roadside Parking restrictions are underway along Dry Creek and Boynton Pass Roads



Overall Findings, Trailhead Shuttle (Continued):

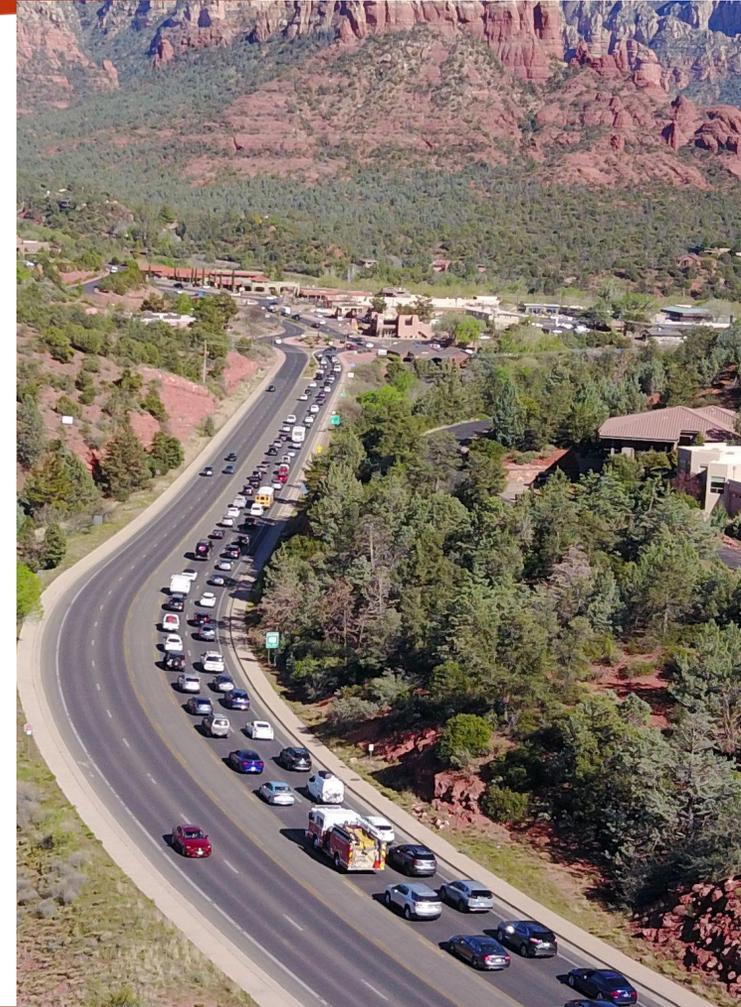
- ▶ Overall, Shuttle use does not reduce fuel use compared to visitors using cars to get to trailheads
- ▶ Shuttle use does not reduce traffic volume in areas of congestion (the “Y”)
- ▶ Low visitation periods must be maintained given high fixed cost of Shuttle equipment and need to maintain driver employment
- ▶ Some trailheads may be over served causing trail degradation



Route - 14 Soldiers Pass

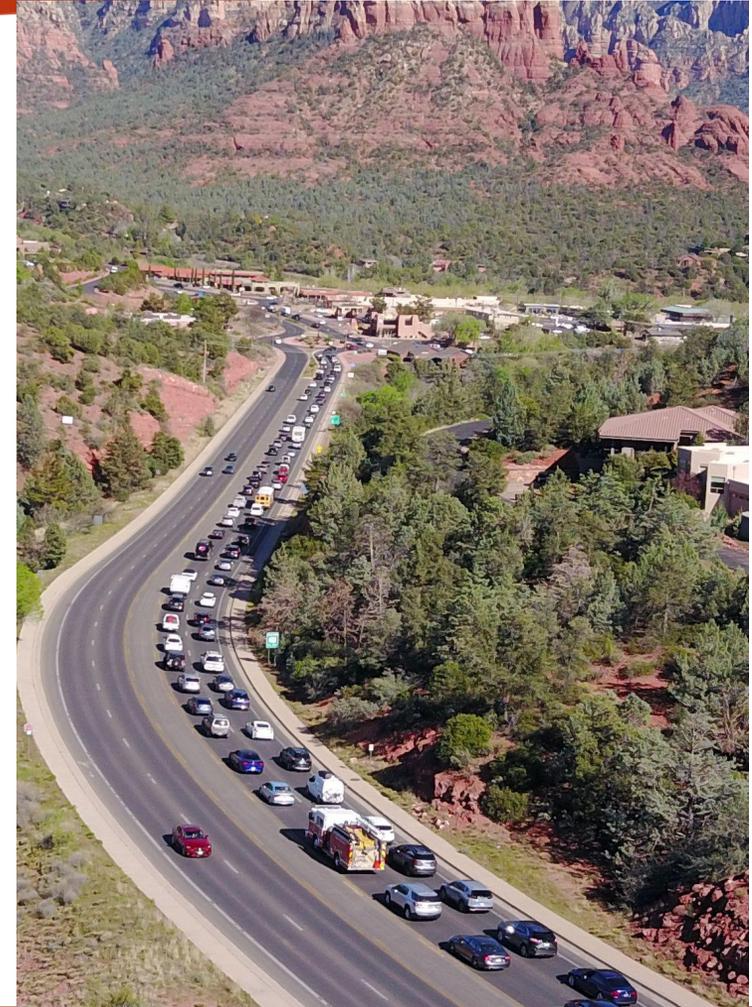
Findings:

- ▶ USFS allows no more than 300 hikers to use the Soldiers Pass Trailhead Shuttle each day
- ▶ Providing parking at Posse Grounds and noticing limited parking at trailhead has reduced the parking nuisance in Soldiers Pass neighborhood
- ▶ During peak times, up to 1,400 additional daily hikers access the Soldiers Pass trailhead using the new 1.2 mile multi-use path alone



Route - 14 Soldiers Pass Recommendations:

