TRANSPORT LONG ISLAND

A Train-to-Plane Connectivity Study

May 2018

ISP Long Island MacArthur Airport

Long Island Rail Road

NYMTC New York Metropolitan Transportation Council

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Steven Bellone
SUFFOLK COUNTY EXECUTIVE

Angie Carpenter
ISLIP TOWN SUPERVISOR

May 2018

We are pleased to present to you the Final Report for the Transport Long Island: A Train-to-Plane Connectivity Study. With the completion of this study, we are one step closer to the establishment of an enhanced connection between these two regional assets. This report documents the study process and its outcomes in the form of four implementation plans over the short, medium and long-term time frames. This study also identifies connection modes and technologies from national and international case-studies and best practices, and evaluates those modes using community, air-traveler and project delivery focused screening criteria, to determine the most suitable Train-to-Plane connection for our region.

As Suffolk County and the greater region continue to grow, this Train-to-Plane connection helps to fulfill regional transportation needs such as system linkage, economic growth and travel demand, and provides an integrated, attractive connection and experience for residents and visitors traveling to and from LI MacArthur Airport.

We would like to express our thanks to the New York Metropolitan Transportation Council (NYMTC) for serving as the primary sponsor and our partner in this effort. We would also like to give our thanks to all the stakeholders and community members who have been involved in this process - your input and collaboration has been invaluable in shaping this study. With your continued support, we can move this vision into a reality.

Sincerely

Angie M. Carpenter

Steven Bellone
Suffolk County Executive

Angie Carpenter
Town Supervisor

Acknowledgements

Suffolk County Executive - Steve Bellone
Islip Town Supervisor - Angie M. Carpenter
Suffolk County Department of Economic Development and Planning
Theresa Ward, Deputy County Executive and Commissioner
Louis Bekofsky, Deputy Commissioner
Jonathan Keyes, Director of Downtown and Transit-Oriented Development
Lauren Moy, Community Engagement Liaison
Ankita Rathi, Consultant Planner (Greenman-Pedersen, Inc.)
Town of Islip - Long Island MacArthur Airport
Shelley LaRose Arken - Commissioner
Robert A. Schneider - Deputy Commissioner

MTA/LIRR
Mitchell Pally - Commissioner
Hector Garcia - Senior Director - External Affairs

Empire State Development
Cara Longworth - Regional Director
Brian Scripture - Economic Development Specialist

Long Island Association
Kevin Law - President & CEO

Funding Partner

NYMTC
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1. Introduction

Introduction

Ronkonkoma is a major railroad station and transportation hub along the Ronkonkoma Branch of the Long Island Rail Road (LIRR), and serves over 17,000 riders daily. Owned and operated by the Town of Islip, Long Island MacArthur Airport is located one mile south of the Ronkonkoma LIRR station, and serves approximately 2 million commercial passengers annually and is the closest airport for over 1.5 million Suffolk County residents. Suffolk County, the Town of Islip, and the Airport Administration – in coordination with Metropolitan Transportation Authority (MTA) LIRR and County stakeholders – have partnered for the study to explore opportunities to improve intermodal connectivity between these two regional assets, improve access to regional destinations, support economic development and tourism initiatives, and create a seamless experience for users across transportation networks.

This study identifies and evaluates modes and technologies, based on review of national and international case-studies and best practices, to enhance connectivity between the Long Island MacArthur Airport ("the Airport") and the Ronkonkoma Long Island Railroad Station ("the Station"). It builds on previous studies and current Suffolk County plans, with a goal of maximizing access between two major transportation hubs, and with a strong emphasis on land use opportunities, economic development, and benefits commonly associated with train-to-plane connections.

This project figures prominently in Governor Andrew M. Cuomo's $160 million plan to "Transform Long Island," of which $20 million dollars were identified to support the development of a direct connection between the Airport and the Station, as well as funding for Enhanced Station Initiatives (ESI) upgrades at Ronkonkoma Station, outlined in the January 2017 "State of the State" address.[1]

There are significant opportunities, both current and future, that the study leverages and the proposed recommendations can facilitate. These include a strong existing and growing customer base at the Airport including new Frontier Airlines service, and increased seating capacity from Southwest Airlines and American Airlines that will offer alternatives to travelers looking for more convenient flight options. Under the leadership of Suffolk County Executive Steve Bellone, Suffolk County's focus on increasing transit use through transit-oriented development, planned bus rapid transit, and walkable communities ensures travelers have high-quality mobility options as alternatives to traditional single-occupancy vehicle trips. Furthermore, customers of the new train-to-plane connection will benefit from coordinated ESI improvements at the Ronkonkoma LIRR Station.

An improved connection between the Airport and the Station contributes to an integrated and reliable transportation network that incorporates modern technology and enhances the high-quality air service offered by the Airport. This connection supports key policy areas of Suffolk County's *Connect Long Island Plan* and *Framework for the Future – Suffolk County Comprehensive Master Plan 2035*, including the development of a modern transit network and priority actions such as the development of compact, walkable communities. As Suffolk County and the greater region continue to grow, this train-to-plane connection helps fulfill regional transportation needs such as system linkage, economic growth and travel demand, and provides an integrated, attractive connection and experience for residents and visitors traveling to and from Long Island MacArthur Airport.

1 New York State, Governor's Press Office. (2017, January 10). Governor Cuomo Presents 24th Proposal of 2017 State of the State: $160 Million to Transform Long Island. [Press Release] Retrieved from https://www.governor.ny.gov/news/governor-cuomo-presents-24th-proposal-2017-state-state-160-million-transform-long-island

2. Project Overview

2.1 Project Purpose and Needs

The purpose of *Transport Long Island: A Train-to-Plane Connectivity Study*, is to provide a transportation link between the Ronkonkoma LIRR Station with LI MacArthur Airport, providing an integrated, reliable and affordable linkage for air travelers served by Long Island Rail Road and county transit services. The project supports the growth of LI MacArthur Airport's catchment area and reaffirms the Airport's value of offering an efficient and comfortable experience to its customer base.

The identified needs for this project fall into three categories – System Linkage, Transportation Demand, and Economic Growth –outlined below:

System Linkage

- To link LI MacArthur Airport with the Ronkonkoma LIRR Station

- To link LI MacArthur Airport with Suffolk County's transit services.

Transportation Demand

- To integrate LI MacArthur into the LIRR network, serving markets in Suffolk County, Nassau County and New York City.

- To offer a scalable and flexible connection that accommodates future airport growth plans.

Economic Growth

- To pursue Suffolk County's policies for expansion of public transit as a means to enable growth without degrading current quality of life standards.

- To strengthen compact, walkable communities that will foster economic development.

- To catalyze economic growth in Suffolk County, strengthening LI MacArthur Airport's position as a regional asset.

2.2 Project Context

Local Context

Suffolk County has a strong foundation in transportation investments with many regional assets like the Airport and the Station that promote economic development and improved quality of life for its residents. This project supports the County's initiative to move from automobile-oriented land use and development patterns characterized throughout the region into a system of multimodal mobility options that connects the County's growing and vibrant downtowns and local and regional destinations. Through its *Connect Long Island Plan* and the *Long Island Innovation Zone (I-Zone),* the County outlined visions of bus rapid transit (BRT) corridors and transit-oriented developments (TOD) clustered at LIRR stations. Suffolk County is on the path of re-envisioning mobility in its communities to increase the share of public transportation usage, attract more choice riders, and make transit an attractive option for residents, visitors, and travelers.

The County is currently building out a network of vibrant transit-oriented downtowns with high-quality connections and access to transportation hubs and local and regional destinations. Offering more and better connections in the County will add to its competitive advantage and its ability to adapt to changing economic conditions through a diversified transportation network. The Ronkonkoma Hub, a residential, retail and office development is currently being constructed north of the LIRR tracks. On the south side of the tracks, a community-driven planning process is currently being undertaken. The County and the town are working together to select a master developer for the development of the south side.

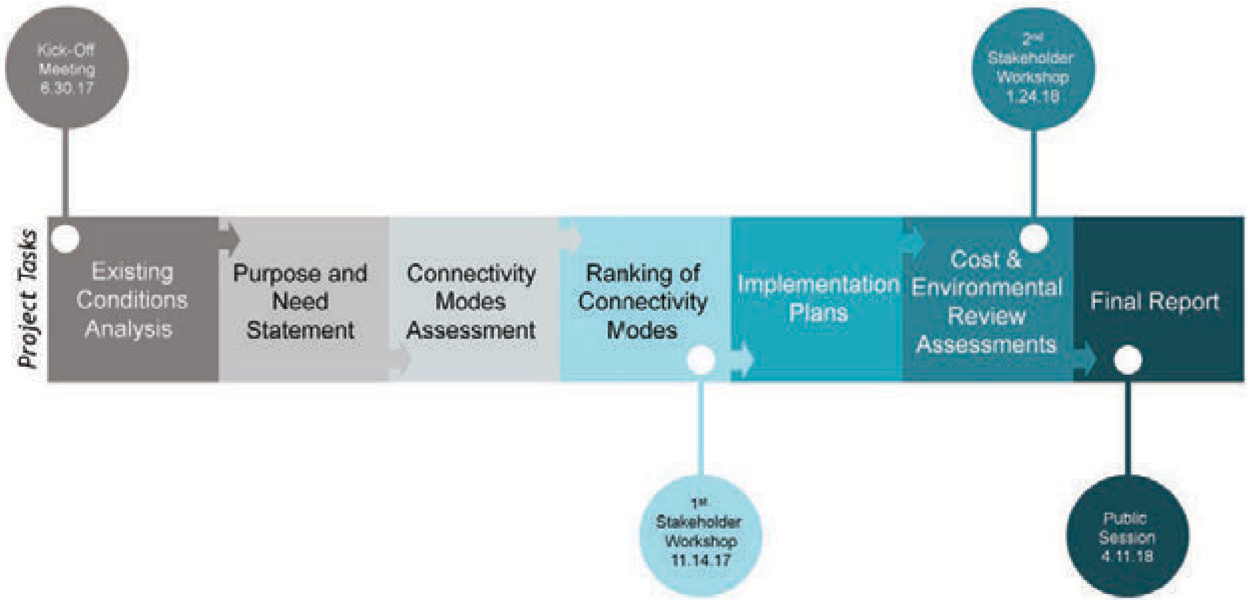

Figure 1: *Transport Long Island: A Train-to-Plane Connectivity Study* Methodology and Schedule

This study's connectivity solutions not only facilitate the local train-to-plane connection between the Airport and Station, but also achieve the larger key policy of building a 21st century transit network to provide more choices, and to improve mobility, access and safety. This connectivity investment will support residents and workers in the Towns of Islip and Brookhaven, and will also serve tourists that want to access the many destinations the area offers. A stronger connection between these two major transportation assets is an opportunity to foster the local development and growth of business and industry, TODs, and other capital investments around the Airport and Station. At the core of the entire transportation network are the people using these systems and services – local residents, workers and visitors – for whom this new connection and experience will be designed.

