PART
piedmont authority for regional transportation

Airport Area Shuttles Analysis

Prepared by the PART Planning Staff

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Background

PART has provided a first & last mile service connecting its regional hub to surrounding employment centers for 15 years. The service, branded as the Airport Area Shuttles, takes PART Express bus passengers to and from their place of employment or to connect with air travel at Piedmont Triad International Airport (GSO). These shuttles are a vital part of the service PART Express provides. Over the past year, customer concerns regarding missed passenger pick-ups; driver speed; missed connections with PART Express; and difficulties explaining how the service works, have become clear through the PART call center service. Call center staff have a close relationship with shuttle passengers, speaking with each of these customers at least once a week.

The shuttle system was not analyzed as part of the overall system analysis completed in April 2017. Its challenges and service delivery are significantly different from the PART Express system; thus, the analysis of the Airport Area Shuttles was conducted separately.

Ridership

Shuttle ridership fluctuations mirror ridership fluctuations on PART Express Routes 1, 2, and 3 and vary with seasonal employment opportunities which exist in the shuttle service area. Current shuttle ridership is detailed in the chart below:

Airport Area Shuttle Ridership								
	2016				2017			
	Hourly	Daily	Monthly	Annual	Hourly	Daily	Monthly	Annual
Peak (30-minute service, 6AM to 9PM & 3AM to 7PM)	28	199	4,202	50,422	25	174	3,681	44,169
Off-peak (60-minute service, 9AM to 3PM) *	5	31	655	7,854	6	45	943	11,310
		Total Annual		58,276				55,479
	Shuttle ridership as a % of entire PART ridership			12.92%				13.72%

*After July 2017, off peak service includes two more hours per day: from 7PM to 9PM.

Current Service Delivery

The service roughly operates in a 2 to 3-mile radius from the hub. Passenger pickups and drop-offs operate on a 30 or 60-minute headway. There is no printed schedule, no time points along the route, and no bus stop signs. The service is similar to a demand response service with four vehicles during peak hours, each covering a fourth of the service area; and two vehicles during off-peak, each covering half the service area. Passengers must call and schedule a pickup 30 minutes prior to the 30/60-minute window during which they wish to be picked up. And that pickup must be timed with the Express Bus they want to catch.

Passengers have indicated to PART staff that the scheduling process for the shuttles is confusing; and, due in part to this confusion, it is also a challenge to market and promote the service. Challenges and

misunderstandings with the scheduling process can lead to missed passenger pickups and therefore missed connections.

Passengers have also mentioned that operators exceed the speed limit in order to complete their route and make it back to the CTC. During peak service periods drivers are expected to convey passengers and return to the CTC—to/from each destination/origin's front door and without a standard routing—in less than 30 minutes. This expectation creates an environment that encourages operators to rush their route.

Known Issues

There is no local transit service operating in the airport area although this large geographic area is one of the major employment districts of the Piedmont Triad. With the volume of people who need to move into and out of the area every day, PART created the shuttle service because of the lack of existing transit service and to supplement the PART Express routes that converge in the area at the CTC. The shuttle service was designed as a first/last mile service without specific stops or time points along a route (only the start and end points and times of the trips were set). This is a high level of service which takes the transit customer to their travel destination without requiring additional travel by foot or other means. It is also a somewhat customized service allowing the consumer to set their drop-off and pick-up times according to a 20-minute window of time (during peak travel).

Providing first/last mile level of service in the area has proven challenging because of the suburban land-use design. Under this design paradigm workplaces are confined to business parks and strip malls which require that most front doors are set 100 feet or more off the public roadway. This design also requires limited street connectivity which insures moderate to large distances needed to move between destinations. Yet in order to connect with PART Express service at the CTC, strict time limits on the duration of shuttle trips are required. Together, these challenges make service delivery to the front door of every destination in the airport area impossible.

Another challenge for the service has been explaining how to use it to potential customers and keeping current customers satisfied with its reliability. These two issues stem from the same two design flaws—the pick-up/drop-off time customization window being too long and the lack of standardized routing along each shuttle route. Since the direction of a shuttle's trip was never consistent, the customer didn't know if they would be at the beginning of the route one day and the end the next day. The only guarantee was that the customer would be dropped-off or picked-up according to the 20-minute window they choose.

