AIRPORT RAIL LINK STUDY

SUMMARY OF FINDINGS

Executive Summary

Consultant Deliverable 9.1 Supplement

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ES1. Introduction

The Airport Rail Link Study (ARLS) was conducted to identify technology and alignment options to link Raleigh-Durham International Airport (RDU) with Triangle Transit Authority's (TTA) proposed regional rail system, and to assess the feasibility of those options. The study identified needed service characteristics of the link and appropriate technologies to address those characteristics, estimated cost and ridership potential, and evaluated options against a set of service objectives, leading to recommendations for implementation of an airport-to-rail link service. The study area is roughly defined as that bound by T.W. Alexander Drive on the north, RDU and Lake Crabtree on the east, Weston Parkway on the south, and Davis Drive on the west, and is shown in **Figure ES-1**.

An eight-member steering committee was formed to guide the development of the study. The committee was made up of four board members from the Raleigh-Durham Airport Authority and four from the Triangle Transit Authority Board of Trustees. The Steering Committee met on three occasions, to develop study goals and objectives, to define Airport Rail Link alternatives, and to evaluate the alternatives and draw study conclusions.

ES2. Study Objectives

At the outset of the study, existing and expected conditions within the study area, including both transportation conditions and land development expectations, were evaluated in order to identify the need for an airport-to-rail link and the purposes it might serve. The Steering Committee identified the following needs:

- Decrease traffic congestion on roadways near RDU, particularly I-40
- Provide more efficient travel to RDU
- Improve satisfaction, reliability and convenience of travel to and from RDU for air travelers
- Improve area desirability and competitiveness for economic development purposes
- Serve nearby development
- Maximize the ease of use of the system
- Provide connectivity to intercity rail

To evaluate the effectiveness of potential alternatives relative to identified needs, a series of service objectives for the project was developed by the Steering Committee. These objectives and associated measures of effectiveness are shown in **Table ES-1**.