Regional Context

Continued transportation investment in the region is necessary to sustainably accommodate projected growth, mitigate projected congestion, and to maintain the competitiveness of Suffolk County in the region. This requires regional coordination that this study has benefited from, with leadership from Suffolk County, New York Metropolitan Transportation Council (NYMTC), LIRR, the Airport, and regional business leaders—to shape the investments for today and the future. This study helps achieve many regional goals including: improving mobility, building the innovation economy, alleviating traffic congestion and supporting economic development initiatives with TOD development at the forefront. Enhancing the region's transportation networks will link together the County's assets – from the iZone to universities to tourism destinations – and provide the region with a cohesive regional identity and diverse mobility network on which the regional economy can flourish.

The Train-to-Plane connection will become fully integrated into the region's transportation structure, in part by supporting the County's existing regional investment in connectivity with Bus Rapid Transit (BRT) routes to improve north-south connections and make more connections to regional hubs and destinations. It is intended to support the region's economic development by enhancing tourism, attracting more visitors to Suffolk County, and providing a seamless experience as they explore and traverse the region. Connecting the Airport directly to the wider regional transportation network helps position the Airport as a foundation for future investments by ensuring the transportation system is better managed, with better value and improved service for regional users.

The study was coordinated with the Long Island Rail Road, one of the core transportation networks with regional scope, whose current projects range from the Enhanced Stations Initiative (ESI) to East Side Access and Double Track, which will improve access to and from New York City, increase train frequency and service, reduce travel time, and yield significant benefits for housing and economic vitality in Suffolk County. These rail investments position Ronkonkoma Station, in particular, as a major transportation and development hub central to the entire region, set the stage for future growth and contribute greatly toward building a more convenient, flexible transportation system for the region.

National Context

The Airport has strategically positioned itself for growth, most recently by designing a new U.S. Customs facility (CBP), which expands its capacity to offer international flights. Construction of the CBP facility is slated to be substantially complete by the end of 2019. Strengthening the connection between the Airport and Ronkonkoma Station – two of the County's largest and most utilized assets –benefits customers who choose to ride LIRR to the airport and helps position the Airport to build a greater national presence as a well-connected, mobility-oriented Airport that serves as a gateway to and from Long Island for national and international travelers. The Train-to-Plane connection, in tandem with ongoing transportation investments and economic development, can help position Ronkonkoma and the Airport as a major transportation hub that Suffolk County can market nationwide as a vibrant and connected place to attract innovation companies, new businesses, new residents, and visitors.

2.3 Project Goals and Methodology

Project Goals

The goals outlined in the kick-off meeting with the working group provided the framework for the Train-to-Plane Study. Perspectives from County leaders, advocates, and representatives were significant and informative contributions to the study vision and process. They highlighted the aspirations the County seeks to achieve through this project as well goals beyond connectivity related to how transportation, technology and investments will continue to shape the County and the region's growth.

Key goals and aspirations outlined by the stakeholder working group included:

- Investing in the Airport and Station area as important assets for the region as a whole;
- Creating a seamless experience for users via both operations and information;
- Integrating a technology strategy in tandem with the connectivity strategy;
- Cost-effectiveness;
- Capitalizing on the "100-year opportunity" at this moment to get the design right;
- Connectivity as a catalyst for TODs, development and job creation;
- Attracting broader and more travelers ranging from County residents to business travelers from the region, to international passengers and

tourists from around the globe, and a keen desire to improve connectivity both within and beyond the project area in Suffolk County.

Project Methodology and Schedule

The study began in June 2017 and concluded in April 2018, and was structured along a sequence of tasks and deliverables. Two stakeholder workshops were held during the study to garner feedback and inform the final recommendations. Figure 1 illustrates major project tasks as well as opportunities for stakeholder input.

The project team engaged a diverse working group for stakeholder feedback at critical points during the study process. The working group comprised the County Executive and Chief-of-Staff, along with leadership and staff persons from the following organizations: SCEDP, LI MacArthur Airport, MTA LIRR, the Town of Islip, and leaders from Long Island business and community associations.

Key tasks and subtasks conducted for the train-to-plane study included:

Existing Conditions Analysis

Review of current conditions and operations at the Station and the Airport, site visits, stakeholder meetings, review of existing studies, inventory of local regulations and guidelines related to project, purpose and needs statement.

Connectivity Modes Identification and Assessment

Identification and investigation of 10 potential connectivity modes, including high-level technology and feasibility assessment. Potential connections included modes that are either existing or likely to be realized in the near-term or long-term.

Connectivity Mode Ranking and Selection of Preferred Modes

Development of screening criteria and assessment of the 10 potential connectivity modes. Each mode was assessed and then ranked through a comprehensive process that included mode assessment against the screening criteria as well as feedback from the project working group received during Stakeholder Workshop #1. The ranking process and input led to the identification of four preferred modes that underwent more detailed vetting and implementation plans.

Implementation Plans

High-level implementation plans for near, medium, and long-term connections were developed for the four preferred modes. These included planning-level cost estimates, key considerations, and levels of effort related to environmental reviews. Stakeholder Workshop #2 was held during this project stage to engage the working group’s feedback on the Implementation Plans.

Public Information Session

Suffolk County hosted a public information session in April 2018 to brief community members and members of the public on the Train-to-Plane Study, and get feedback on the four alternatives outlined in this report. The study content shared at the Public Information Session can be found in Appendix E.

Final Report

This report summarizes the project context, existing conditions analysis, mode assessment; highlights the four selected modes and respective implementation plans; and provides information for the County to progress a dialogue with the public and advance the implementation plans with stakeholders and transportation partners.

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3. Existing Conditions

3.1 Existing Plans and Initiatives

Over the past ten years, Suffolk County has released plans outlining a vision for improving the county's transportation infrastructure and advancing broader regional connectivity goals outlined in plans developed by the Long Island Regional Economic Development Council (LIREDC) and the Long Island Regional Planning Council (LIRPC). The goals advanced by these plans served as the foundation for the development of the study. These plans leverage existing transportation and business assets to spur economic development and smart growth in the County. The Airport is a key asset for the County, and serves a key role in Long Island's future by better connecting residents and businesses with major markets around the U.S. and potentially abroad.

The train-to-plane connection builds from the County's goals and creates a series of connections that better integrates the Airport into its surrounding community, improving airport accessibility, and promotes transit ridership. Increasing density around Ronkonkoma Station through planned transit-oriented development, improvements to LIRR service, expanding mobility options in Suffolk County, and growth at the Airport itself are the critical drivers for improving the train-to-plane connection which will both expand and enhance traveler choice and experience.

2017 Long Island MacArthur Airport Master Plan Update

In 2017, the Town of Islip undertook a Master Plan Update to guide the development of the Airport's facilities and service for a planning period ending in 2037. The plan, prepared in accordance with FAA guidelines, includes an inventory of the existing facilities and the development a set of alternatives for the airfield, terminal and general aviation to accommodate future needs and forecasted increases in passenger demand. The final plan outlines a recommended development program for the future of Long Island MacArthur Airport, including two runway extensions, with activity-based milestones that can respond to growth trends and align the Airport's improvements with dynamic airline industry and passenger travel choice changes over time. Implementation of the Master Plan Update recommendations along with the airport's Air Service Development program will support efforts to attract new air service and increase passenger demand.

Suffolk County Land Use and Transportation Plans and Initiatives

Suffolk County's 2035 Comprehensive Master Plan sets forth an agenda to promote sustainability and to grow the business base creating jobs around Long Island's top research facilities at Stony Brook University, Brookhaven National Laboratory, and along the Route 110 corridor. This plan also emphasizes the importance of the Airport as a critical economic development asset. The plan notes that "the full potential of MacArthur Airport to serve as an important economic engine for the region remains untapped", and identified proximity to airport as one of criteria for prioritizing growth center locations for "advanced manufacturing", and "office areas, including R&D and start-up space".[2]

The *Connect Long Island - A Regional Transportation and Development Plan*, commissioned by Suffolk County, aims to create sustainable economic growth through coordinated land use and transportation planning. The plan calls for investments in transportation infrastructure that strategically connects Suffolk's educational and research institutions, transit-oriented developments, and Long Island Rail Road stations.

2 Transportation, Economic Development and Housing Strategies for Suffolk County: Background Documentation, Suffolk County Comprehensive Master Plan 2035.

Two major projects envisioned in Connect Long Island are the Ronkonkoma Hub and the Nicolls Road BRT, a 15-mile bus rapid transit (BRT) route along the Nicolls Road / CR97 corridor. The Ronkonkoma Hub, adjacent to Ronkonkoma Station, broke ground in the fall of 2017 on its first phase and will transform vacant lands and surface parking around Ronkonkoma Station into a mixed-use community. It will eventually comprise 1,450 residential units, 195,000 square feet of retail space, 360,000 square feet of office space and 60,000 square feet of flexible space. The Nicolls Road BRT project will fill a gap in rapid transit service along a major north-south corridor, connecting Ronkonkoma Station with other regional assets between Stony Brook and Patchogue. Both projects have significant potential to generate additional trips between Ronkonkoma Station and the Airport.

A related initiative is the development of the Innovation Zone ("I-Zone"), Suffolk County's vision to connect TODs with the region's research institutions and build out a major innovation hub to attract new businesses and highly-skilled workers. The plan brings together multiple levels of government and leaders of the region's top research institutions. The goal is to create a "quality of life ecosystem" to support smart economic growth within the county. The iZone comprises four major projects: (1) The transformation of Nicolls Road into a multimodal corridor complete with Bus Rapid Transit and an extensive Hiking/Biking Network; (2) The full build-out of the Ronkonkoma area adjacent to the Ronkonkoma Train Station; (3) The establishment of a new train-to-plane connection between Long Island MacArthur Airport and Ronkonkoma Train Station; and (4) The relocation of the underutilized Yaphank LIRR Station to Brookhaven National Laboratory.[3]

3 Suffolk County Government. (2015, June 16). *Bellone, Romaine, Carpenter and Major Research Institutions Announce Regionally Transformative Plan to Build "Innovation Zone."* Retrieved from http://www.suffolkcountyny.gov/Government/CountyExecutive/CE/tabid/1515/ctl/details/itemid/3609/mid/876/bellone-romaine-carpenter-and-major-research-institutions-announce-regionally-t.aspx

MTA and New York State Plans and Investments

Statewide and regional transit initiatives and policies support the train-to-plane connection. The MTA and LIRR are currently engaged in several infrastructure expansion programs that greatly enhance the regional transit network, including East Side Access, which will connect the Long Island Rail Road to a new LIRR terminal beneath Grand Central Terminal in Manhattan, and the Main Line Double Track and Third Track Programs, which enhance capacity, reliability, and ability for reverse commuting.

In 2018, MTA anticipates completion of Double Track improvements, which will provide a second track on the LIRR Ronkonkoma Branch between Ronkonkoma and Farmingdale. The second track will allow for increased service along the line, and increase the overall transit accessibility of the airport. In addition to service improvements, Ronkonkoma Station is among the many LIRR stations slated for major customer experience improvements as part of the Enhanced Station Initiative (ESI).