A more standardized approach to service delivery was needed. The PART team decided to focuses on the following:

- Explainability: the service delivery needs to be easy to explain and illustrate.
- Reliability: A customer should be able to count on the bus being consistent in routing and timing. For customers who will still need to pre-reserve a pick-up, the tools to complete this task need to be simple and reliable.
- Safety: The temporal and spatial requirements put on operators to complete their trips need to be appropriate and attainable.

Analysis

Service Delivery Options[1]

A 30-minute slot scheduled for a shuttle trip must account for several stops, dwell time at bus stops (for customers to exit or board the bus), appropriate amount of dwell time at the CTC for passengers to make their connections with other routes. A reasonable, safe breakdown of the 30 minutes trip looks like this:

Dwell time at CTC	5 minutes
Travel time outbound	10 minutes
Total dwell time at stops	5 minutes
Travel time inbound	10 minutes

Image 1 shows a 10-minute drive isochrone from the CTC, meaning that is the farthest extent a shuttle can drive under the best conditions. The street network and speed limits determine the isochrone, but it does not take into account dwell time or recent changes in the highway network north of the CTC.

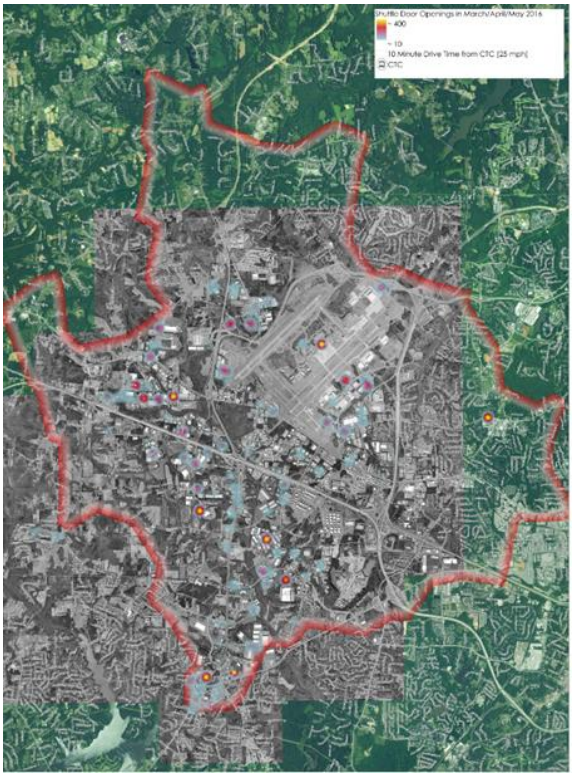

Image 1

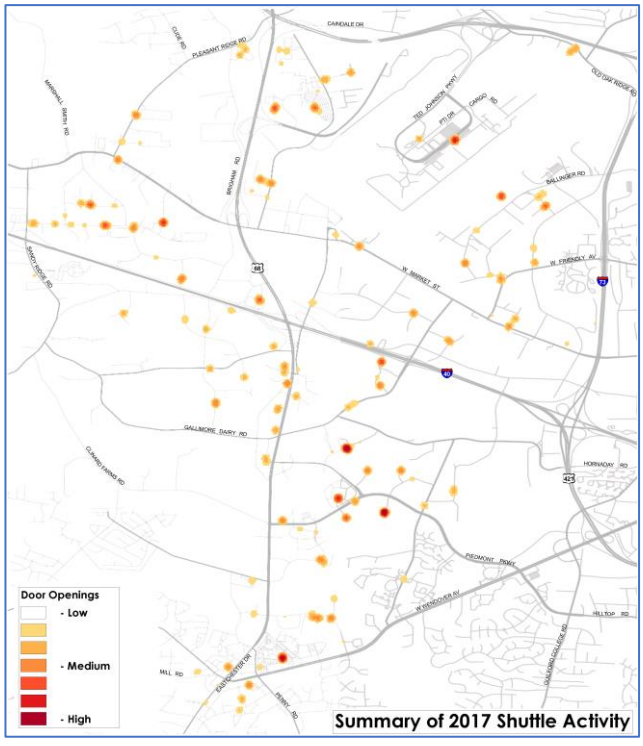

Image 2

Image 2 is a heat map of bus door openings for the shuttle system in 2017. The red dots represent the highest number of bus door openings. The map reveals several groups of locations with more door openings than others.