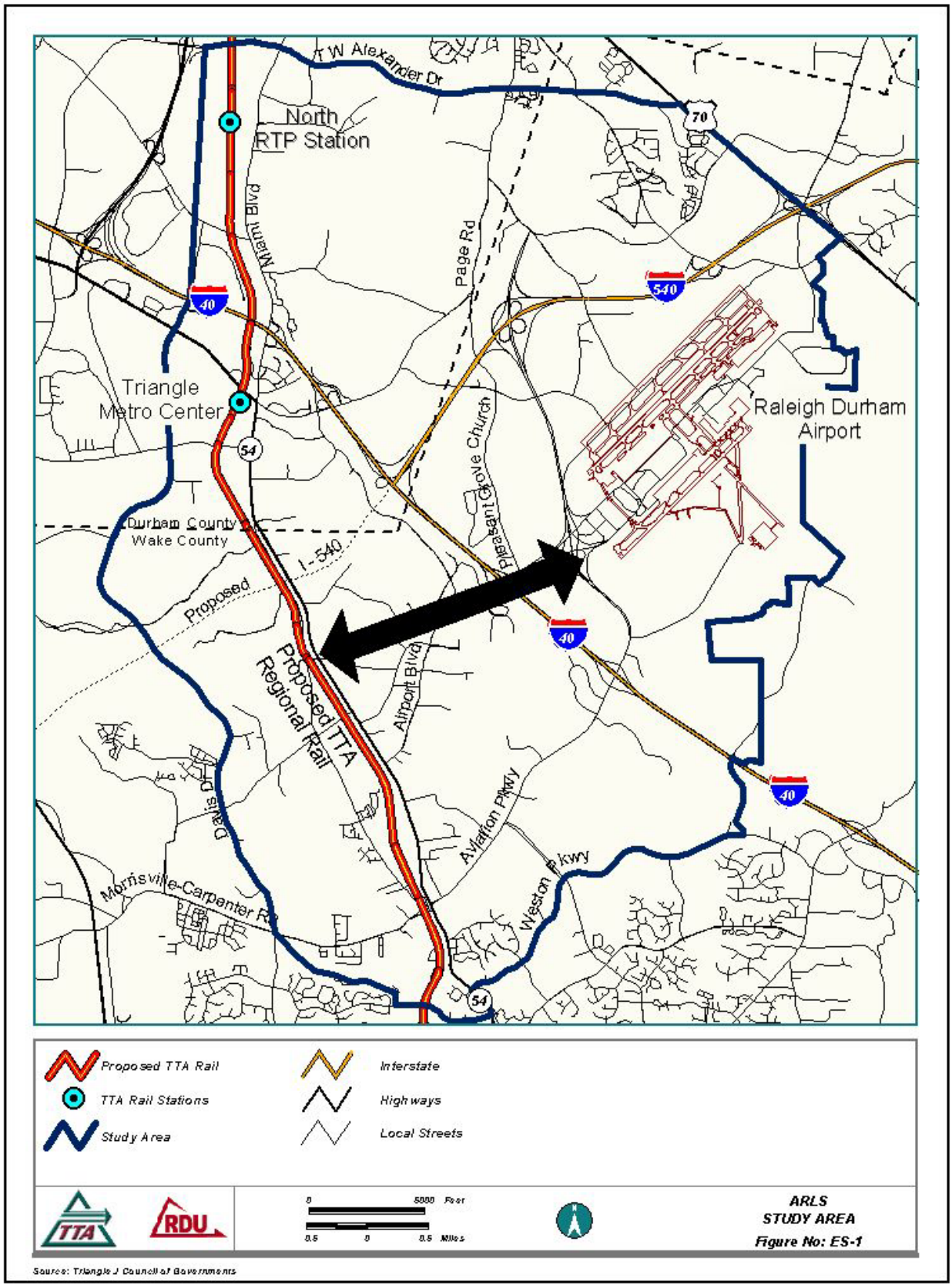

T W Alexander Dr
North
RTP Station
NCSU Blvd
Page Rd
70
40
540
Triangle
Metro Center
54
Raleigh Durham
Airport
Durham County
Wake County
I-540
Proposed
Proposed TTA
Regional Rail
Pleasant Grove Church
Airport Blvd
Davis Dr
Aviation Pkwy
Weston Pkwy
Morrisville-Carpenter Rd
Proposed TTA Rail
TTA Rail Stations
Study Area
Interstate
Highways
Local Streets
TTA
RDU
0
5000 Feet
0.5
0
0.5 Miles
ARLS
STUDY AREA
Figure No: ES-1
Source: Triangle J Council of Governments

TABLE ES-1
Objectives and Measures of Effectiveness

Objectives	Measures of Effectiveness
Maximize ridership	• Total airport-to-rail daily ridership • Total airport-to-rail new ridership • Total ARL daily ridership
Maximize the use of existing rights of way	• Potential for rights-of-way impacts
Exceed customer service expectations	• Total airport-to-rail travel time • Total waiting time for riders of the ARL • Service reliability and/or customer convenience
Minimize total cost and cost per rider	• Total capital costs • Annualized capital cost per rider • Annualized capital cost per new rider
Maintain compatibility with the RDU Master Plan	• Compatibility with technology needs of on-airport APM • Compatibility with on-airport service requirements • Location and alignment

ES3. Definition of Alternatives

At its second meeting, the ARLS Steering Committee identified three candidate corridors that were thought to satisfy the study objectives. These three corridors, which offer varying opportunities for technology application, directness of connection between the airport and the regional rail system, and service to either existing or planned intermediate developments, are described below:

- I-40 Corridor – Direct connection from RDU to regional rail at the Triangle Metro Center, using a corridor generally parallel to Airport Boulevard, I-40 (or Slater Road), and Page Road.

- Nelson Road Corridor – Direct connection from RDU to Triangle Metro Center, in a corridor generally parallel to Aviation Parkway, Nelson Road and Page Road.

- Northeast Quadrant Corridor – Connection from RDU to the North RTP station, within a corridor that would serve the planned Brier Creek and Globe Road Center planned communities. This corridor generally follows the corridor identified in the Center of the Region report and planning process sponsored by the Triangle J

Council of Governments. It would generally parallel Aviation Parkway to north of I-540, and then use a new westerly alignment to reach the North RTP station.

In addition to alternative alignments, technology options for the ARL were also considered. **Table ES-2** shows the range of technologies that were evaluated.

Preliminary evaluation of the alternative corridor and technology options yielded three alignment-technology alternatives for further analysis in the remainder of this study. For comparative purposes, a No-Build alternative, reflecting existing TTA shuttle service to the airport, was also evaluated. These alternatives are presented in **Table ES-3** and are shown graphically in **Figure ES-2**.