- ▶ Eliminate the fixed Shuttle Route
- ▶ Utilize the Posse Ground parking and multi-use path (1.2 mi) for hiker access to the Trailhead
- ▶ Maintain signage noting no parking beyond Posse Grounds on Soldiers Pass Road
- ▶ Provide enforcement if parking problems occur
- ▶ Allow private shuttles to and from trailhead



Route 15 - Cathedral Rock/Little Horse Findings:

- ▶ USFS allows no more than 600 hikers to use the Trailhead Shuttle each day
- ▶ Anecdotal reports are that significant increases in trail use are caused by Shuttle
- ▶ Other trailheads are available to access Cathedral Rock
- ▶ Controlling access to Back O' Beyond at the roundabout has controlled parking nuisance and safety issues near the Trailhead



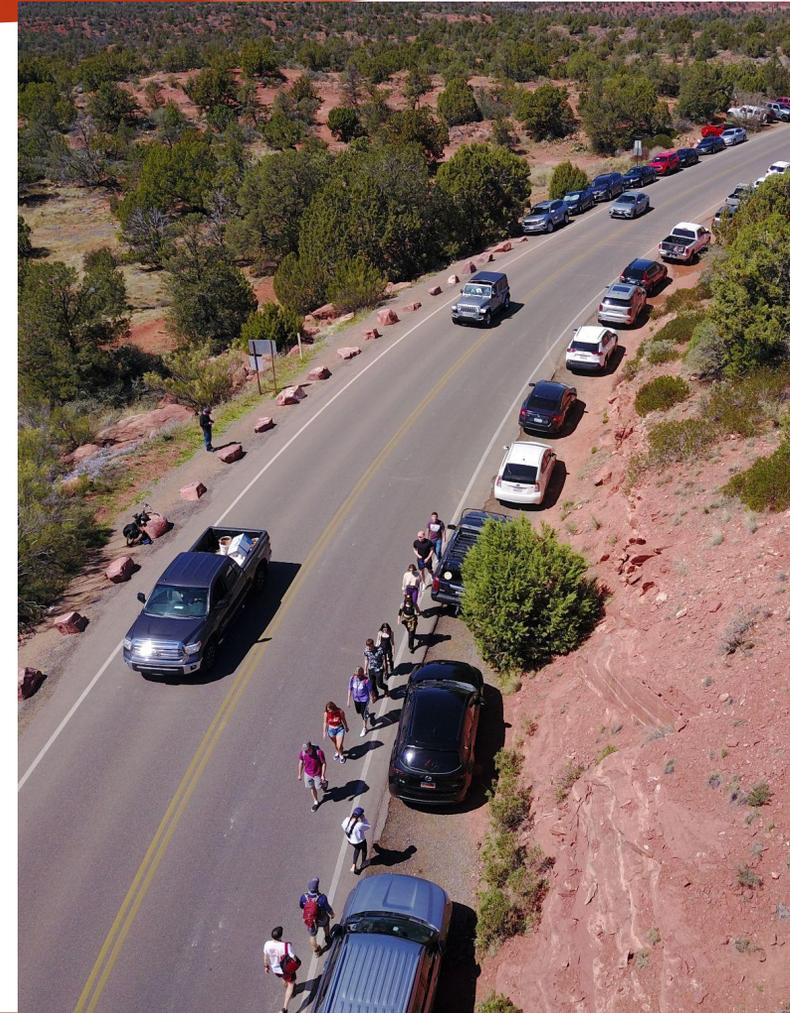
Route 15 - Cathedral Rock/Little Horse Recommendations:

- ▶ Eliminate the fixed Shuttle Route
- ▶ Stop use of the 179 parking area
- ▶ Utilize Back O'Beyond Road traffic control at the roundabout during peak periods only - allow in residents and allow hikers as spaces opens in Trailhead parking
- ▶ Maintain signage noting no parking beyond entrance to Back O'Beyond
- ▶ Provide enforcement if parking problems occur



Route 11/12 - Dry Creek & Mescal Findings:

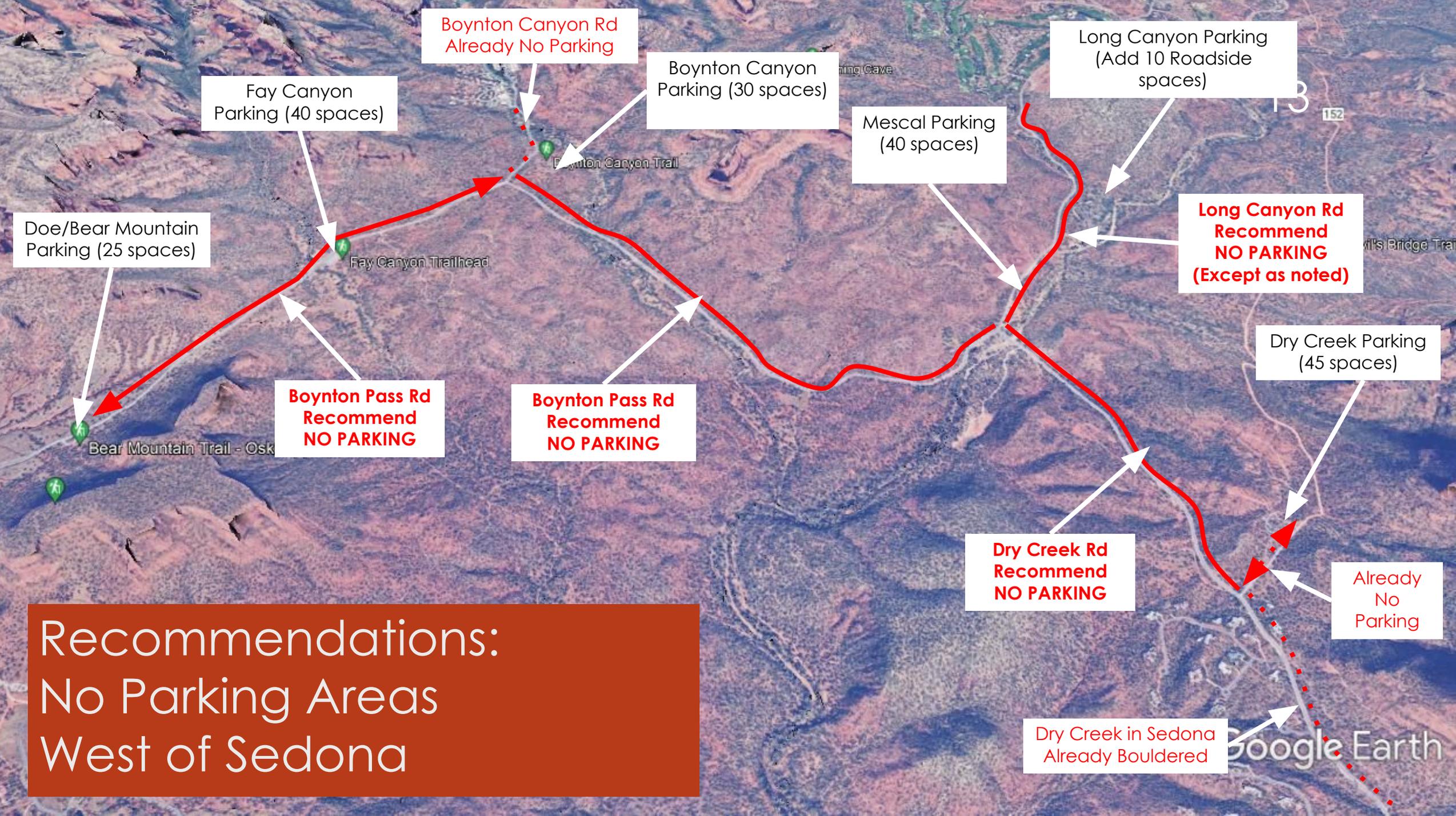
- ▶ USFS allows no more than 500 hikers to use Dry Creek Vista and 300 to use Mescal using the Trailhead Shuttle each day
- ▶ The Trailhead parking lots have remained open during Trailhead Shuttle operations
- ▶ Abundant roadside parking available near the trailheads has caused roadway hazards and high hiker volumes
- ▶ Roadside parking problems present at Boynton Canyon as well
- ▶ Parking Restrictions along Dry Creek Road are underway



Route 11/12 - Dry Creek & Mescal Recommendations:

- ▶ Construct High School hiker parking ASAP
- ▶ Complete Dry Creek Road, Long Canyon Road, Boynton Pass Road parking restrictions north and west to Fay Canyon Parking Lot
- ▶ Complete planned parking restrictions along Dry Creek Road that are underway
- ▶ Eliminate Route 11 to Dry Creek
- ▶ Continue Route 12 to Dry Creek & Mescal (1 Shuttle)
- ▶ Develop Route 13 to Boynton Canyon and Fay Canyon Parking Lots (1 Shuttle)
- ▶ Consider using remaining shuttles for other uses during low visitation periods





Doe/Bear Mountain
Parking (25 spaces)

Fay Canyon
Parking (40 spaces)

Boynton Canyon Rd
Already No Parking

Boynton Canyon
Parking (30 spaces)

Mescal Parking
(40 spaces)

Long Canyon Parking
(Add 10 Roadside
spaces)

Long Canyon Rd
Recommend
NO PARKING
(Except as noted)

Boynton Pass Rd
Recommend
NO PARKING

Boynton Pass Rd
Recommend
NO PARKING

Dry Creek Rd
Recommend
NO PARKING

Dry Creek Parking
(45 spaces)

Already
No
Parking

Dry Creek in Sedona
Already Bouldered

Recommendations:
No Parking Areas
West of Sedona

Google Earth

New Hotel Guided Route(s) Recommendations:

- ▶ Consider guided trips directly from hotels to a variety of trailheads
- ▶ Guide for 20 hikers gives history and ecology info on route with fixed dropoff and pickup and keeps group together and on schedule
- ▶ Guaranteed access to trailhead and their cars stay at the hotel
- ▶ Hikers charged reasonable fee, provided with water and lunch for trip
- ▶ Hotel concierge coordinates hiker needs with route
- ▶ Encourages less auto usage



New Hotel Guided Route(s) More Considerations:

- ▶ Multiple trips from different hotels would allow schedule coordination to reduce dead head Shuttle trips
- ▶ Modest charges (\$20-30 per hiker) would allow the shuttle to cover the fixed, variable and fuel costs
- ▶ Use of Shuttle in place of visitation cars would reduce auto use at high use times
- ▶ Use of guide would provide an enhanced experience for hotel visitors and encourage visitors to use traditional lodging



Potential Guided Hotel Routes:

- ▶ Cathedral Rock (out and back) - 2 hours
- ▶ Soldiers Pass (including Soldier Pass cave) - 3 hours
- ▶ Boynton Canyon (including Subway Cave) - 4 hours
- ▶ Mescal Chuck Wagon route to Devils Bridge - 4 hours
- ▶ Courthouse Rock and Bell Rock Loop - 3 hours
- ▶ Jim Thompson Trailhead to Midgley Bridge - 3 hours



Summary Recommendations:

- ▶ Eliminate Trailhead Shuttles to Soldiers Pass and Cathedral Rock
- ▶ Use parking limitations to control access to these trailheads
- ▶ Construct the parking limitations along Dry Creek, Long Canyon, and Boynton Canyon Roads
- ▶ Construct High School parking lot
- ▶ Maintain Route 12 to Dry Creek Vista and Mescal Trailheads from High School
- ▶ Begin Route 13 to Boynton Canyon Trailhead from High School
- ▶ Establish guided routes from local hotels on a paid basis



THE END



The Next Step Forward

How Microtransit Can Create A Compelling
Mobility Option for the Sedona Community