One goal of a new service delivery system should always be preserving and hopefully increasing ridership. Using the isochrone, the 20-minute (approx. 12-mile round trip) outbound/inbound limitation and the boardings heat map, planning staff can sketch out routes that include the popular locations and stays within the 30-minute trip window.

From these maps PART staff identified spatial limits to match the temporal constraints necessary for connectivity with PART Express, and spatial patterns in light of the street network and the most popular destinations. Staff found five or six potential routings/ areas for the Airport Area Shuttles that would cover the majority of current customer destinations.

[1] Note: This analysis only applies to peak hour shuttle service. At is assumed that the non-peak shuttle service which has a 60-minute window does not suffer from a safety concern and any improvement in explainability and reliability would be addressed in this analysis.

PART staff has identified three potential service delivery options for the known issues affecting the airport area shuttle system:

1. **Expansion of Current Service System**
   - Keep the current service delivery method in place;
     - Continue providing door to door (first/last mile) service;
   - Add a dedicated airport shuttle; and
   - Increase the number of service areas from 4 to 6, thus decreasing the physical area served by each individual bus.

   Maintaining the current Airport Area Shuttle system will require an increase in staff and put stresses on the current PART fleet (potentially requiring at least one new vehicle purchase). This option would continue the greatest flexibility for customers and improve the transit experience, yet it will not simplify the system for ease of use. This option offers no additional standardization and does not improve marketability.

2. **Implement a Traditional Fixed Route System**
   - Move to a pure fixed route system with set routings, traditional stops and time points;
   - Add a dedicated Airport Shuttle; and
   - Eliminate call ahead scheduling

   Switching to a pure fixed route system would take away some of the flexibility the service currently provides; and, initially, ridership would drop because "off-route" locations would no longer be served. In the long run however, ridership may increase due to the reliability and understandability fixed route service brings. Bus stops would have to be identified and signed; the door–to–door service would be discontinued.

3. **Implement a Hybrid System** (see Image 3)
   - Establish a firm service area boundary;
   - Create "soft" routings which have one firm, mid-trip time point;
     - "soft" routing allows for limited distance deviations
   - Include a limited number of designated stops;
   - Continue call ahead scheduling for any deviation requests; and
   - Add a fifth shuttle

   Switching to this style of hybrid system, with limited fixed bus stops, deviated bus stops (within a set limit on distance and/or number) and a mid-route time point will retain a portion of the flexibility of the current shuttle system. But the primary attractiveness of this system is

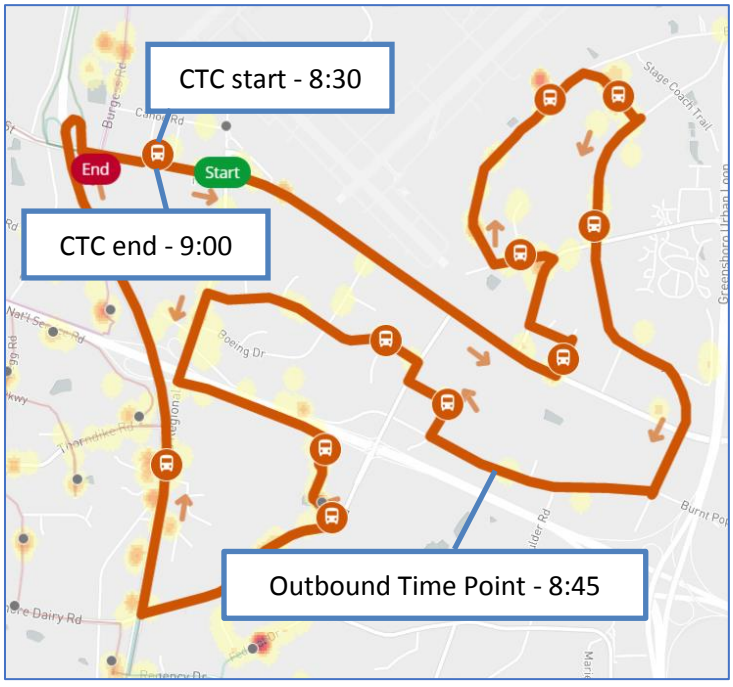

Image 3

that it incorporates characteristics from the pure fixed route system designed to substantially improve reliability and explainability. Some fixed bus stops will have to be identified and signed, and a mid-route, time point stop will have to be determined.