ES4. Evaluation of Alternatives

A summary as to how each alternative rates against project objectives and measures of effectiveness is provided in **Table ES-4**. Each alternative has its advantages and disadvantages. The I-40 BRT alternative rated the best of the three build scenarios for travel time, potential for low right-of-way and environmental impacts, capital costs and costs per rider, but rated the worst for service reliability (though BRT technology is considered to be quite reliable) and forecasted ridership. The I-40 guideway alternative would be much less costly than the Northeast Quadrant alignment due to its shorter length. However, the I-40 guideway alternative would likely cost from $128 million to $317 million dollars more than the BRT alternative (depending on technology) and is expected to carry only 200 additional riders per day along the same alignment.

While the I-40 BRT alternative is by far the least costly of the build alternatives, it would still be expected to attract nearly as many passengers as the I-40 guideway alternative. The Northeast Quadrant guideway alternative would likely generate the highest total ridership and new riders, but for APM technology could cost up to $527 million more to build than the I-40 BRT. The Northeast Quadrant guideway alternative with the small monorail is projected to have the lowest cost per new rider at $13.78 compared to the $42.02 for the I-40 BRT. However, the cost per new airport-to-rail riders for this alternative is much higher than the BRT alternative.

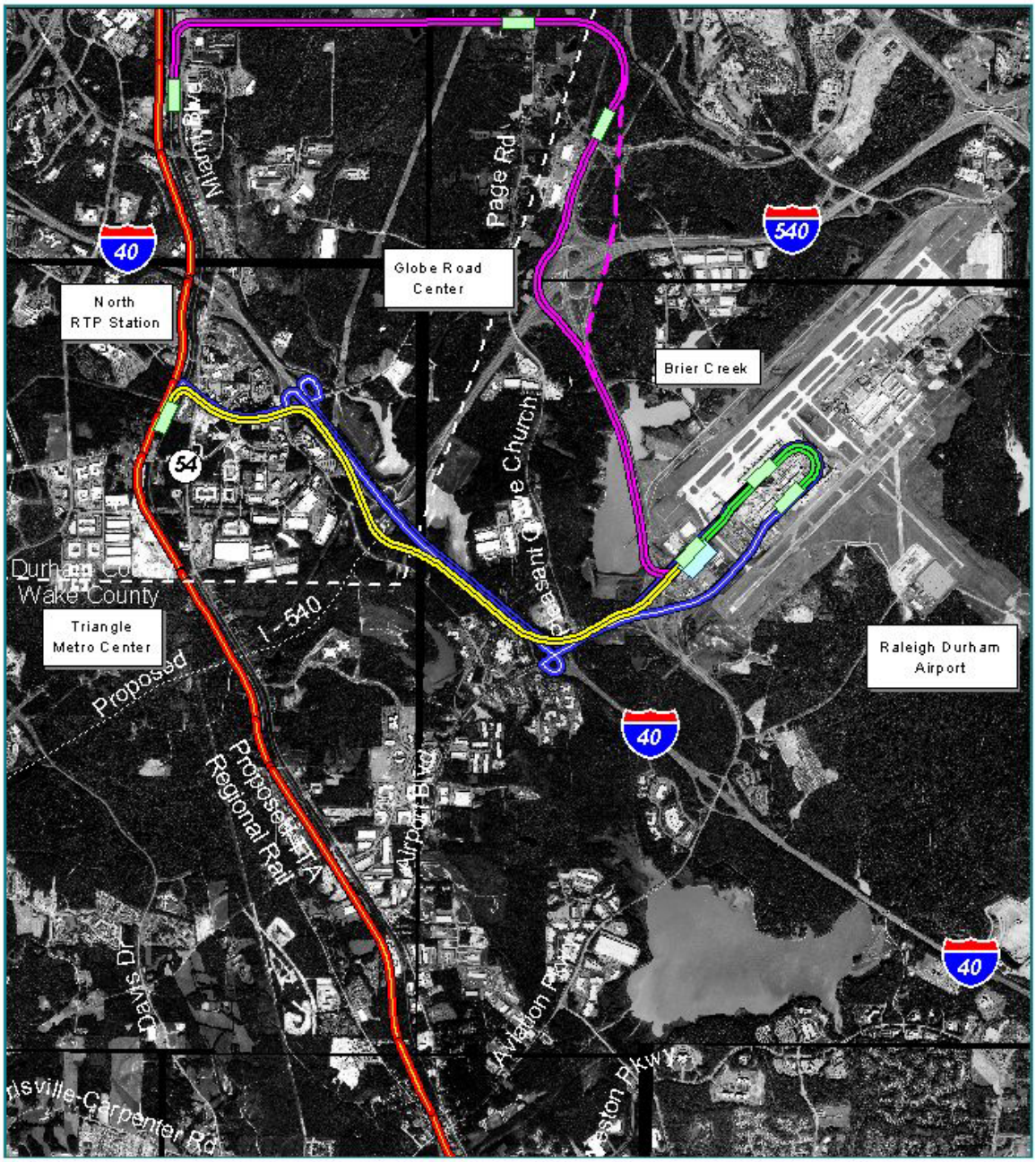
TABLE ES-2 Technology Alternatives

Evaluation Criteria	Bus Rapid Transit	Guided or Advanced Bus	Automated People Mover (APM)	Monorail	Light Rail
	Shuttle Bus	Guided Bus	Off- Airport APM	Small Monorail	Light Rail
	Traditional Bus	Bus Tram	On-Airport APM	Large Monorail	Electric tram
Goal: Maximize Ridership	If service is attractive	If service is attractive	Likely	Likely	Likely