Prepared by TransLoc Planning & Design
June 2021

TransLoc
4505 Emperor Boulevard
Suite 120
Durham, NC 27703

Table of Contents

Project Introduction	3
Future Microtransit Service Simulation	4
Simulation and Service Goals	4
Estimating Ridership	4
Service Area and Trip Generators	6
Key Simulation Assumptions	7
Simulation Results	8
Ride Quality Metrics	8
Service Metrics	9
Vehicle Travel Heatmap	10
Simulation Considerations and Interpretation	11
Final Recommendations and Conclusions	12
Launching the Best System for Residents and Visitors	12
Microtransit Considerations for Sedona	13
Microtransit is One Piece of the Mobility Puzzle	14
Conclusion	15

Prepared for City of Sedona

by TransLoc Planning & Design

June 17, 2021

Please direct questions to TransLoc Solution Engineer: Joe Melliere

joe.melliere@transloc.com

Project Introduction

The red rocks of Sedona are recognized world-over as a destination of beauty and peace. Over three million visitors per year make their way through the city, and a vibrant community of residents call Sedona home year-round. Residents and visitors alike value opportunities to connect with the city's varied destinations including breathtaking hiking trails, world class dining, and cultural hubs of art and expression.

In order to ensure that Sedona's treasures remain accessible while reducing traffic congestion on major roads, the City of Sedona is launching an innovative transportation system to keep the community connected. Part of this new transportation offering will include trailhead shuttles to provide direct access for hikers to access popular trails and moderate vehicle traffic on trailhead access roads. Complementing these trailhead shuttles will be a network of microtransit "on-demand" vehicles which will connect riders point to point within Sedona and reduce the need for individual vehicles for short trips.

In order to help plan for the future of this microtransit system, the City of Sedona approached TransLoc's Planning & Design Services team to simulate potential service, identify key concerns, and provide recommendations on ways to best serve the mobility needs of Sedona's residents and visitors.

After in-depth discovery calls, data analysis, and service simulation, TransLoc Planning & Design is pleased to present the following report to the City of Sedona. We believe that our recommendations will not only help Sedona launch the best possible microtransit service, but will also improve quality of life for residents and visitors. By providing safe, efficient, and reliable mobility, we are proud to work with Sedona to advance our mission of creating freedom of movement for all.

Future Microtransit Service Simulation

Simulating microtransit service is a fundamental step to helping design new services, forecast potential daily trips, and anticipate operational plans for launch and growth of the service. Using input and data from the City of Sedona as well as experience with microtransit services around the country, TransLoc Planning & Design developed ridership estimates for low and high season time periods as well as a model for movement throughout the service. The simulation takes into account a range of scenarios for multiple levels of daily trips and service provision. These scenarios illustrate how the rider experience changes as the number of trip requests grows and highlight key decision points such as when to add vehicles or make adjustments to the service itself.

Simulation and Service Goals

Gauging the success of any microtransit service requires clear and measurable goals, which we seek to establish and estimate through simulation to inform how effective that microtransit service could be at meeting those goals. One of the City's greatest challenges is reducing traffic congestion at the "Y", which causes both frustration for residents and visitors as well as economic and environmental impact from idling vehicles. Much of this report and the accompanying efforts to introduce public transportation to Sedona are targeted at the goal of reducing congestion and offering more efficient access in and around the City to residents and visitors. Meeting this goal of traffic reduction will require a combination of microtransit and other measures not directly related to this report, but we will seek to estimate the impact microtransit could have in contributing to this larger effort.

A key component of meeting this goal is the parallel effort to establish Trailhead Shuttles which offer fixed route service directly to popular area trailheads. These shuttles would, at the time of this report, operate from Posse Grounds Park and Brewer Road locations to the area's most popular trailheads with reduced impact to traffic, access roads, and the trailhead areas. The microtransit service should provide efficient and reliable service to riders accessing these shuttles in order to encourage their use over private vehicles accessing trailheads directly. Providing a service which has reasonable wait times as well as comparable trip times to driving a car are sought in the design of the service and the potential to meet this goal is noted in the simulation results analysis.

Estimating Ridership

TransLoc developed a range of estimates representing the number of potential daily trips for the new microtransit service based on available data about visitors to Sedona and trips taken through existing local services such as the Verde Valley Caregivers Coalition. The primary basis for these estimates was the hotel occupancy rate during the busiest and slowest seasons in Sedona which ranged from 40-80% of rooms occupied based on data from the Sedona Chamber of Commerce. Based on prior experience with microtransit services among areas which did not previously have public transit service, a "microtransit factor" ranging from 3-5% was applied to these occupancy

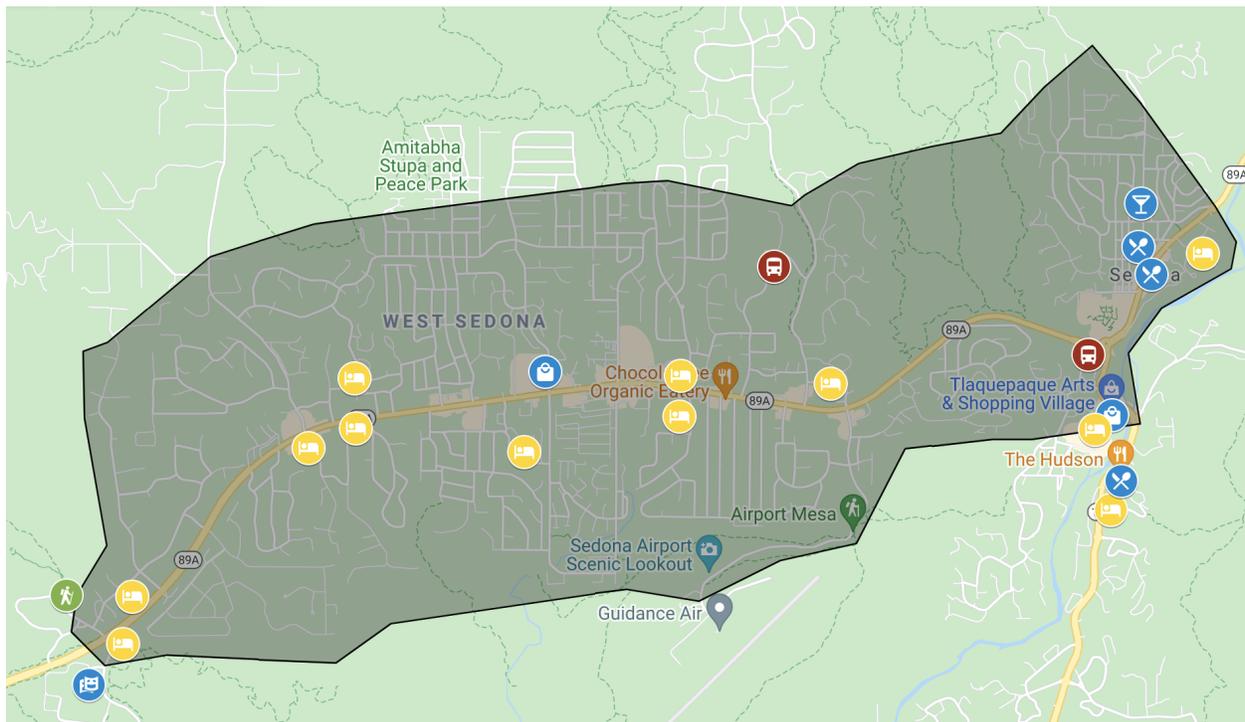
rates. Essentially, this is the proportion of the overall pool of potential riders who would actively choose to take microtransit instead of driving their vehicle. Put another way, it represents the number of hotel rooms occupied by visitors who would use the microtransit service instead of their car for their daily trips. We further assumed visitors must take no less than two trips per day (from their hotel to a shuttle exchange/shopping/other activities and back to their hotel). This yielded a low-season volume of approximately 96 trips per day and a high-season volume of approximately 320 trips per day.