The table on the following page ranks the service options and their appropriateness within the broader PART system of connectivity.

Service Option	*Explainability*	*Reliability*	*Safety*	*Vehicle Needs*	*Flexibility*	*Cost*	*Marketability*	*Ridership*	*Bus Stops*	*Door to Door*
Increase in Current Service	Low	Low	Low	High	High	High	Low	No gain	No	Yes
Fixed Route	High	High	High	High	Low	Moderate	High	Gain	Yes - Numerous	No
Hybrid	Moderate	Moderate	High	Low	Moderate	Low	Moderate	Gain	Yes - Limited	Limited

The Airport Area Shuttle Experience

Reliability and Simplicity are two factors that most transit passengers demand, especially those that are exploring transit options or are learning a new transit system. Most transit users understand a traditional fixed route system—that a vehicle picks them up at specific location on a schedule, follows a predetermined route and drops them off at another specific location according to the schedule. Experience tells us that even this traditional system can be confusing to people, regardless of how well an agency designs brochures, websites, apps and maps or trains its call center employees. So, PART staff is not surprised that a service which requires a phone call to schedule a trip, does not have a defined route, and has a 30-minute pickup window can be viewed as un-reliable and complicated by many of our customers and too complicated for people who have decided not to use the service.

Simplifying the service delivery is only one part of making the current shuttle service more reliable and easily understandable. For first/last mile and deviated fixed route services other considerations are the process of scheduling a trip and planning the trip. Use of better technology can play a role. An online scheduling platform that passengers and call center employees can use to schedule trips and seamlessly communicates the manifest to the bus operator would be an improvement over the current system. Secondly the ability to tell a passenger "this is the route the shuttle takes, this is the 10-minute window that you will be picked up in," and "these are the locations it serves" again provides reliability and simplicity.

Another factor that impacts service is fare payment. Currently PART collects fares or accepts a transfer to board a shuttle. The process of using the farebox is a time killer on the airport area shuttles. Put simply, having each customer stop at the farebox and feed in money or a bus pass takes valuable time. Since transfers are free between all PART routes, fare collection could be eliminated on the shuttles or at least made optional. Persons using an Airport Area Shuttle to connect with PART Express at the CTC could simply pay their fare to the Express

Bus operator. This can aid the bus operator in safely covering their assigned service area/route and making connections for customers.

The “door to door” expectation and undefined bus stops slows down current shuttle service delivery. The door to door service is a perk, but an understandable development given the land development pattern previously discussed (lack of sidewalks, building setbacks…). To address both of these issues each route and business has been evaluated for appropriate bus stop locations.

Currently shuttle pickups must be phoned in to the call center. The pickup is placed on a Google Sheet that immediately updates and can be seen by dispatch and drivers when at the CTC. The shuttle operators go by dispatch and visually receive the pickup schedule. While this system works, it does not let passengers directly schedule a pickup online or confirm they are on the schedule. If the system were internet based, it would be possible to put the schedule on smart phones or tablets that the drivers carry.

The call center will also need more detailed information concerning the service boundary or limits, street addresses that are served, where stops are made. Under the hybrid system, new passengers who need a deviation, due to distance or difficulty accessing established bus stops, would need to call PART staff or register to validate they are in the service area for deviations and to get the time frames for their pickup window.

In a true demand response system, routing becomes critical. Under the current service delivery approach, knowledge of the area (the street network and location of businesses) is very important. Moving to a fixed route would eliminate the need for extensive knowledge of the area making it easier for any operator to assume an Airport Area Shuttle route.

Service Costs Considerations

Implementation of any of the three options presented above would require additional resources. Each option would require driver wages, vehicles, maintenance, fuel and improved technology. Depending on the service option, costs could rise in excess of what PART will be able to sustain.

For all options, maintenance would be covered by the contractor under the regular repair rate, and not pose a funding concern. Theoretically the number of miles driven would not increase since PART does not intend on extending the service area or frequency in any of the options, therefore no added wear and tear on vehicles.