Goal: Use existing ROW/Roadway	Shared roadway	Shared roadway, enhanced roadway, or exclusive guideway	Can share ROW, but on exclusive guideway	Can share ROW, but on exclusive guideway	Can share ROW, but on exclusive guideway
Goal: Exceed Expectations	If service is attractive	Likely	Likely	Likely	Likely
Goal: Minimize Cost	$50k-$400k per vehicle	$1M-$10M per mile, including guideway	$15-40m per mile (up to $100m/mile on airport)	$25-60m per mile (up to $100m/mile on airport)	$30M - $60M per mile
Goal: RDU Compatibility	Yes	Yes	Likely	Small- likely Large-unlikely	No
Recommenda-tions	Near or long term	Near or long term	Long term only	Small for Long term only	Drop from consideration

TABLE ES-3
Summary of Evaluated Alternatives

Characteristics	Alternative			
	No-Build	**I-40 BRT**	**I-40 Fixed Guideway**	**NE Quadrant Fixed Guideway**
Technology	Existing TTA Rolling Stock	Bus Tram	Small Monorail or Rubber-tired APM	Small Monorail or Rubber-tired APM
Speed (Max/Avg)	35/25	65(I-40)/30	45/35	45/35
Length (Miles)[1]	4.9	4.9	4.9	7.4
Headways	15 min. peak / 30 min. off peak	10 min. peak / 20 min. off peak	10 min. peak / 20 min. off peak	10 min. peak / 20 min. off peak
Rail Terminus	Triangle Metro Center	Triangle Metro Center	Triangle Metro Center	North RTP Station
Intermediate Stations	Triangle Factory Shops, RDU Consolidated Rental Car Facility	RDU Consolidated Rental Car Facility	RDU Consolidated Rental Car Facility	Brier Creek, N. Globe Road Center, RDU Consolidated Rental Car Facility
Guideway Characteristics	None; uses existing roadways	Within existing roadway r/w; travels within existing lanes, except special treatment such as queue-jump lanes, separate ramps at high congestion locations	Within existing roadway r/w, but on fully-separated guideway	Partially within existing roadway r/w, partially on new alignment, fully grade-separated

[1] Distance from Terminal A at RDU to the regional rail system. Length of construction for the guideway alternatives would not include the 1.12 miles between Terminal A and the proposed Consolidated Rental Car Facility.