Improving connectivity to the Airport is critical part of Suffolk County's vision for development. It also figures prominently into Governor Andrew M. Cuomo's $160 million plan to "Transform Long Island," one of 37 key budgetary proposals announced in the January 2017 State of the State address. The Governor identified $20 million dollars to support the development of a direct connection between LI MacArthur Airport and the Ronkonkoma LIRR station, as well funding for the ESI program.[4]

4 Office of the Governor. (2017, January 10). *Governor Cuomo Presents 24th Proposal of 2017 State of the State: $160 Million to Transform Long Island*. Retrieved from https://www.governor.ny.gov/news/governor-cuomo-presents-24th-proposal-2017-state-state-160-million-transform-long-island

3.2 Existing Train-to-Plane Connection

Currently, customers have three options for connecting between the train station and airport terminal: the official LI MacArthur Shuttle and taxi service; transportation network companies (TNCs) such as Uber, Lyft or Via; or infrequent transit buses. According to the FAA, in 2007 about 8% of the Airport's passengers used LIRR to access the airport (6% as their primary mode, and 2% as a secondary mode).[5,6]

Village Taxi operates the on-site taxi and LI MacArthur Shuttle service for the airport. Service is made available during all hours of airport operations. The company stages vehicles in a dedicated parking area near the train station to ensure that customers arriving on LIRR can obtain immediate service. Their fleet consists of town cars, SUVs, and small vans with capacity for up to 10 passengers. The company reports that, since the introduction of Frontier Service, as many as 40 passengers at a time from arriving flights have requested service to the train station.

At the train station, Village Taxi picks up customers on the roadway loop directly adjacent to the train station. The company office at that location functions as a waiting room. At the airport, pickup and drop-off is located outside of the baggage claim area. Passengers wishing to connect to the train station are directed to a separate queuing area from the general taxi line.

Village Taxi / LI MacArthur Shuttle service between the train station and airport terminal costs $5 ride per passenger. While a discounted train and taxi package ticket is available from LIRR ticket windows and kiosks, it is marketed as a "Long Island Getaway" and few customers appear to be aware of this option. Just 162 combined tickets were sold in 2015 and 119 were sold in 2016.[7]

In addition to authorized taxi operations, train riders may choose to arrange a ride to the airport with a transportation network company (TNC), such as Uber and Lyft. These companies began operating for-hire vehicle services in Suffolk County in 2017 and are already drawing customers at Ronkonkoma Station. However, convenience of this connection depends on the availability of nearby drivers, which cannot be guaranteed. A typical Uber ride is about $10, although fares may vary by time, date, and driver availability.

Suffolk County Transit offers a connection between train station and the airport via the S57 bus route. However, this option is likely to be inconvenient for most customers because service is infrequent and the bus schedule is not aligned with the train or flight schedules. Service operates only hourly and with a limited service span (7:00am to 7:00pm, Monday through Saturday).[8]

3.3 MTA LIRR and Ronkonkoma Station

Service Patterns

The Airport is accessible by rail transit on the Ronkonkoma Branch of the LIRR at Ronkonkoma Station, which, with over 17,000 daily riders when last tabulated in 2006, is the busiest station in Suffolk County.[9] Express service to Ronkonkoma is available from Penn Station in Manhattan, from the Jamaica and Woodside LIRR stations in Queens, and the Mineola

5 FAA Regional Air Service Demand Study, Task A (2007).
6 Primary modes and secondary modes were self-reported by customers in response to the survey questions "How did you get to the airport today?" and "What other mode of transportation did use to reach the airport today?"

7 2016 (Source: MTA, via email).
8 Suffolk County Transportation (2016, October 10). *Suffolk County Transit Bus Information - S57*. Retrieved from http://www.sct-bus.org/schedules/s57.pdf
9 Transportation, Economic Development and Housing Strategies for Suffolk County, Background Documentation, Suffolk County Comprehensive Master Plan 2035.

LIRR station in Nassau County. Typical scheduled travel times to Ronkonkoma during peak periods are about 78 minutes from Penn Station; 59 minutes from Jamaica; and 34 minutes from Hicksville, where the Port Jefferson and Ronkonkoma Branches diverge. Peak service is provided approximately every 18 minutes. Off-peak service is hourly.

Significant portions of single track on the route limit the capacity of the line, resulting in a 2 ½ -hour gap in off-peak direction during peak periods. There are no eastbound trains between about 6:30am and 9:00am, and no westbound trains between about 4:45pm and 7:15pm.

To eliminate this gap in service, LIRR is building a second track between Farmingdale and Ronkonkoma stations that will allow off-peak and shoulder service expansion on the Ronkonkoma branch. The first phase, between Ronkonkoma and Central Islip, was completed in 2016. The second phase, between Central Islip and Farmingdale, is scheduled for completion in December 2018. Once fully completed, the additional track will allow LIRR to run trains in opposing directions without compromising the frequency of service in the peak direction.[10]

Figure 2: Ronkonkoma Station

Station Layout

The Ronkonkoma LIRR station has three platforms and two tracks. An overpass connects the three platforms to exits on the north and south sides of the tracks. The passenger waiting room is located on the north side of the station. Neither the platforms nor the overpass feature wayfinding signage indicating directions for LI MacArthur Airport access, the taxi stand, or the bus stop.

Ronkonkoma is among 17 stations slated for renovations as part of the LIRR Enhanced Station Initiative (ESI). MTA has budgeted $150 million for the program, which will deliver "new facilities, Wi-Fi, charging stations, public art, new platform waiting areas, general station renovations and improved signage."[11,12] MTA is currently procuring design and construction services for ESI improvements. Ronkonkoma is in the Phase 2 package along with four other stations, with a budget of $45 to $55 million for all stations.

Station Area

Currently, surface parking comprises the primary land use around Ronkonkoma Station. The station has a total of 5,868 parking spaces, the majority of

10 Metropolitan Transportation Authority. (2018). *Long Island Rail Road Double Track Project - Ronkonkoma to Farmingdale*. Retrieved from http://web.mta.info/lirr/doubletrack/

11 MTA Capital Program 2015-2019 - Renew. Enhance. Expand. - Amendment no. 2

12 Metrpolitan Transportation Authority. (2017, January 10). *Governor Cuomo Proposes $120 Million to Enhance 16 LIRR Stations and Improve System Connectivity with MacArthur Airport and Brookhaven National Laboratory*. Retrieved from http://www.mta.info/news/2017/01/10/governor-cuomo-proposes-120-million-enhance-16-lirr-stations-and-improve-system.

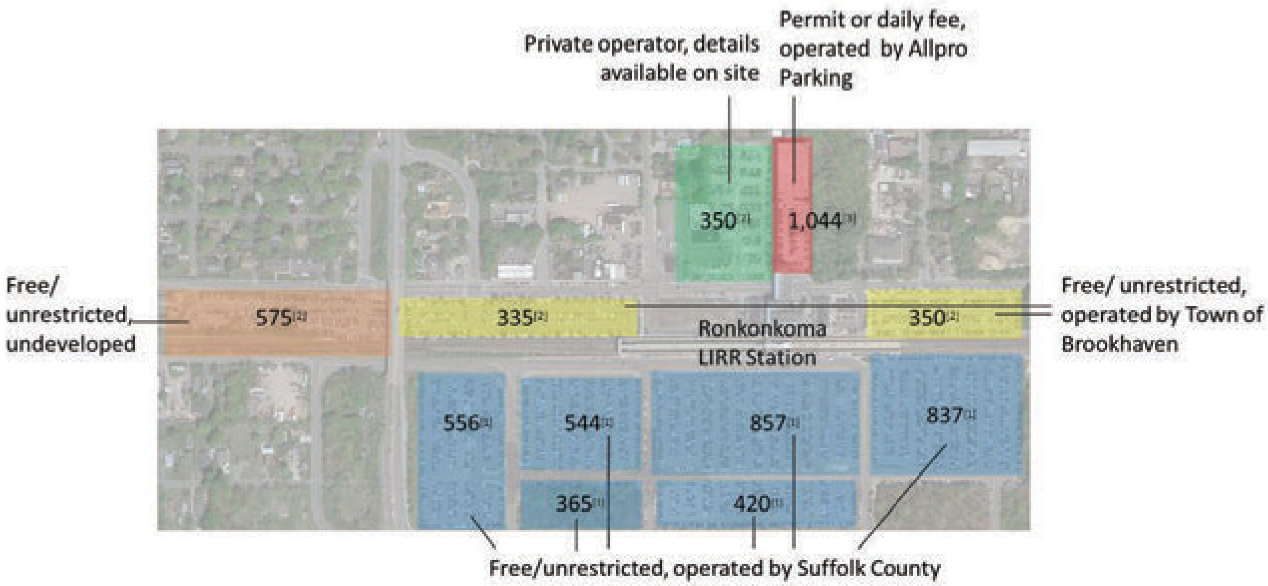

Figure 3: Ronkonkoma LIRR Station, Showing Location of Parking Facilities[14]

Figure 4: Current Taxi and Shuttle Boarding Area at Ronkonkoma Station

Figure 5: Ronkonkoma Hub Rendering and Ronkonkoma Phase I Site Plan

which are public, free, and unrestricted.[13] There are two privately operated parking lots on the north side of the station. The capacity for each parking lot is indicated in Figure 3.

The taxi and shuttle service picks up and drops off passengers in the loop located just west of the LIRR station house, north of the tracks. From the station overpass, passengers may take an elevator or stairs to the ground level under a covered path to reach the Village Taxi office. Passenger shelter is provided

in the retail space currently used as Village Taxi's dispatching and business office. Passengers' paths to the existing taxi area are illustrated in Figure 4.

Transit-oriented development will greatly impact the area around Ronkonkoma Station, and generate new users, by converting vacant land and surface parking areas to mixed use residential, commercial, office, and retail uses. The Ronkonkoma Hub project will include 1,450 residential units (20% of which will be set aside as affordable housing) and over half-million square feet of retail and commercial space. When fully built out, Ronkonkoma Hub will add thousands of residents and visitors to the area just north of Ronkonkoma Station, and within the catchment of any potential train-to-plane connector.

To reinforce creation of a walkable, transit-oriented community around the station, Suffolk County has also begun to seek developers interested in redeveloping the parking lots south of the train station (known as "Ronkonkoma South"), an area comprised of up to 40 acres available for potential redevelopment.[15]

13 Lot ownership/operation: http://web.mta.info/lirr/images/stationmaps/ronkonkoma.pdf Suffolk County lots: Arup; Allpro Parking garage counts: Allpro Parking; Town of Brookhaven, free unrestricterd/undeveloped, and other private operators' lots: VHB (Proposed Adoption of the Land Use and Implementation Plan for the Ronkonkoma Hub Transit-Oriented Development (TOD))

14 MTA Long Island Railroad. *Parking, Bus and Taxi Information - Ronkonkoma Station*. Retrieved from http://web.mta.info/lirr/images/stationmaps/ronkonkoma.pdf

15 Winzelberg, David. (2017, October 20). Major New Ronkonkoma Development Sought. *Long Island Business News*. Retrieved from https://libn.com/2017/10/20/major-new-ronkonkoma-development-sought/

3.4 Long Island MacArthur Airport

Commercial Air Service

LI MacArthur Airport is owned and operated by the Town of Islip. Though it is designated by the FAA as an Official Metro Airport, IATA does not group the Airport under the NYC Metropolitan Area code with JFK, Newark-Liberty, LaGuardia, and Stewart International in travel and information searches for New York airports. The Airport currently serves approximately 2 million commercial passengers annually and has available capacity.