Increases in costs will largely be seen in additional service hours. PART transit services are billed by the number of in-service hours operated. Shuttle service option 1 would increase service hours by the largest amount, and both options 2 and 3 will increase service hours by half the amount option 1 would.

Improved technology would address deficiencies in the pick-up reservations system. PART staff recommends that the shuttle system uses online scheduling and employs a more efficient use of Transloc for scheduling deviations. This upgrade will make the system easier to use for customer, call center, dispatch and bus operator. Deviation passengers should be able to schedule online and see their scheduled pickup. The driver should be able to readily access their scheduled deviation pickups via smart phone or internet connected tablet. It is possible to use existing smart phones and website Wordpress plugins to achieve these results at a very low cost.

Recommended Service Plan: Deviated Fixed Route

Image 4 illustrates the entire deviated fixed route system. All of the popular locations will be served at the expense of some less popular locations. This approach would preserve the majority of the current ridership. The five routes shown on the map fulfill the following criteria:

Service Area	*Loop Length (mi.)*	*Runtime*	*Wiggle*
Airport	12.69	21.8	8.2
Friendly	13.98	24.0	6.0
Piedmont	12.88	22.1	7.7
Sandy Ridge	12.92	22.2	7.8
Pleasant Ridge	12.87	22.1	7.9

Each route has time devoted to getting to the mid-trip time point, making stops along the way; and then time devoted to getting back to the CTC, making more stops along the way. This can be further understood as 10-minute windows for pickups along the route.

On each trip the shuttle would follow the same route, deviating to a designated deviation point if need be, then, stopping, if necessary, at the midway point. This would complete the first 10-minute window pickups. The second half of the run would then start, making the remaining 10-minute window pickups and leaving time to return to the CTC, deviating to a designated deviation point if need be. (Illustrated in Image 4). There is a time table for each route to follow with the bus stops having associated times. This creates clarity for shuttle customers.

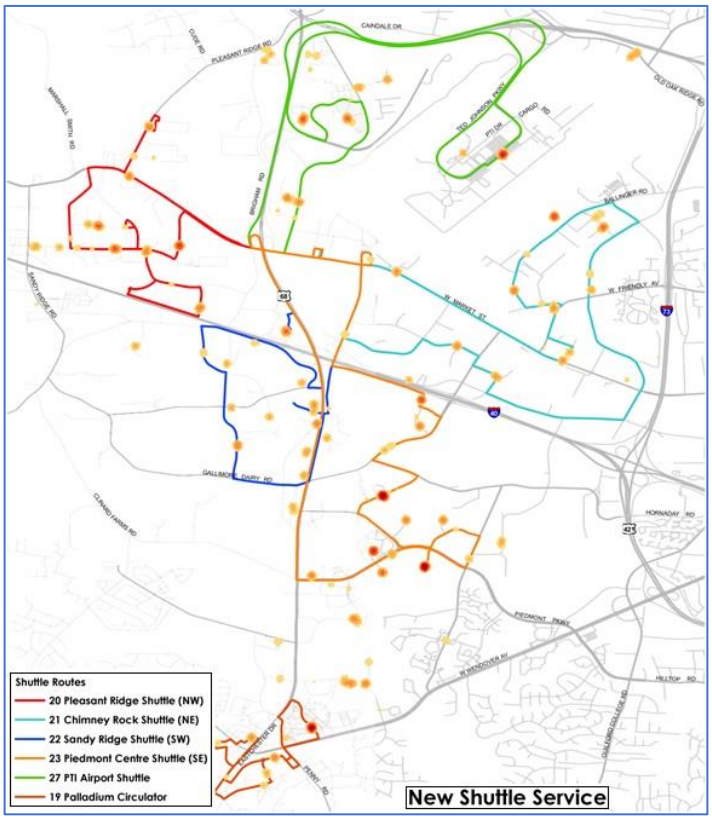

Image 4

This service delivery method is designed to provide reliability by creating a five-shuttle system and limiting the service area. It addresses safety or speeding concerns by standardizing the routes' lengths. It addresses the service's explainability by defining a route and service territory and allows for ten-minute pickup windows instead of 30-minute windows.