Source: Triangle J Council of Governments

TABLE ES-4
Summary of Alternatives Evaluation

Objectives Measures of Effectiveness	**Alternative**			
	No-Build	**I-40 BRT**	**I-40 Guideway**	**NE Quadrant Guideway**
Maximize Ridership				
Total airport-to-rail daily ridership	1,300	1,500	1,700	1,500
Total airport-to-rail new riders	**	200	400	200
Total ARL daily ridership	1,300	1,500	1,700	7,600
Minimize Total Cost and Cost Per Rider				
Capital costs (2002 $, US)	N/A	$19.8 M	$146.7M – $335.9M[1]	$260.5 M – $577.8 M[1]
Annual cost per rider	N/A	$5.60	$28.81 - $58.80[1]	$11.42 - $22.67[1]
Annual cost per new regional rail rider	N/A	$42.02	$122.46 - $249.90[1]	$434.09 - $861.52[1]
Maximize Use of Existing Rights of Way				
Potential for rights-of-way impacts	None	None to Minimal[2]	Minimal[3]	Significant[4]
Maintain compatibility with the RDU Master Plan				
Compatibility with technology needs of on-airport APM	N/A	Excellent; no conflict	Excellent; but lower cost monorail would result in technology change	Excellent; but lower cost monorail would result in technology change
Compatibility with on-airport service requirements	N/A	Good; but would result in a duplication in service of APM	Excellent	Excellent
Location and Alignment	N/A	Excellent	Excellent	Excellent

TABLE ES-4
Summary of Alternatives Evaluation
(continued)

Objectives Measures of Effectiveness	**Alternative**			
	No-Build	**I-40 BRT**	**I-40 Guideway**	**NE Quadrant Guideway**
Exceed Customer Service Expectations				
Total airport-to-rail travel time (minutes)	13.2	9.1	9.9	15.1
Total wait time for ARL riders (Rail to RDU, peak-off peak)	7.5-15	5-10	5-10	5-10
Service Reliability / Customer Convenience	Fair	Good	Excellent	Excellent
Other Criteria				
Funding Eligibility	N/A	Eligible for FTA and FAA funding	Eligible for FTA and FAA funding	Eligible for FTA and FAA funding
Potential for Environmental Impacts	N/A	None to Minimal	None to Minimal	Moderate

[1] The smaller values represent costs with small monorail technology and the larger values reflect costs with APM technologies. Capital cost does not include cost of building the on-airport circulator system (estimated as between $94.6 and $147.6 million).

[2] New rights-of-way likely to be limited to intersections

[3] New rights-of-way likely to be limited to transition areas between roadways and access terminal

[4] Assumes new rights-of-way north of Globe Road. Approximately 55% - 65% of total length.

ES5. Findings and Conclusions

One of the most critical elements in determining the appropriate mode for the ARL is the timing of its implementation and coordination with other ongoing efforts. Without the presence of the regional rail system, a fixed guideway transit mode would not be constructed. Similarly, construction of the on-airport APM would need to precede construction of a fixed-guideway ARL, with consideration given to future ARL extension in the planning and design of the on-airport system. Similarly, funding for construction of the on-airport APM, which would need to precede construction of a fixed-guideway ARL, is uncertain and most likely would not be available until after 2020. Should the regional rail system begin operations prior to the construction of the on-airport APM, any interim connection would need to occur via rubber-wheeled technology. Selection of the ARL alternative should be coordinated with the findings of the I-40/NC54 corridor transportation assessment. Should this effort result in the implementation of BRT from Chapel Hill to RTP via I-40, extending the BRT service along I-40 to RDU would be a less problematic transit connection to RDU for implementation.

The ridership analysis completed for this effort was based upon population and employment data for development in the RDU area. As a result, ridership on the Northeast Quadrant alternatives modeled the greatest number of riders due to the two large planned communities along the alignment. In the event these two developments occur at lower densities than currently planned, then the ridership projections along this alignment would decrease significantly.

The factors cited above, which reflect the alternatives evaluation, lead to the general finding that there is insufficient time, funding and ridership available or expected to warrant construction of a fixed guideway facility from regional rail to RDU. More specifically:

- The cost per rider, a traditional measure of effectiveness for major transit investments, is significantly higher than that usually projected for federally funded transit projects.
- The timing of TTA and RDU projects that must precede or accompany construction of the ARL precludes any near-term fixed guideway project and argues against construction of any fixed guideway ARL. There are indications that RDU will not be prepared to “accept” a fixed guideway ARL until at least 2020, when terminal expansions, necessary parking, interior roadway, and other needed predecessor improvements are completed.
- While the best ridership would result from the NE Quadrant alternative, the developments that underlie this alternative are still quite speculative. A commitment to invest in this corridor prior to firm development decisions seems premature.