This estimate for potential visitors using microtransit was combined with potential local trips, supporting some existing riders of the Verde Valley Caregivers Coalition as well as other community members who may choose microtransit instead of their current options due to personal mobility, traffic, cost or car ownership or other factors. The final range of estimates starts at a baseline of 100 trips per day during the slower season and during initial launch of the service, up to a peak of 300 trips per day during the busiest season. These figures of daily trips will be the primary reference for ridership in the report, as these more directly relate to the number of SOV trips replaced by microtransit.

Having estimated the number of trips, we then must account for how many passengers are present on each of those trips to provide operational estimates of vehicle capacity. We generally assume that each trip could have anywhere from one to three riders, which may vary slightly from Sedona's experience once service is deployed. This provides a sound basis to run the simulation and demonstrate effects on vehicle capacity during peak times. Local trips for healthcare, daily errands, or work are more likely to have a single rider, whereas visitors are much more likely to have 2-3 riders travelling together as a family group. This results in total potential passenger boardings ranging from 184 to 536 people per day corresponding to the above range of daily trips.

Service Area and Trip Generators

TransLoc has outlined a potential service area which approximates a ¾-mile buffer around Highway 298A, extending from Cultural Park Place on the Western edge to Owenby Way in Uptown Sedona. Riders can book door-to-door trips anywhere within this service region, as well as select locations outside of the zone such as the Cultural Park trailhead and Sedona Performing Arts Center. The zone has been abbreviated on its Southeastern edge in order to concentrate trips to and from destinations along Highway 179 with the intent of reducing exposure to traffic congestion heading Northbound on Highway 179 towards the rest of the service area.



Simulated service zone with key trip generators highlighted, including Trailhead Shuttle Exchanges (red), lodging (yellow), trailheads (green), and shopping, dining, and entertainment (blue).

Within the service area are key trip generators, which are used to develop travel patterns in each ridership scenario. These can be broken down into subcategories as follows:

- **Lodging:** Since many microtransit riders will be visitors to Sedona, a selection of hotels and resorts throughout the service region were used to approximate this ridership. Rides typically went from these locations to other destinations during the morning and early afternoon, then shifting gradually from those locations back towards the hotels from midday until the end of service.
- **Trailhead Shuttle Exchanges:** A key goal of the microtransit service is connecting riders with the Trailhead Shuttles, so we estimated that a majority of trips to and from lodging

were connections to the Posse Grounds and Brewer Road Trailhead Shuttle Exchanges. Based on input from the City on expected Shuttle ridership, trips to and from the Exchanges were split 60% to Brewer Road and 40% to Posse Grounds.

- **Shopping and Entertainment:** Microtransit riders typically take the service to the same places they might otherwise drive, so a selection of trips were also designated to locations such as Tlaquepaque Arts & Shopping Village, Sedona Performing Arts Center, and various locations in Uptown Sedona.
- **Local Destinations:** Local residents are also likely to access other services such as healthcare, grocery stores, and local shopping centers with microtransit. These rides were generated throughout the service zone to simulate local residents traveling between their homes and these locations.

Key Simulation Assumptions

In order to accurately represent the City's potential microtransit service, a number of assumptions must be made which affect how the rides are generated and service is provisioned within the simulator. These are provided within this report for transparency in understanding the results and implications of those results.

Service Parameters

- Service runs from 7:30 AM to 6:30 PM
- Vehicles in service will accommodate trips scheduled before 6:30 PM and operate until all accepted rides are complete
- All vehicles had capacity of 10 ambulatory passengers, or 8 ambulatory with 2 wheelchairs
- Estimated live traffic data was used when simulating vehicle movement
- Load and unload times were 3.5 minutes for all trips