Further recommendations:

Deviations: Staff recommends only 2 set deviation points per shuttle route. This service design has a defined service limit that would need to be adhered to.

Locating stops: PART recommends that bus stops along each shuttle route (and the set deviations) be located to attract the most people from the most possible destinations. This process starts with the boardings data and using the spots with the most boardings as stops. Further priority was given to spots along each route where a cluster of boarding

hotspots were located within a ¼ mile of each other. A quarter mile is industry standard for the catchment area of a "walk-up" bus stop. Image 5 illustrates the Deviated Fixed Route Shuttle system with the gray dots representing ¼ mile buffers around the bus stops and designated deviation stops.

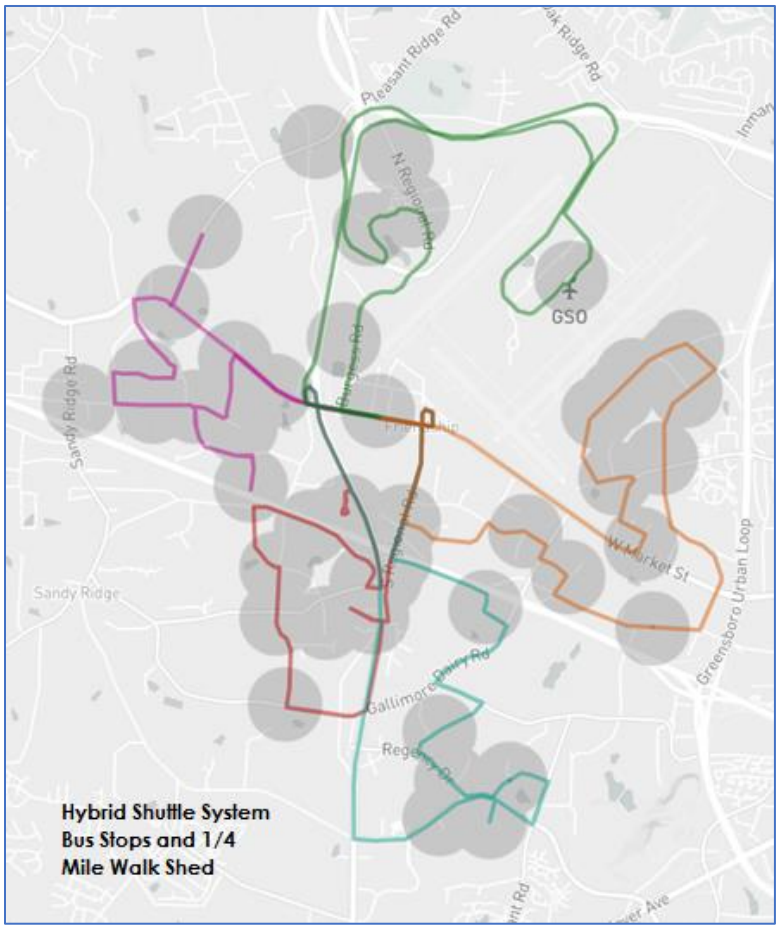

Image 5

Title VI Considerations

PART conducts Title VI public hearings and completes a Title VI analysis when instituting major service changes. A major service change is any change or series of changes that directly affect:

- 25 percent or more reduction of transit route revenue hours of PART Express system-wide service.
- 50 percent or more reduction of transit route revenue hours of a single PART Express corridor service computed on an annual basis.
- The implementation of a new transit corridor route.

Because these conditions are not fulfilled by the recommended Airport Area Shuttle changes, a Title VI analysis is not required. PART staff has however surveyed shuttle customers to understand their needs and concerns. Indeed, the changes prescribed in this analysis of the Airport Area Shuttles are directly shaped by concerns voiced by shuttle riders. PART staff has informed riders of the proposed changes through outreach including face to face interaction, email outreach and printed materials.

New Deviated Fixed Route Service Bottom Line:

Safer – Timed routes, Safe stop locations.
More Reliable – Consistent stop locations with timed stops
More Convenient – Don't have to call ahead (except for deviations), No guessing when shuttle arrives
More Efficiency – Improves driver training, increased ridership
Adjustments – No more front door service, some locations not served