Three commercial carriers currently operate flights at the Airport: Southwest Airlines, Frontier Airlines, and American Airlines. Together, these airlines operate 25 scheduled flights each day.

Southwest offers daily nonstop flights to the following destinations:

- Baltimore–Washington International, MD (BWI)
- Fort Lauderdale International, FL (FLL)
- Orlando International, FL (MCO)
- Tampa International, FL (TPA)
- Palm Beach International, FL (PBI)

American Airlines currently operates daily non-stop service to one destination, Philadelphia International, PA (PHL). Frontier Airlines currently operates daily non-stop service to the following destinations:

- Orlando International, FL (MCO)
- Miami International, FL (MIA)
- Palm Beach International, FL (PBI)
- Southwest Florida International, Fort Meyers, FL (RSW)
- Tampa International, FL (TPA)
- New Orleans International Airport, LA (MSY)
- Hartsfield-Jackson International, Atlanta, GA (ATL)
- Chicago O'Hare International, IL (ORD)
- Detroit Metropolitan, MI (DTW)
- Minneapolis-Saint Paul International, MN (MSP)
- San Juan International Airport, PR (SJU)
- Myrtle Beach International Airport (MYR)

Airport and Terminal Layout

The airport has one passenger terminal, four runways and two helipads, and covers a footprint of 1,311 acres located within the Town of Islip. In addition to commercial service, the airport has general aviation and U.S. Army Guard facilities. The terminal, located on the south side of the airfield, was built in 1966 and expanded in 1999 and 2006. It features 10 active gates and 7 remote loading positions. Check-in, ticketing and baggage counters, and security screening checkpoints for departing commercial passengers are located toward the east of the terminal. The baggage claim, taxi/shuttle pick up area, and car rental counters are located toward the west of the terminal.

A replacement U.S. Customs and Border Protection facility is scheduled to open in 2019 in the central terminal. This facility will allow the airport to continue to accommodate international general aviation, and to serve the needs of scheduled international airline flights, should they arise.

The Airport plans to build a new ground transportation facility on the east side of the property to consolidate and support car rental operations, taxis, and other ground transport services. This facility is scheduled for construction in 2018. The availability of this new facility was considered in the development of train-to-plane connection alignments and alternatives.

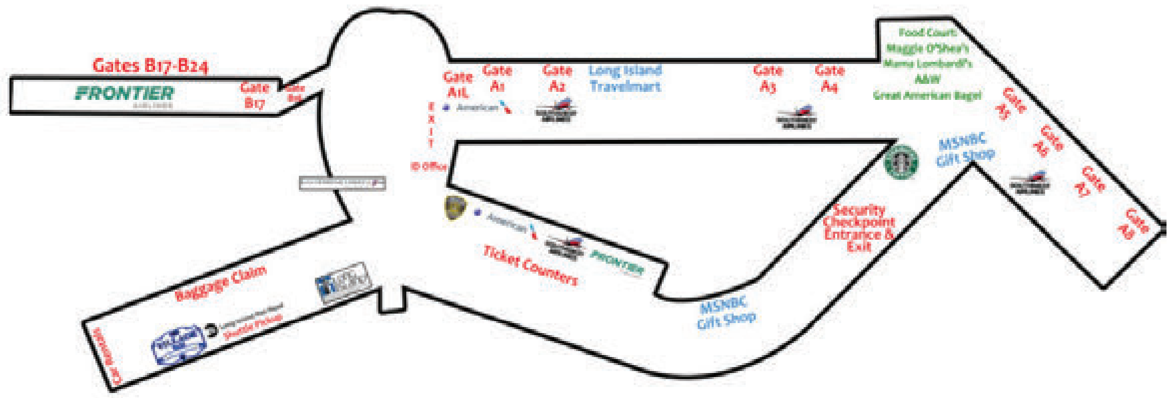

Figure 6: Airport Terminal Map

Figure 7: Existing Airport Terminal and Planned Location for Ground Transportation Facility

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4. Evaluation Process, Methodology and Screening

4.1 Process

The initial stage of the train-to-plane study was to conduct a thorough evaluation of the existing conditions. This review compiled information about current and planned infrastructure and service patterns at the airport and train station. To inform this study, the project team conducted site visits; reviewed existing plans and data; synthesized information provided by project stakeholders; investigated national best practices; and carried out additional desktop research and analysis. Section 3 above recaps the major highlights from the existing conditions review.

The resulting existing conditions report documented the current and future issues and opportunities that could be addressed by the train-to-plane connection, forming the basis for establishing the purpose and needs for the project. The three broad project needs identified were linking transit and airport services; integrating the airport into the LIRR network with a scalable and flexible connection; and enhancing Suffolk County's transit and aviation assets to foster economic growth.

The study next identified a range of transportation modes that could satisfy these project needs in the local context of Suffolk County. The initial list of connection modes included options that could be implemented over various time periods and scalable to meet the evolving needs of the airport and changes to existing land use patterns and infrastructure. A high-level, comparative evaluation of these options resulted in a shorter list of plans to be further explored and developed.

4.2 Methodology

The initial list of train-to-plane connection options consisted of ten mode options, comprising a wide range of transportation modes including existing modes currently in use across the U.S. and internationally for airport connections, as well as more advanced technologies. The initial list of connection options is presented in Table 2. Detailed profiles and descriptions of these ten modes can be found in Appendix A.

Category	Description	Modes Included
Point to Point	• Pick-up and drop-off passengers at nearly any location • No major investment in stations, tracks, rolling stock	• Taxis • TNCs
Structured, Centered on Airport	• Mostly used for a train-to-plane connection • Focused on airport-generated demand • New investment in stations, transit-ways, and roling stock	• Shuttle • Gondola • Automated People Mover • Personal Rapid Transit • Moving Walkways
Structured, Branched to Airport	• Used as part of a regional transit network, with an extension for a train-to-plane connection • New investment in stations, transit-ways, and rolling stock	• Bus Rapid Transit • Streetcar • Light Rail Transit

Table 1: Mode Category and Grouping

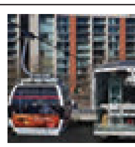
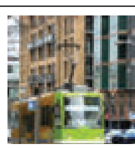
Initial List of Connection Options		
Upgraded Taxi Service		A fleet of for-hire vehicles offers rides for individual passengers or small groups. Rides are summoned by hailing a taxi parked at a stand or driving by. The updated taxi system mode differs from the existing conditions baseline service by the provision of enhanced facilities and amenities for passengers such as a dedicated mobile app.
Transportation Network Companies		Two variations of TNCs would suit the connection: ‘ride-hailing’ services, from companies like Uber and Lyft provide customers the ability to arrange a ride using a GPS-enabled mobile device; ‘microtransit’ services such as Chariot, Birdj and Via connect passengers to high-occupancy vehicles and shared rides.
Upgraded Shuttle Bus		A dedicated bus service traveling along fixed routes at fixed schedules.
Bus Rapid Transit		Enhanced buses, traveling along dedicated lanes with signal priority, offer reliable, convenient, and fast transit. Systemic operational control ensures high levels of service.
Light Rail Transit		Rail service running on dedicated right-of-way. Smaller vehicles and lower operating costs than traditional subways or commuter rail services.
Automated People Mover		APM is a grade-separated mass transit system with full automated, driverless operations, featuring vehicles that travel on guideways with an exclusive right-of-way.
Gondola		Cabins supported and propelled by overhead cables connecting stations. Used to cross landscapes where ground options are too costly or inconvenient.
Personal Rapid Transit		Small autonomous vehicles providing on-demand point-to-point service along a fixed guideway.
Moving Walkway to North-Side Terminal		A slow-moving conveyor mechanism that transports people across a horizontal or inclined plane over a short to medium distance.
Streetcar		Streetcars are electric, rail vehicles, operating in mixed-traffic and on tracks embedded in the pavement. Station design is similar to a high quality bus stop.

Table 2: Initial List of Connection Options

Screening Criteria	
Air-Traveler Focused	
Ease of Connection:	Convenience of the accessing the connection vehicle, assessed by walking distance, level changes, wayfinding, and baggage accommodation.
Reliability:	Potential frequency of delays and vehicle availability
Passenger Experience:	Overall quality and convenience of the train-to-plane journey, considering fare transactions, station quality, and in-vehicle comfort
Community Focused	
Neighborhood Integration:	Degree to which the travel mode complements or degrades the neighborhood and adjacent land uses, considering shading, obstructed views, scale, and context
Ability to Serve Other Markets:	Convenience of integrating the mode to the regional transit network, serving other travel markets and contributing to the county's goal of creating a 21st century transit network
Environmental Performance:	Efficiency of the mode with respect to natural resource consumption and magnitude of adverse effects on natural system
Delivery Focused	
Rollout Phasing:	Ability of the project to be delivered in incremental stages and build additional capacity over time to match demand
Ease of Implementation:	Overall complexity of the project and delivery timeframe
Capital Costs:	Order of magnitude estimate of funding require for construction, vehicle procurement, and systems procurement
Operating Costs:	Order of magnitude estimate of annual funds required to operate the connection

Table 3: Mode Screening Criteria

The ten modes can generally be organized by the following categories and descriptions in Table 1.

These options were evaluated against one another using 10 screening criteria developed based on the established project goals, input from stakeholders, and industry best practices. See Table 3 for a list and description of screening criteria.

4.3 Mode Evaluation Screening

Each connection mode received a score of Good (10 points), Fair (4 points), or Poor (1 point) based on its performance along each of the criteria. The modes were then scored for their overall performance across all criteria and were assigned short-term, medium-term, and long-term time frames. Modes were evaluated relative to both the existing airport terminal, as outlined in Figure 8, as well as to a future potential north side terminal, shown in Figure 9. Detailed information on the screening of the ten modes can be found in Appendix C.