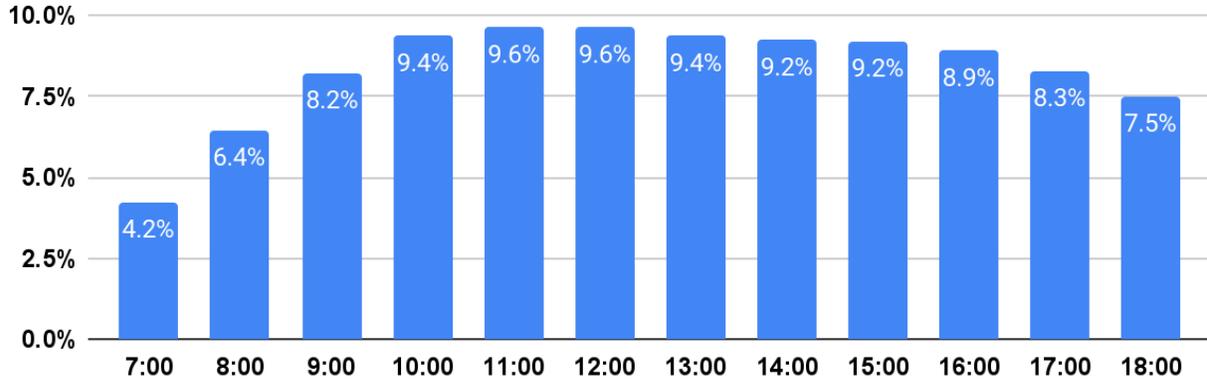
Operations and Logistics

- Vehicles began the day at either Courtyard Marriott Sedona, Sedona Rouge Hotel, or Arabella Hotel Sedona
- When idle, vehicles relocated to repositioning points at the Brewer Road and Posse Grounds Shuttle Exchanges, Tlaquepaque Arts & Shopping Village, and Uptown Sedona
- No shift changes or breaks were included (i.e. all vehicles were available the entire day)

Ride Generation

- All rides are requested as "on-demand" (i.e. no advance scheduling or walk-up/flagdowns)
- A randomly selected 2% of rides required wheelchair accommodations
- No trips were cancelled by the riders or "no showed"
- Trip requests throughout the day will generally match the flow of traffic through the "Y" as recorded during March and April 2021 traffic studies.

Estimated Hourly Ride Distribution



Percentage of daily ride requests estimated to occur during each hour of the day based on the traffic flow data through the “Y”, demonstrating a broad distribution of rides throughout the service period.

Simulation Results

The following visualizations demonstrate the range of results from the simulated scenarios, illustrating key differences in how the system performs as daily trip requests grow and additional vehicles are deployed to service that growing ridership. The data presented represents only a selection of the available KPIs which are most instructive in our analysis and relevant to the City’s planning decisions for launching and growing the service. The appendix to this report includes further KPIs available for consideration.

Ride Quality Metrics

Average Wait Time by Scenario (Minutes)

		Vehicles			
		3	4	5	6
Ride Requests	100	13.3	6.1	5.0	4.5
	150	33.4	14.5	7.9	6.5
	200	68.1	34.4	16.0	9.1
	250	102.6	54.9	30.0	15.2
	300	143.8	93.9	50.1	34.4

Average Ride Time by Scenario (Minutes)

		Vehicles			
		3	4	5	6
Ride Requests	100	9.5	8.9	8.3	8.2
	150	15.2	9.6	8.7	7.9
	200	39.0	17.3	11.4	9.2
	250	51.4	30.7	16.2	11.1
	300	66.3	53.9	27.3	18.6

Wait Time: Duration from when the trip is requested to when the rider(s) is/are picked up.

Ride Time: Duration the rider(s) is/are onboard the vehicle from pickup to drop off.

Average Trip Time by Scenario (Minutes)

		Vehicles			
		3	4	5	6
Ride Requests	100	26.4	18.4	16.8	16.1
	150	52.0	27.7	20.1	18.0
	200	110.6	55.3	30.8	21.8
	250	157.4	89.1	49.7	29.8
	300	213.6	151.3	80.9	56.5

Trip Rejections by Scenario

		Vehicles			
		3	4	5	6
Ride Requests	100	2	0	0	0
	150	14	3	0	0
	200	42	14	5	0
	250	69	36	13	4
	300	100	68	38	15

Trip Time: Total duration from requesting the trip to drop-off at the rider(s) destination. Average is based on all trips completed in that scenario, not the addition of Average Wait Time and Average Ride Time.

Rejections: Number of trips rejected by the scheduling algorithm, typically due to excess ride requests which cannot reasonably be served by the fleet currently in service.

Service Metrics

Productivity by Scenario

		Vehicles			
		3	4	5	6
Ride Requests	100	2.9	2.3	1.9	1.6
	150	3.9	3.2	2.7	2.3
	200	4.3	4.0	3.4	2.9
	250	4.7	4.5	4.1	3.6
	300	4.9	4.6	4.4	4.1

Vehicle Miles by Scenario

		Vehicles			
		3	4	5	6
Ride Requests	100	373	423	446	469
	150	353	527	591	648
	200	325	429	596	759
	250	315	413	503	755
	300	330	438	488	609

Productivity: Rides per vehicle revenue hour, with revenue service starting from the dispatch of a vehicle's first ride to the completion of the last ride.

Vehicle Miles: Combined mileage driven by all vehicles.

Shared Rides by Scenario

		Vehicles			
		3	4	5	6
Ride Requests	100	32	22	8	4
	150	98	49	35	14
	200	144	143	103	52
	250	172	194	178	132
	300	192	216	231	217