- A strong move to implement the Brier Creek and Globe Road Center planned developments could provide a strong base for transit ridership, and the viability of those developments could be strengthened by a commitment to build a fixed guideway link to the regional rail system.
- The two alternative corridors present conflicting results. While the NE Quadrant could attract the most riders, due to the potential intermediate stations at Brier Creek and the Globe Road Center, it is less satisfactory in terms of providing the airport-to-rail link. The travel time from rail to airport is longer, and it requires a longer rail trip from the Raleigh end of the corridor (transfer at North RTP Station rather than Triangle Metro Center).
- TTA and the Durham-Chapel Hill-Carrboro MPO are considering a premium transit service from Chapel Hill to Research Triangle Park. If that service develops as Bus Rapid Transit, it could logically extend past Triangle Metro Center to RDU. This service would not only fulfill the I-40 BRT alternative concept, but also would represent a direct transit link from Chapel Hill to RDU that is less reliant on the implementation of the regional rail system.

Toward the end of the study, the ARLS Steering Committee heard a presentation of the alternatives evaluation and study findings and reached a series of conclusions regarding the feasibility of the Airport Rail Link and future transit services to RDU. These conclusions include the following:

- A more aggressive marketing campaign for the existing shuttle service should be an immediate priority in order to increase awareness of RDU passengers and employees of available transit service to the airport.
- The short and long-term need for a reliable, high quality transit link from the regional rail service to the airport was affirmed.
- Key decision points for selecting alignments and technologies need to be identified.
- It may be premature to make a decision on ultimate alignment and technology given the number of unknown elements, such as the airport improvement schedules and the NC 54/I-40 corridor study.
- Reliability and speed are key elements for successful service.
- The preferred alternative needs to be flexible to account for technology changes.
- HOV lanes along I-40 are a critical component in developing a recommendation for an ARL BRT alternative.
- The on-airport system, if implemented, should be designed such that it can be extended to the regional rail in the future if such extension is deemed feasible.
- Fixed guideway technologies do not seem feasible under current assumptions of future conditions due to lack of projected ridership, high cost, and, thus, high cost per rider.

- Because it is planned as a future regional hub for the regional rail system, the Triangle Metro Center would seem to be the logical connection point of any service from RDU to the system.
- On-airport transit service must service both terminals.
- In order to be proactive, there is a need to establish a plan, solidify an alignment and protect it from future encroachments.
- Travel demand will drive the technology for the ARL.

For these reasons, it seems reasonable to conclude that many decisions can be delayed until a later time without compromising the ability to implement a fixed guideway system. Shown below in **Table ES-5** are the key decision points at which ARL decisions will be needed, if the service is to progress, along with the issues presented at that time and likely TTA or RDU action that will be needed.

Table ES-5
Key Decision Points in the Development of the ARL

Decision Point	Issue	Needed ARL Action/Response	Timing
TTA Selection of NC 54/I-40 Transit Locally Preferred Alternative (LPA)	Premium transit service in the NC54/I-40 corridor offers opportunity for non-stop transit service between Chapel hill and RDU.	Expand NC54/I-40 study scope to include RDU extension.	Second phase of NC54/I-40 feasibility study.
Regional Rail Opening	Determining whether need exists to upgrade existing shuttle service from RDU (i.e., ITS enhancements, new vehicles, etc.).	Prior to the regional rail system beginning operation, TTA should evaluate the existing bus shuttle service to RDU and decide whether an upgrade to BRT technology is appropriate.	2006 +/-. Sufficient time prior to rail opening to allow BRT upgrade.
HOV Lane Programming on I-40	Should NCDOT decide to implement HOV lanes along I-40, the potential to implement the ARL along the I-40 alignment as an enhanced BRT is substantially increased.	TTA would need to coordinate with NCDOT to ensure an ARL-friendly design with regard to HOV lane access.	NCDOT production schedule unknown.
On-Airport Improvements: On-Airport APM and Consolidated Rental Car Facility	Numerous predecessor improvements, such as the on-airport APM and consolidated rental car facility, must occur prior to ARL implementation.	If RDU moves to implement its on-airport APM, feasibility of a fixed guideway ARL needs to be revisited.	Unknown. Timing dependent on airport activity increases, implementation of predecessor activities, and determination of operational and financial feasibility. However, unlikely to occur prior to 2020.
Phasing of Globe Road Center and Brier Creek Developments	Both developments are planned to be transit-oriented and mixed-use. Implementation of direct transit service to regional rail is perceived as a critical component for the success of these developments. Such a transit link could be feasible regardless whether a direct link to RDU is provided.	Continue to monitor development trends in concert with other ARL actions.	Ongoing.