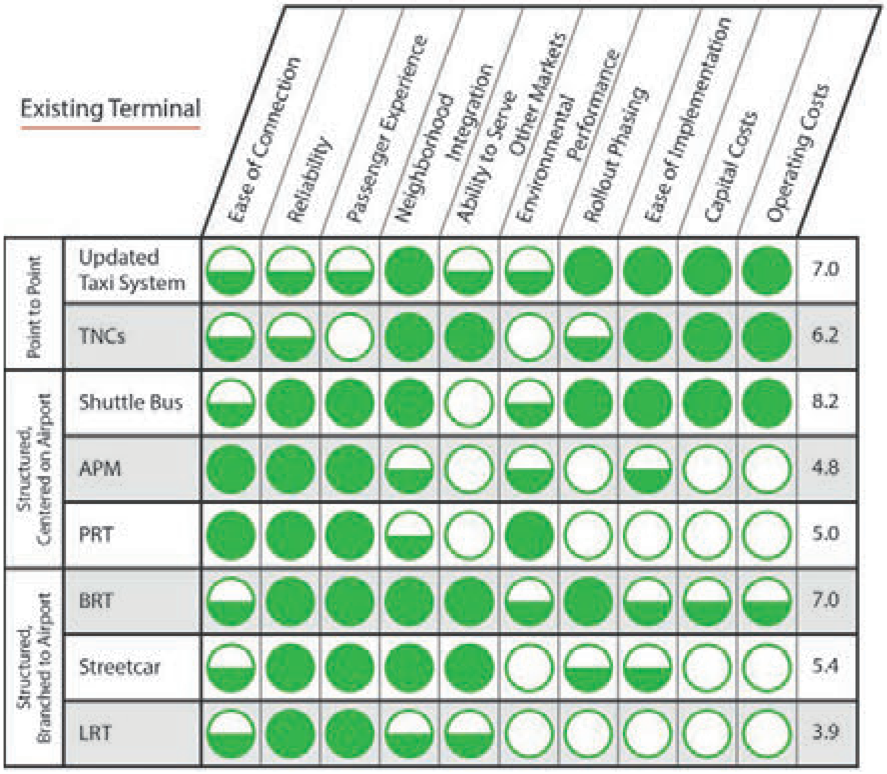


Figure 8: Mode Evaluation Screening Matrix for Existing Terminal

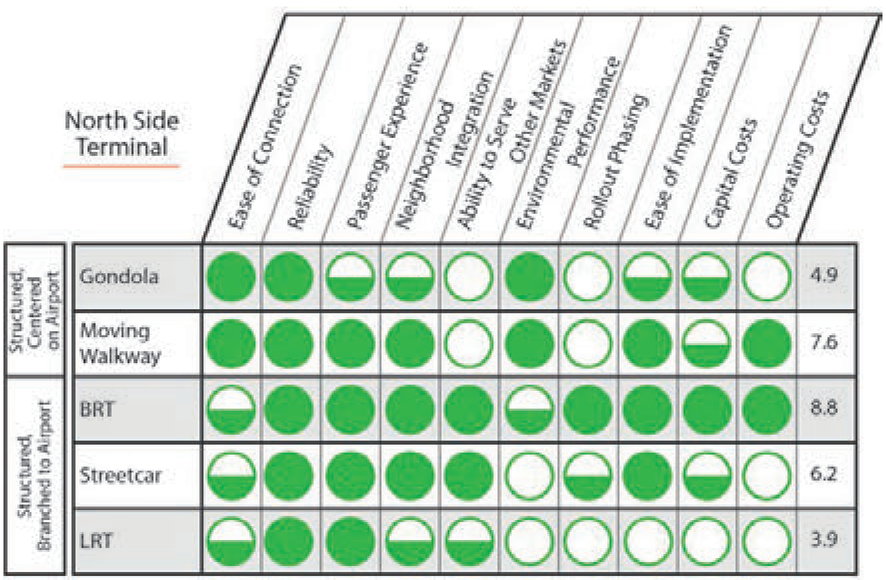


Figure 9: Mode Evaluation Screening Matrix for Potential Future North Side Terminal

Rating levels		Score
	Good	10
	Fair	4
	Poor	1

Table 4: Rating levels key

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5. Train-to-Plane Connection Selected Alternatives

5.1 Upgraded Taxi Service (Short-term, 1-2 years)

Mode Overview

The Upgraded Taxi Service connection option builds upon the existing train-to-plane service between the Station and the Airport, but improves the customer experience through an enhanced fleet of modern vehicles designed for airport-bound taxi passengers' needs and expectations, with defined pick up points, through service that is supported by mobile transactions with contemporary reservation and payment systems.

Both at Ronkonkoma LIRR Station and at the Airport terminal, passenger pick up and drop off will take place at predetermined locations. At the LIRR Station, this area is in the parking lot north of the railway tracks. At the Airport, taxi riders are currently directed to the western edge of the terminal's front curbside; however, once the new Transportation Facility is completed, all taxi operations will be relocated to this new facility east of the terminal, where the Airport plans to direct all its commercial ground access vehicles. Taxis can choose their travel route between the airport and the train station, as there will be no pre-determined alignment. Free from a rule to follow specific roads for travel, drivers can choose the best travel route based on traffic conditions, as reported by a mobile application.

The upgraded fleet can offer more comfort than the taxi vehicles currently operating between the Station and the Airport. A wide variety of vehicles are available to be integrated into the upgraded fleet, including sedans, SUVs, and minivans. Taxis based on modified small cargo vans – such as the Ford Transit and Nissan NV200 – have grown in popularity among operators. These vehicles offer good mix of passenger amenities and have been designed to maximize interior space on a small chassis. Desirable amenities for the new taxi fleet include:

- Capacity to seat a minimum of four passengers plus one driver comfortably;
- Sliding doors, interior grab-handles, and swing out-steps to maximize ease of entry and exit;
- Flat vehicle floors which provide additional comfort and space for small luggage;
- USB / charger stations
- Independent rear climate control;
- Spacious rear luggage compartment;
- Wipe-clean interior surfaces;
- Reading lights and floor lighting;
- Universal Accessibility features.

In addition to upgraded vehicles, introduction of an electronic reservation, dispatching, and payment system is proposed. This system will allow users to request rides in advance of arriving at the taxi area using a mobile device. After the user requests a ride through the mobile app, an available driver receives the order and prepares to welcome the upcoming passenger. Drivers and passengers identify one another using profile information (e.g., driver name, vehicle model, license plate number) shared by the application. If they choose to do so, passengers can pay for the ride with the app, in a cashless transaction.

There are many vendors capable of offering this electronic hailing and dispatch service, with either custom or off-the-shelf systems. Cloud-based services are preferred to avoid procurement, setup and maintenance of network servers. Still, to ensure service reliability and provide service options for passengers, the ability to request a taxi in person and pay in cash or a physical credit card should be preserved alongside introduction of new digital technology.

To promote the taxi upgrade and disseminate a consistent message of the system values, a new branding strategy should accompany the system launch. A distinctive, recognizable and strong brand will ensure that the public gets a positive and accurate impression of the system from the onset, raising the social profile of existing Airport customers, and increasing the potential of attracting new users.

The combination of these elements defines a visual identity which will be systematically deployed every time the system sends visual cues to riders: on signage at the Airport and Station, on driver uniforms, on vehicles liveries, at the mobile application and at the connection's webpage. This visual identity will be distinguished from the taxi operator's, to guarantee consistency in the event of a future change of operator, but it may reference the LIRR's and the Airport's brands, to increase its association with them.

Upgraded Taxi Vehicles

- Vehicles available from different vendors, and in different configurations including light commercial vehicles and SUVs.
- Ample interior space with flat floors, lighting and independent rear climate control.
- Facilitated entry and exit with swing-out steps, sliding doors, interior grab-handles.
- A spacious rear compartment capable of accommodating at least 4 bags.
- Wipe-clean interior surfaces, and anti-bacterial pleather seats.
- Universal Accessibility features.
- Hybrid electric vehicle technology for increased fuel efficiency and reduced pattern of emissions

Ancillary improvements associated with the upgraded taxi service include:

- Improved wayfinding signage at Ronkonkoma LIRR Station to guide passengers to the taxi curb
- Installation of video screens near the taxi station, providing up-to-date flight information.

Key Benefits

Improved passenger experience

The updated system would deploy modern vehicles equipped with onboard digital amenities, and design favorable for stepping in and out, baggage movement and accommodation of persons with disabilities. The new fleet would allow passengers to pay by cash/ card in addition to a new mobile device function, and to reserve a trip in advance through their smartphone.

Operational ease and improvements

Similar to operations today, outsourcing train-to-place connection operations to a third-party taxi operator enables the airport to have lower operational costs and minimizes management responsibilities. Updating the current operating agreement could deliver improvements to service, standards, and performance if amended for its next valid period.

Upgraded taxis would pick up and drop off passengers at a very similar station location as they do today. Drivers would still accept cash or credit card payments, as well as LIRR Getaway Package vouchers. Current riders would benefit from more comfortable rides and more options for securing their rides, while still having familiar experience in hailing taxis.

Improved technology and performance tracking

A new mobile application would allow users to easily book taxi trips, and inform them of ride availability, and on trip details such as expected travel time, fare level, driver identification and vehicle accessibility features. The same application could facilitate transactions, handling payment and issuing receipts for passengers with registered accounts.

This new application would also benefit the system operator and the contract sponsor. Gathering data on vehicle location and passenger trips, the application could offer subsidy to optimization problems, such as dispatching, produce planning insights based on usage trends. Furthermore, system transparency would be boosted by online dashboards, which could report on average waiting times, typical trip durations and other performance metrics.

E-hailing application

- Digital system to allow passengers to request and secure taxi rides before they arrive at the taxi station.
- E-hailing application available for riders' mobile devices, which enables fare transactions for cashless payment.
- Online system monitoring dashboard available for the taxi operator and the system sponsor.
- Integration with the MTA mobile app sale of getaway package offers.

LIRR Ronkonkoma Station Improvements

- Electric chargers set up at the taxi parking area.
- Improved signage to facilitate navigation and enhance awareness.

5.2 Upgraded Shuttle on Public Roadways (Medium-term, 5-7 years)

Mode Overview

An upgraded shuttle system would handle the potential medium-term growth in demand for the connector, capitalizing on existing customers and new riders generated by LIRR Double Track service, Nicolls Road BRT service, and the build out of Ronkonkoma Hub. With moderate levels of investment into a shuttle system, the overall connection capacity would be expanded, and travelers could access a wider range of options. In addition to the taxi service, riders would have access to timed, spacious buses departing from stations built to accommodate the needs of air travelers.

The upgraded shuttle plan involves changes and improvements to the current system infrastructure and operations to enhance the customers' sense of connectivity when using transit to access the airport. Most changes to the system center on adoption of high-standard vehicles, introduction of frequent service, and improvements to the passenger experience at the train station and at the boarding and drop-off zones.

Passenger Shelters

- Enclosed shelters include seating, heating and cooling, and check-in kiosks/MTA ticket vending machines.
- Displays inform passengers on shuttle waiting times, flight departure status/LIRR schedule.
- Raised shelters allow shuttle-level boarding for passengers

There are two options for siting the shuttle stop at the Ronkonkoma station: the loop north of the tracks, or south of the tracks. The shuttle would proceed along a route on public roadways, following Smithtown Avenue, Lakeland Avenue, and Veterans Memorial Highway before accessing the airport via Schaeffer Road.

Generally, shuttles would be scheduled to depart from the train station and airport terminal approximately every twenty minutes during peak activity hours, with adjustments to meet every train arrival. Service should be provided during all hours during which the airport is active –. Departures should follow a fixed schedule published online, allowing travelers to plan their trips with the support of an online travel service, such as the MTA Trip Planner, thus ensuring they can always arrive on time for their connections.

The service should operate with new buses. Two vehicles plus one spare should be sufficient to operate the service. These vehicles are usually 40-feet in length, with a capacity to seat 40 persons and hold a similar number of standing passengers. However, to improve the experience for air-travelers, the final fit-out should include a seating arrangement that accommodates luggage racks and better in-vehicle circulation. To reduce emissions, the fleet could be comprised of new, battery electric buses.