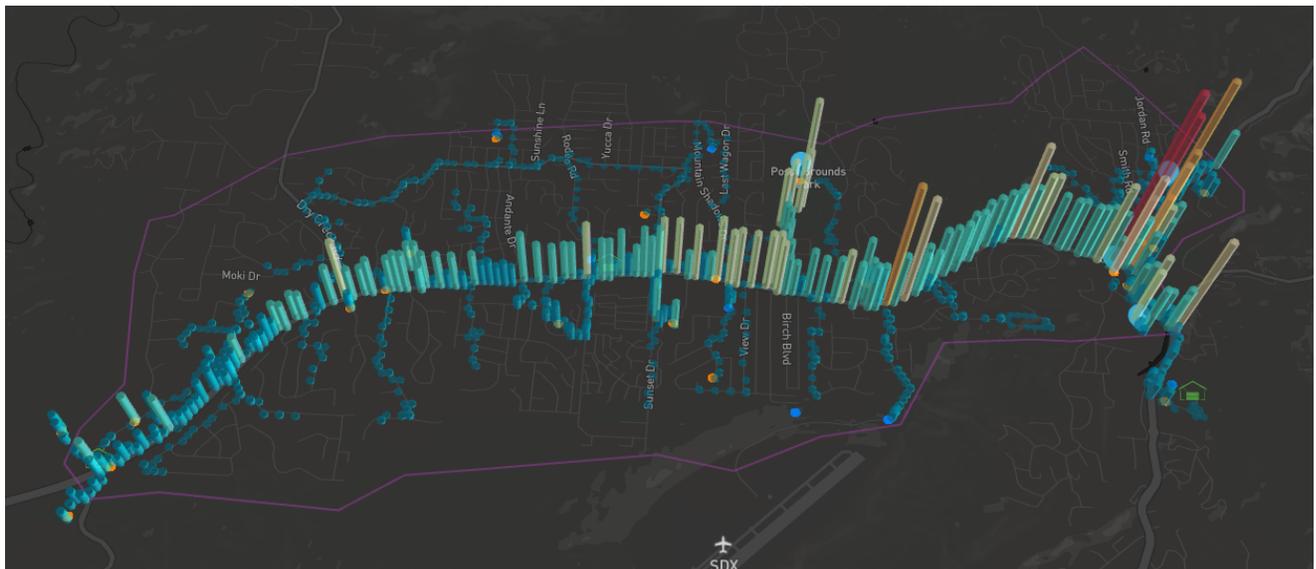
Ridesharing Rate by Scenario

		Vehicles			
		3	4	5	6
Ride Requests	100	33%	22%	8%	4%
	150	72%	33%	23%	9%
	200	91%	77%	53%	26%
	250	95%	91%	75%	54%
	300	96%	93%	88%	76%

Shared Rides; Total number of rides which had any portion of the ride shared with another ride.

Ridesharing Rate: Percentage of completed rides which had any portion of the ride shared with another ride. Note that this percentage takes into account rides which were rejected and therefore not completed.

Vehicle Travel Heatmap



This heatmap illustrates the movement patterns of all vehicles in the 200 trip requests and 4 active vehicles. The height and color of each bar represents the relative frequency of vehicles traveling on that particular road segment.

Simulation Considerations and Interpretation

The simulation results presented in the previous section highlight a number of key patterns and tradeoffs which should be considered when making planning and operational decisions around microtransit. It is essential to comprehend each of the metrics and the way in which they interact, so the following descriptions are examples of how TransLoc interprets these outputs.

- **Microtransit riders typically desire an average wait time under 15 minutes, which these results indicate can be achieved with the planned four vehicle deployment for up to 150 ride requests per day.** As rides increase beyond this figure, the City should strongly consider deploying the fifth vehicle during peak times or the entire day to ensure Wait Times and Ride Times stay within a reasonable range.
- Ride times in a microtransit service can always be expected to average longer than the time it would take to drive from origin to destination due to the nature of a shared ride service. Picking up and dropping off other riders on the same vehicle inherently adds time to a rider's trip, but using an efficient scheduling algorithm can help ensure these additional stops do not unduly delay riders (provided the system is not greatly overburdened).
- Productivity (rides per vehicle hour) and Ridesharing tend to be inversely related to Wait Times and Trip Times. Stakeholders often believe that microtransit services should attempt to achieve the highest possible productivity and shared rides in order to utilize their available assets, but these results clearly show that there must be a compromise between the desired productivity and providing riders an appealing ride experience.
- The number of shared rides is translatable to the number of personal vehicle trips averted by the microtransit service. Rides which are not shared carry the same traffic burden as that rider driving their own vehicle, but each pair of rides shared represents half the traffic burden compared to those riders driving separately. This means 132 shared rides in the 250 Rides/6 Vehicles scenario would avert approximately 66 vehicle trips.
- Microtransit vehicles use the same roads and are subject to the same traffic as all other drivers. This can be observed in the heatmap of vehicle segments traveled which generally shows that vehicles follow similar patterns to what the City has observed. Moving people between Uptown Sedona, Tlaquepaque and the surrounding district, and the Central/Western areas of Sedona still require the microtransit vehicles to heavily traffic the "Y" and its feeder roads.
- Vehicle miles are more closely related to the number of vehicles deployed than the number of ride requests. When looked at per vehicle, mileage ranges from a low of 78 miles per vehicle per day to a high of 125. Only 3 out of 25 scenarios had mileage per vehicle under 100 per day, and the average was 109 miles per vehicle per day. Once vehicle utilization has reached a maximum, the service must either deny additional riders which don't match other trips already in the system or drastically increase wait time and ride time for all riders.

Final Recommendations and Conclusions

The simulation process reveals a number of key insights about the future of a microtransit system, from operational considerations to potential community benefits. Incorporating these insights into the design of the system will help ensure a successful system launch. It is also important to keep in mind that while a simulation is a reflection of potential service, actual rider behavior may vary, especially as the service evolves overtime. In this light, **our simulation recommendations should be seen as a guidebook, rather than a rulebook.**

Launching the Best System for Residents and Visitors

As Ridership Grows, So Must Microtransit Service

One of the key decisions in any microtransit system is balancing operational costs with rider experience. Even the best-designed system can falter if ridership doubles and service levels remain unchanged. **Our simulation predicts that a microtransit system of four vehicles should adequately service up to about 150 trips per day, but as daily trips approach 200, rider experience metrics such as wait time and ride time will begin to degrade.** We recommend the City of Sedona monitor daily rides after system launch, and consider adding additional vehicles as wait times and ride times begin to climb. The City could also consider introducing larger vehicles into the system if the system data shows that large groups are commonly booking rides.

The Importance of Rider Education

While more and more communities around the country are operating microtransit services to expand mobility options, microtransit may still be unfamiliar to many riders. Rider education about how the system works, how to book a ride, and what to expect once a ride is reserved will be critical to maintaining a high level of rider experience and ensuring the system is functioning optimally. This is especially true for visitors to Sedona who are likely to be first-time riders.