While such buses are more expensive to purchase and require installation of new charging infrastructure, they have lower lifetime costs due to lower fuel and maintenance expenses. Buses should be equipped with an automatic vehicle location (AVL) system that can be used to track the location of the vehicles in transit and provide real time passenger information (RTPI) on shuttle arrival times for passengers waiting at the train station or the airport. Vehicle livery should be designed with a unique brand to reinforce the new connectivity provided by the service.

Ancillary improvements associated with the upgraded shuttle system include:

- An enclosed bus shelter at Ronkonkoma LIRR Station would provide a comfortable waiting area for passengers at the train station. The station should feature amenities such as seating, heating and cooling, information displays, and check-in kiosks. To ensure that the shelter can comfortably accommodate travelers with luggage, a minimum of 10 square feet per passenger, net of furnishings, is recommended for shelter sizing.[16] MTA should be consulted on developing wayfinding signage in and around the station area to help guide passengers to the shuttle pick-up area. Signage should feature branding elements consistent with the vehicles.

- To provide space for a new shelter, capital improvements (eg; extending curb lines and building new concrete sidewalks) are needed adjacent to the train station area.

- A small depot is required to provide the buses with light maintenance, cleaning, storage and charging (should the vehicles be electric).

- A layover area for driver breaks is also required on airport property. Stakeholders have indicated that the new Transportation Facility located at 150 Arrival Avenue should be suitable upon completion.

- Video screens for passenger information should be set up at the train station bus shelter, and at the airport terminal. While the shelter at the Rail Station would display flight arrival and departure times and may also offer flight check-in kiosks, the shelter at the Airport would display the Railroad schedule and hold LIRR ticket vending machines.

Key Benefits

More environmentally friendly

Having a full shuttle bus of passengers is more environmental friendly than multiple taxis or cars transporting passengers to and from the airport. Reducing the number of vehicle trips around the airport will help improve local air quality and may reduce carbon emissions. This effort could be further enhanced by procurement and use of low or zero-emission shuttle buses.

More affordable options for passengers

If the connector shuttle cost was free to passengers, had a subsidized fare by stakeholders, or was part of a combined fare media, it would provide a less expensive alternative to the cost of a taxi, providing users with more options for mode, cost, and comfort.

Shuttle Vehicles

- 40-foot long shuttle buses, fit for the specific needs of air travelers: flat floors for facilitated in-vehicle circulation, and luggage racks.

- Two vehicles plus one spare should be sufficient to operate the service.

- Vehicles equipped with an automatic vehicle location system feed information to shuttle operators, and riders waiting at shelters.

- Light maintenance, cleaning and charging done out of a small depot located within airport property.

- Fully electric buses have lower lifetime costs and produce zero local emissions.

16 Based on the minimum threshold for a Level of Service "B" rating for queuing areas.

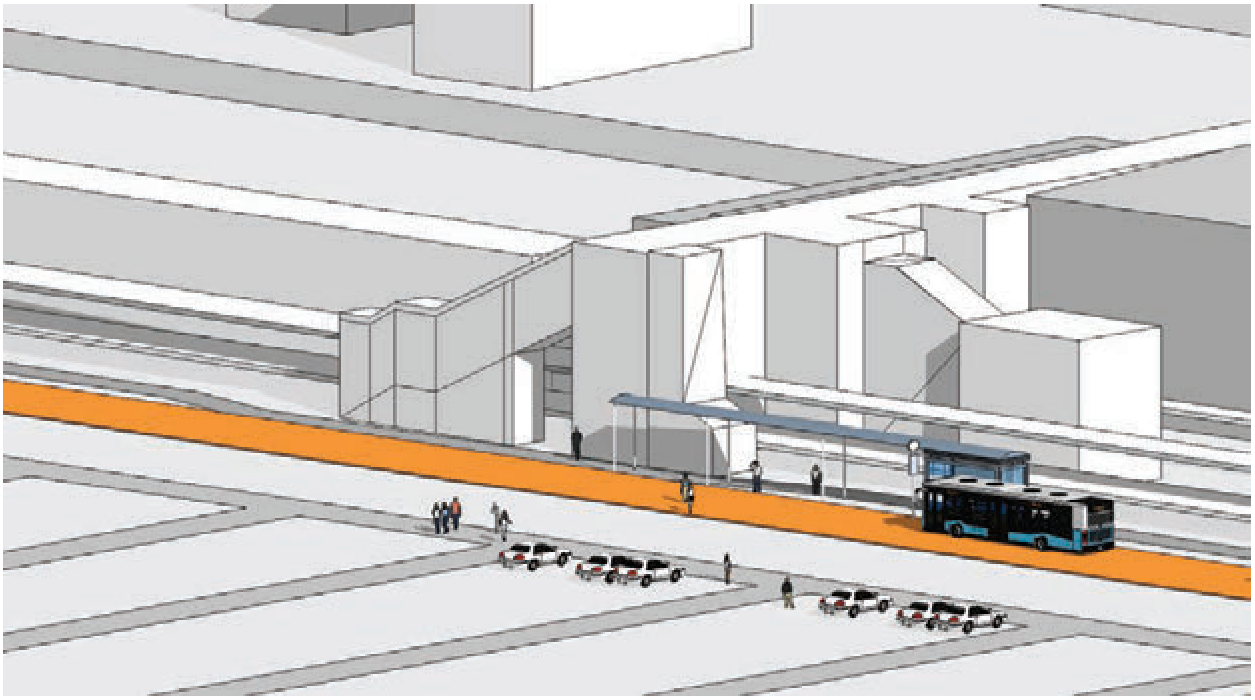

Figure 10: Axonometric view of potential location for a shuttle pick-up and passenger waiting area, south of Ronkonkoma Station tracks.

Service Details

- Service should be available at all times the airport operates: from 4:00am to 1:00am.
- Shuttle schedules should meet every train arrival/ departure, with frequencies of 20 minutes or lower.

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5.3 Autonomous Vehicle Shuttle on Private Airport Roads (Long-term, 20+ years)

Mode Overview

The upgraded shuttle on private roads would operate with similar elements and service to the upgraded shuttle on public roads. The service would accept passengers at the Ronkonkoma LIRR Station shortly after arriving LIRR trains from a sheltered station, bringing them to a station located at the airport terminal and vice versa. The primary difference between the two shuttle options is the routing. Shuttles will travel mostly on exclusive right-of-way, entirely within airport property.

The shuttle will travel along a portion of Railroad Avenue south of the LIRR tracks, entering the airport property at a secure gate located north-north-east of the airfield. Shuttles would then travel toward the terminal along a new roadway within the airport, approximately 3.5 miles in length. An Airport Operation Area (AOA) fence will be required on both sides of the roadway until the roadway exits the airport secured area and enters public area.

To avoid a conflict with the Runway Protection Zones (RPZ) and other FAA protected surfaces for runways 6/24 and 15R/33L, the airport shuttle roadway would traverse underneath the two RPZs and other surfaces in tunnels to be constructed as part of the system implementation. Preliminary geotechnical observations suggest that a culvert box tunnel would be most cost efficient and viable. A cut and cover method shall be considered as the preferred construction technique for the tunnel.

A dedicated roadway could be built almost entirely within airport property, with just short segments overlapping with the future Ronkonkoma Hub South, and with Railroad Avenue. The Airport has enough room to accommodate a new roadway, with no need to tear down any existing facilities to clear the pathway. Geological conditions are favorable, and the underpasses required to keep the runway safety areas clear of obstructions could be constructed with pre-fabricated culvert boxes tunnels.

Due to the tunnel and roadway construction, this option is viable only in the long-term (20+ years). Given technological advances during this time frame, and the exclusive right-of-way, it may be possible to offer the shuttle service using autonomous vehicles (AVs). In the context of the train-to-plane connection, an AV would arrive at the designated shuttle station south of the train station, transporting passengers to the airport. At the airport, the passenger pick-up and drop-off area would be located at the end of the shuttle route, near the new transportation facility, and not curbside in front of the terminal.

To avoid railway crossings, the shuttle station should be located south of the LIRR tracks. The frequency and operational plan of the service should be similar to the public roads shuttle, with vehicles headways of approximately 20 minutes, with some deviation to meet arriving trains and aircraft as needed during peak activity periods.

Additional technical details on this long-term alternative and related ancillary improvements including security, utilities and stormwater systems are outlined in Appendix D.

Autonomous Vehicles

- Vehicles do not have a steering wheel or pedals. Current models seat 10 people, but future capacities could be larger.
- Power by electric engines, vehicle has zero local emissions.
- Onboard audio/video communication system allows passengers to contact operators.
- While sector standards and regulations are evolving fast, currently AV shuttles cannot operate in public roads in New York State.

Dedicated Roadways

- A new roadway dedicated to the connection shuttle could be constructed in the airport site, even after consideration of current runway extension plans.
- An Airport Operation Area (AOA) fence will be required on both sides of the roadway to separate riders from the airport secure area.
- To ensure clearance from the runway protection zones one 2,000 foot underpass would be constructed under each major runway.
- Preliminary geotechnical observations suggest that a cost-efficient, pre-cast culvert box tunnel would be viable.

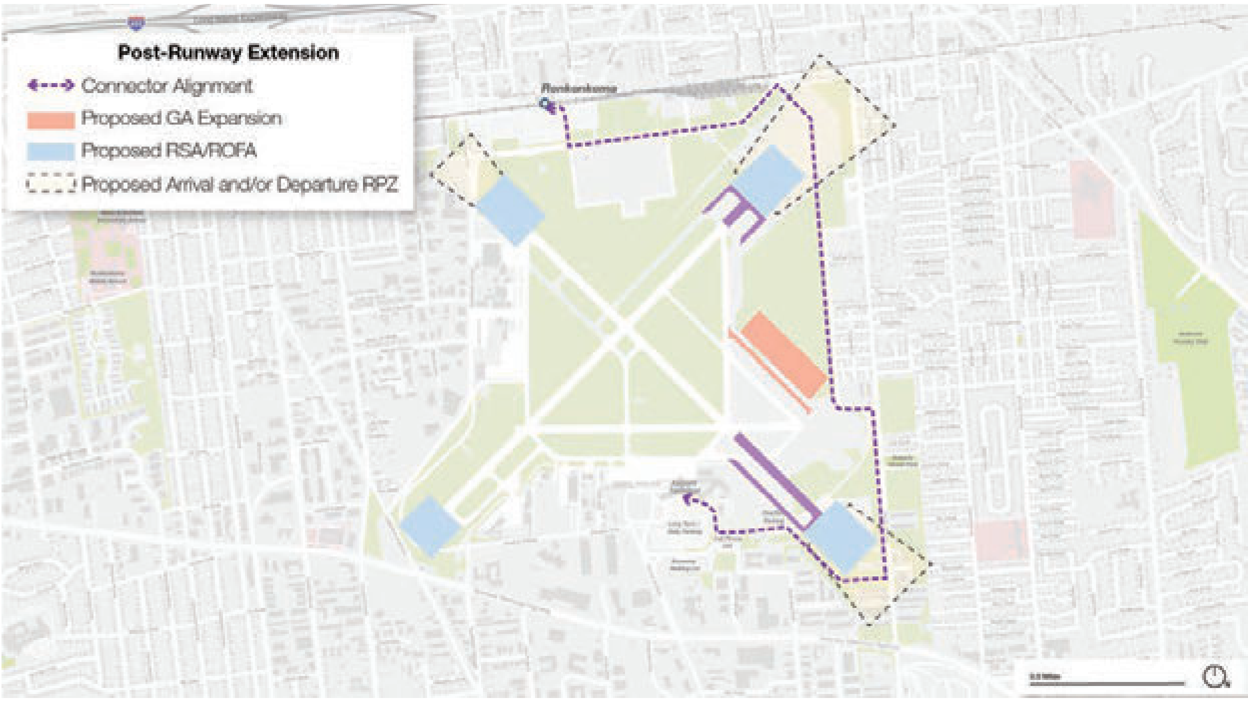

Figure 11: AV Shuttle on Private Airport Roadway – Proposed Route Alignment

Key Benefits

More reliable and resilient service

A dedicated alignment on a private airport roadway would provide more reliable service and improve travel conditions for both shuttle riders and drivers around the airport area. Because shuttle vehicles would run through a private airport road, the public roadways would not incur any impacts of AVs. In their turn, shuttle riders would experience increased reliability, since they would no longer be surprised by delays caused by road accidents, construction road closures and other forms of congestion.

Faster journey times

A dedicated private road would have a marginally more direct route and fewer junctions, meaning that journey times to the airport from the station may be marginally faster than a shuttle bus or taxi on public roads.

More environmentally friendly

Having a full shuttle bus of passengers is more environmental friendly than multiple taxis or cars transporting passengers to and from the airport. Reducing the number of vehicle trips around the airport will help improve local air quality and may reduce carbon emissions. This effort could be further enhanced by procurement and use of low or zero-emission shuttle buses.

More affordable options for passengers

If the AV shuttle cost was free to passengers, had a subsidized fare by stakeholders, or was part of a combined fare media, it would provide a less expensive alternative to the cost of a taxi, providing users with more options for mode, cost, and comfort.

Potential operational efficiencies

Replacing the traditional shuttle buses with autonomous vehicles (AVs) would mitigate cost spikes of increased service. While driving staff is the largest operating cost item on traditional shuttle systems, it is completely absent on AV-based systems, which, therefore, can increase trip frequencies more efficiently.

5.4 Moving Walkway to Relocated North Side Terminal (Long-term, 20 + years)

Mode Overview

In a future scenario wherein the Airport terminal may be considered for relocation to the north side of the airfield, the new terminal would be located much more proximately to Ronkonkoma LIRR Station and a vehicular-based transportation system may be unnecessary due to the short journey distance. Instead, a moving walkway could bridge transit-riders' final trip segment from the station building to a north-side terminal. This system would consist of two parallel conveyor systems to aid passengers' travel in both the direction of the train station and the airport. The walkways would provide universal access – without vertical steps – and allow passengers to walk or ride at faster-than-walking speed. Because the system would run continuously, customers will simply walk between the station and airport, with no delays or wait time. The walkway system enhances the passenger experience and journey by making it faster and more comfortable.

The alignment of the walkway would be determined to provide the shortest, most direct connection between the train station and terminal and would be housed within a climate-controlled structure, with entry/exit points located directly at the train station and terminal buildings. Depending on the ultimate on future development of the airport and adjacent properties, the walkway could be constructed at ground level, elevated, or potentially underground.

Various moving walkway systems and technologies exist, with slightly varying speeds and lengths. It is estimated that a moving walkway system for the Airport would have a travel time in the range of 3.5 to 6 minutes. These short travel times are possible due to a recent technology of high-speed walkways, which have been deployed around the world to bridge distances similar to the one envisioned in this study. Trip times could be minimized by using variable speed walkways. This type of walkway has two-speeds: typical walkway speeds towards the access and egress points, and faster "cruise" speeds at the middle of the walkway.

Key System Features

- Conveyor mechanism provides continuous service between the Station and North-Side Terminal.
- No-step access, passengers can walk or ride at faster-than-walking speeds within a climate-conditioned space.
- Adjacent walking lane accommodates passenger-assist vehicles, provides redundancy.
- Travel times in the walkway would be in the 3.5 – 6 minutes range, depending on design specifications.
- Walkway has two speed zones to enhance safety: slower speeds on the access and egress, and "cruise" speeds in the middle section.

For maximum passenger comfort, the supporting structure for the system should include sufficient access to views and daylight, and be safely lit during times of darkness. This structure should also include enclosure walls, external railing, guards, closures, shutters, ventilation, and smoke barriers as required. Adequate areas should be provided for passengers to queue before entry and to re-adjust any baggage, attend to children, etc. upon exit, with further detail as defined in ASME A17.1 (Section 6.2.3.8.4).

In this alternative, an additional physical structure enclosing a moving walkway would offer a more cohesive train-to-plane connection and passenger experience than any solution involving surface transportation vehicles. Because a moving walkway would be designed in conjunction with the new terminal, it is envisioned be fully integrated to the terminal building, connecting passengers from the train station overpass directly to the terminal concourse. The passenger would experience the Station and the Terminal as a single, unified transportation hub for the County and the larger regional transportation network.

Key Benefits

Shortens journey distance between the Station and Airport

A moving walkway between the train station and a new northern terminal would significantly reduce the time it takes to transfer from train to airport. The shorter the transfer time the more attractive ISP will be for passengers. With a shuttle or taxi, a passenger might have to wait a few minutes for service but with a moving walkway there is zero waiting time, it is always available when the passenger needs it.

Seamless Journey and Passenger Experience

This option would provide a seamless journey between transportation networks and passengers' Airport experience could begin at Ronkonkoma Station. Additionally, travelling on a moving walkway is easier than using a taxi or shuttle bus, as passengers do not need to lift baggage into a taxi or shuttle. Secondly, most passengers do not perceive a moving walkway as a mode of transport and therefore in the eyes of the consumer moving between the train station and the airport would not require a 'transfer'.

Weather Protection

Depending on the design of the walkway, passengers could move from the train station to the airport under cover. If the walkway is fully enclosed, passengers could benefit from a more comfortable transfer.

Automation and operational efficiencies

Once constructed, a moving walkway has low operating costs and does not require staff to operate. It would require regular maintenance costs.

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6. Implementation Plans

High-level implementation plans were developed and are outlined in this section for the four selected modes described in Section 4. The implementation plans include: potential roll-out plans, key considerations and cost estimates.

In addition, the implementation plans include estimates about the level of effort required to undertake an environmental assessment for each connection option. This assessment is aimed at assisting decision-making that could impact the development of the train-to-plane connection, and it includes a summary of key regulatory and policy considerations with illustrative assessment durations and potential costs. The schedule and cost estimates reflect rough order-of-magnitude approximations based on information currently available. It is recommended that detailed environmental assessments, in compliance with all relevant local, state and federal regulations, be undertaken to inform subsequent project stages.

6.1 Upgraded Taxis (Short-term, 1-2 years)

Roll-Out Plan

The high-level roll out plan for implementing an upgraded taxi fleet is outlined and depicted in Figure 12. Some steps may require more complex decisions or additional design work that must be completed as part of the implementation process. These are discussed in Section 6.1.2 as key considerations. The initial steps involve investigating vehicles, contractual requirements, and systems. Suffolk County should choose a vehicle standard, or mix of vehicles, that will be used in provision of the taxi service. Ultimately, these vehicles may be owned by the taxi operator, or owned by a public agency and leased to the operator under a service agreement. Both cases will require changes to existing contractual agreements. Simultaneously, Suffolk County should begin the process of refined scoping and vendor identification for the mobile hailing and dispatching service.

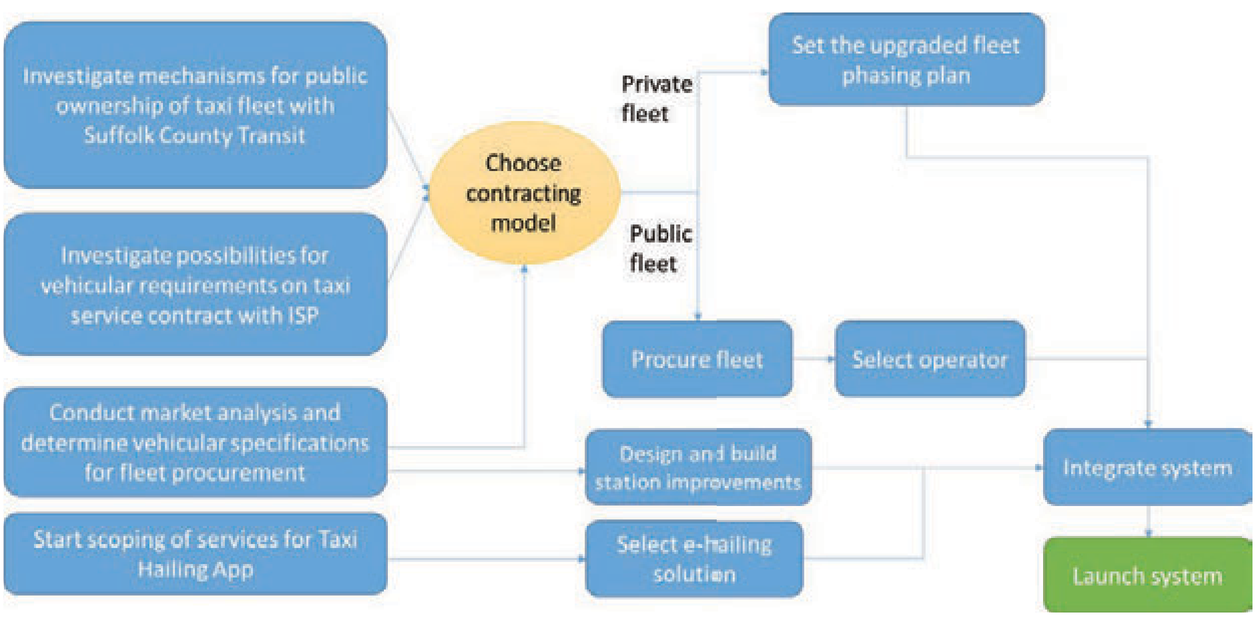

Figure 12: Roll-out Plan, Upgraded Taxis (Short-term, 1-2 years)

Once the contractual model is chosen, and a preferred vendor for the electronic hailing solution identified, the procurement process can proceed. If the preferred model involves private ownership of the upgraded fleet, the operator must agree to a plan specifying the vehicle performance requirements and timeline for phasing in the new vehicles. Under a public ownership model, a specified government entity will directly procure the vehicles. The taxi service provider only needs to operate and maintain the vehicles. The final design and construction of ancillary improvements may take place on a similar timeframe. Once the vehicles and electronic hailing solution are in place, the digital infrastructure and systems can be integrated. The process entails the testing of the services to determine operational readiness and subsequently, launching the service to the public.

Key Considerations

Key considerations for upgraded taxi service include:

Fleet ownership and operation model

Two potential options for ownership of the upgraded taxi fleet were identified through this study. The fleet may be procured and owned by a public entity such as Suffolk County or Suffolk County Transit, and then leased to a private taxi operator. This private operator would provide service and maintain the vehicles under the terms of a lease and service agreement. This model decreases financial risk to the operator associated with capital investment in new vehicles. Direct procurement also eliminates potential negotiation with the operator regarding vehicle specifications and costs, enabling straightforward delivery of the fleet.