Educating riders on the importance of a smooth and timely pick up process can have a significant impact on overall system performance. For instance, **reducing average dwell time (time from when a vehicle arrives at a pick up point to when the rider is safely on board, or time for a rider to alight from a vehicle) from 3.5 minutes to 2 minutes can reduce average total trip times throughout the day by as much as 45.5%.** Riders must understand that microtransit is not the same as a private ride-hailing service. Riders should be ready to board when the vehicle arrives. This can be accomplished through a combination of strategic marketing, healthy relationships with partners such as hotels and local businesses, and clear communication in the dispatch process. **We recommend the City of Sedona and the future microtransit vendor have a clear vision for marketing, communication, and rider education.**

Right-Sizing Your Service Area

While it may be tempting to expand the initial service area with the intention of serving outlying areas of the city, an oversized service area can result in system-wide service degradation. Microtransit works best when service zones correspond to distinct districts or corridors with a focused concentration of trip generators. A microtransit zone can be expanded over time, but **we recommend launching this service with as focused a zone as possible, and expanding slowly while monitoring the impact these changes may have on system performance.** We've found that it is usually easier to expand a concentrated zone, rather than reactively contract an overextended zone (no one likes when an existing amenity is taken away!).

Microtransit Considerations for Sedona

Extending Mobility for All

In addition to providing convenient access to trailhead shuttles and reducing visitor vehicle traffic, a microtransit service would also revolutionize transportation options for Sedona residents with limited mobility: including older adults and individuals with disabilities. As this is a brand-new service, it is difficult to predict the potential community benefits, but **we recommend the service be implemented with all community members in mind.** This includes wheelchair accessible vehicles, an app designed for riders with visual / hearing disabilities (WCAG 2.0 Compliance) and call-in ride booking options for individuals who prefer not to use a smartphone.

Minor Adjustments Can Have Magnified Impact

Another important concept in microtransit design and operation is that even **small changes to the service can have significant system-wide implications.** This is illustrated in the dwell time example above, but also plays out in service area sizing and vehicle scheduling. A seemingly small addition in a service zone can disproportionately affect average wait and ride times.

Similarly, minor adjustments in vehicle scheduling significantly affect operations. **Service planners should make sure that driver breaks are staggered, so multiple vehicles are not out of service at the same time.** If a vehicle is coming out of service and being replaced by a new vehicle/driver, the incoming vehicle should begin service before the first vehicle leaves service. These basic operations practices avoid service supply shortages which can have ripple effects on rider experience throughout the day.

Use Data as a Tool

Microtransit will represent a compelling transportation option for residents and visitors, but the secret power of microtransit comes from the data the system generates. Microtransit trip data can paint a compelling picture of the movement patterns, mobility hubs, and concentrations of destinations in a community. **We recommend the City of Sedona, alongside the future microtransit vendor, articulate a "Data Plan" to monitor microtransit data, watch for warning indicators, and use these insights to regularly improve the service.** This ongoing evaluation will

help ensure that the microtransit system evolves flexibly to meet the needs of the rider community. In addition to informing the system itself, microtransit data can also influence other mobility planning, and even land use planning decisions about where to concentrate new development to align with existing mobility patterns.

Microtransit is One Piece of the Mobility Puzzle

Local Mobility Ecosystem

Microtransit plays an important role as a community connector. The City of Sedona is leveraging this potential through the future trailhead shuttle services. **The relationship between the on-demand microtransit service and the fixed-route shuttles can result in a harmonious ecosystem of mobility where each mode can play to its strengths.** Microtransit works best for short trips in a focused environment (service zone) while fixed-route can accommodate longer point-to-point trips to destinations far from the urban core (such as trailheads).

In order to maintain a healthy relationship between microtransit and fixed-route shuttles, we recommend the City of Sedona balance microtransit average trip times with trailhead shuttle headways. If either becomes too inconvenient for riders, both modes will suffer. Alternatively, if microtransit trip times are kept low and shuttle headways are short, the services will complement each other and encourage greater ridership.

Transit, Parking, and Active Transportation

While a convenient and compelling microtransit system can be an important tool to reduce vehicle trips and traffic congestion, it's important to remember microtransit is one mode among a larger web of transportation options. If Sedona residents and visitors believe that driving their own vehicles will be more convenient than taking microtransit, system ridership will suffer. **When cities invest in automobile-oriented infrastructure, such as adding lanes to roads or oversupplying free parking in busy areas, they incentive driving alone, and often exacerbate traffic and parking issues in the future.** A strategic parking management strategy, including appropriate pricing of parking in busy areas, can go a long way to reducing traffic and encouraging travelers to use shared modes like microtransit.

Furthermore, the City of Sedona should not ignore the important relationship between microtransit and active transportation. Once a rider is dropped off by a vehicle, will they be able to cross the street safely? Are there adequate crosswalks and sidewalks in good repair? Bike infrastructure, such as bike lanes and bike racks can promote more cycling, another alternative to driving. Similarly, the City of Sedona can consider the role of micro-mobility in its transportation future: how could bikeshare and scootershare increase mobility in town while decreasing short vehicle trips?

Conclusion

The true strengths of any microtransit system are **Flexibility of Service** and **Robust Mobility Data**. Microtransit, unlike traditional fixed-route, adaptively meets the needs of riders in real-time. The vehicle finds the passenger, not the other way around. Microtransit also offers operators flexibility in service provision: a microtransit system can be quickly deployed and iterated upon based on observed data.

Microtransit data is itself a useful tool for planners at all levels. Live system data can help dispatchers problem-solve on the fly, trip data can help with forecasting future transit needs / budget, and geographic data on trip origins and destinations can be used by the City in a variety of planning and land use-decisions.

Any microtransit service launched by the City of Sedona should take into account the importance of service flexibility and the value of the data generated. With these principles in mind, a new microtransit service will have the greatest impact in improving transportation for residents and visitors, offering a compelling alternative to driving, and provide new opportunities for community access to individuals with mobility challenges. This service will represent one more step toward a safer, healthier, and more sustainable Sedona.

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