Alternatively, the upgraded fleet could be procured directly by the private operator, after an update of the taxi service provision contract that include higher standards of quality. The company would own, maintain and operate the fleet under contract to a public entity. This arrangement may require more gradual introduction of the new fleet, as the taxi operator manages risk and capital investments in their vehicles.

Vehicle specifications

Final vehicle specifications – or a mix of vehicles specifications – must be selected in order to provide the service. This process may involve choosing among available vehicles based on performance. If a hybrid vehicle is selected, chargers will have to be procured and installed in at least one of the waiting areas for the taxis, and in that case the Ronkonkoma LIRR Station should be prioritized, as it is the location where the taxis dwell, even when they are not returning from a trip to airport. A summary of taxi fleet vehicles is provided in Appendix D for informational purposes.

Electronic hailing platform

Either a private operator or a public entity could serve as the contracting entity for an electronic hailing ("e-hailing") platform. If the private operator is selected, a list of minimal requirements should be specified. As discussed above, a variety of vendors can provide applications using solutions ranging from off-the-shelf, semi-customized, to fully customized. These systems are likely to include an upfront cost for set up and development as well as ongoing subscription or transaction-based fees.

Cost Estimate

The total expected capital expenditures associated with an upgraded taxi fleet including 10 vehicles is $1.1 million. The expected cost for new taxis will be $40,000 per vehicle.

No estimate of operating costs is provided for this mode, as operating costs will depend largely on the contractual arrangement with the taxi operator. In addition, the operating costs will include ongoing costs associated with the electronic hailing application; however, not enough public information is available to inform a reliable estimate.

Cost estimate classification and general assumptions for these figures are outlined at the end of this report.

Environmental Review Effort Assessment

It is assumed that no Federal funding will be used for the development of this option and therefore no National Environmental Policy Act (NEPA) review will be required by the U.S. Environmental Protection Agency.

The project is an unlisted action under the New York State Environmental Quality Review (SEQR). The environmental review will require the preparation of an Environmental Assessment Form (EAF) followed by a Negative Declaration as per SEQR requirements. No public hearings would be required as part of this SEQR review.

A SEQR Lead Agency will need to be identified, and it is anticipated that the EAF will include multiple Involved Agencies, so a coordinated review will be necessary.

The only element of the development of this option anticipated to require environmental analysis would be the construction of electric vehicle (EV) charging stations. Per current development plans, the proposed locations for EV charging stations are on paved and/or previously disturbed surfaces which have been maintained as developed sites. From preliminary review, no trees or other natural vegetation will need to be cleared. It is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. There are no surface waters or wetlands in the vicinity. The project is in a Sole Source Aquifer area; however, no detailed analysis is anticipated. It is anticipated that there are no cultural resources in the vicinity that could be impacted.

Estimated timeline for assessment:
2 – 3 months

Estimated cost of assessment:
$25,000 - $50,000

6.2 Upgraded Shuttle on Public Roadways (Medium-term, 5-7 years)

Roll-out Plan

The initial steps for implementing the upgraded shuttle service involve siting the new infrastructure required. First, the location of shuttle stops must be finalized. The existing options at the LIRR station are either north or south of the tracks. At the airport, the route may be configured for shuttles at a new location near the transportation facility. Preliminary engineering of the stations and shelters may be required to inform this process. Suitable locations and size must also be determined for parking at the driver layover area and for the bus depot capable of supporting light-maintenance, cleaning, and vehicle charging.

At a future conceptual design phase, Suffolk County should further explore options for contractual means and business models for operations. This involves identifying the appropriate public and/or private entities to purchase the vehicles and to provide drivers and administrative staff for operations. The service could be operated by Suffolk County Transit, or a private contractor. In the latter case, the vehicles and technology may be owned by a public entity and operated and maintained under a service agreement. Alternatively, a private entity willing to purchase and own the vehicles could be sought.

The next steps are to begin acquiring and constructing the elements needed to run the service. At this stage, vehicles, shelters, AVL and real-time passenger information systems will be procured from a vendor. Final design and construction for the bus depot and transportation center improvements will begin. Final designs for the shuttle station at the LIRR should be coordinated with the MTA and/or property developers of Ronkonkoma Hub and Ronkonkoma South, and then constructed.

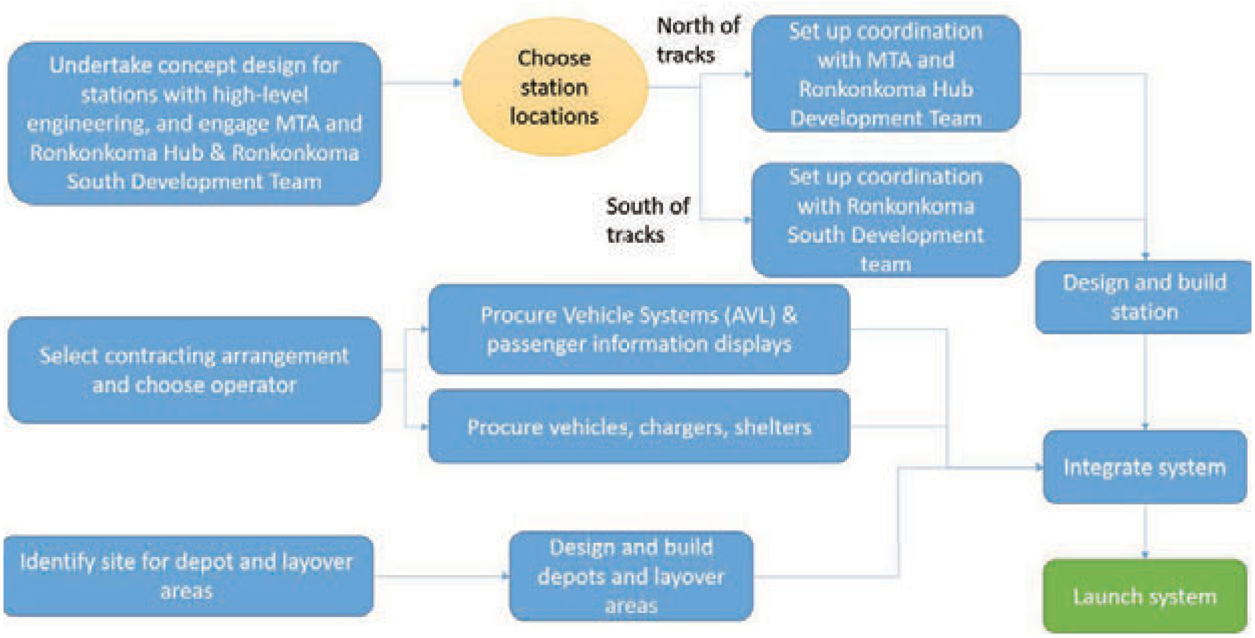

Figure 13: Roll-out Plan, Upgraded Shuttles on Public Roadways (Medium-term, 5-7 years)

In the final step, the operator defines the service plan (scheduling trips and assigning shifts to drivers). It also requires integrating the technology components so that real time information on flights, trains, and shuttles are communicated and displayed appropriately to customers. Subsequently, the service can be launched to the public.

Key Considerations

The key considerations for the upgraded shuttle service are related to contractual model and siting of various elements.

Contractual models – Key considerations on the contractual model focuses on two key questions: who will operate the bus service and who will purchase the vehicles? Duties of the operator will include providing staff for driving, cleaning and conducting light maintenance for vehicles, and periodically updating the service plan as train and flight schedules change. A selected public entity, such as Suffolk County Transit, would procure and own the buses, in-vehicle technology, and charging infrastructure. If the operator is a private company, the private contractor would operate and maintain the publicly-owned fleet under a service agreement. A private ownership model would involve accepting proposals to identify a company that would be willing to purchase vehicles and technology meeting Suffolk County's standards in addition to operating the bus service. The public procurement model is likely to be more successful, as the capital investment in new high-standard vehicles poses a large financial risk to the operators.

Infrastructure siting

There are two potential locations for siting the shuttle station at the LIRR Ronkonkoma station: within the loop north of the station, or south of the station,

Figure 14: Shuttle Stop Location Options (A&B) and Routing Options at Ronkonkoma Station

as shown in Figure 13. While the northern station alignment (Location A) avoids potential delay resulting from heavy park-and-ride activity during the morning and evening peak hours, the routing is more circuitous and must stop at the signalized intersections located just east and west of Smithtown Avenue on Railroad Avenue. The southern alignment (Location B) may suffer delays from conflicts with parking vehicles, but avoids potentially recurring stops at the traffic lights.

Because the sidewalks adjacent to the train station are narrow, installation of the proposed shelters requires additional capital work at either location. At Location A, the curb would be extended and the grass median shifted northward to allow installation of the shelter and a clear path on the south side of the loop. At Location B, the curb would be extended southward into the existing drop off area to allow for installation of the shelter and a clear path on the north side of Easton Street. In addition, the plan for Location A would require coordination with the long-term development of Ronkonkoma Hub, while the Location B plan for south side operations would require coordination with the eventual development of the Ronkonkoma South Site.

In addition to stations, a convenient layover area where driver may park vehicles during breaks is required. It is desirable to place parking near the new transportation facility at the airport terminal, as this location has been identified as a suitable location for administrative functions and to house bathrooms, break rooms, and other amenities for drivers.

Bus depot

This facility should be designed to support bus storage, light maintenance, and regular cleaning of the shuttle buses. Electric vehicle charging infrastructure should also be located at the depot (only if the vehicular fleet is electric or hybrid). Ideally, this location would be close to the new transportation facility, to consolidate the operational infrastructure (parking, break rooms, and administrative functions) within the Airport's property,

Cost Estimate

The total expected capital expenditures associated with an upgraded shuttle service amount to $8.5 million. This includes a fleet of three new, battery electric buses along with charging infrastructure and ancillary structures.

The annual operating costs could amount to approximately $2.2 million, but this would vary with specific operating plans and contractual arrangements.

Cost estimate classification and general assumptions for these figures are outlined at the end of this report.

Environmental Review Effort Assessment

Even if the project is not funded through the AIP program, grant assurances require the airport to conduct a NEPA review. Because the only new building in the airport would be the bus depot, the FAA would require the airport to complete a Categorical Exclusion (CATEX) or short form EA.

The project is an unlisted action under the New York State Environmental Quality Review (SEQR). The environmental review will require the preparation of an Environmental Assessment Form (EAF) followed by a Negative Declaration as per SEQR requirements. No public hearings would be required as part of this SEQR review.

A SEQR Lead Agency will need to be identified, and it is anticipated that the EAF will include multiple Involved Agencies, so a coordinated review will be necessary.

Per current development plans, the proposed locations for the shuttle stations and bus depot are on either paved and/or previously disturbed surfaces that have been maintained as developed sites. Based on existing information, it is anticipated that a Phase 1 Environmental Site Assessment (ESA) will be required. It is assumed that no potential hazardous waste issues will be identified.

From preliminary review, no trees or other natural vegetation will need to be cleared. It is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. There are no surface waters or wetlands in the vicinity. The project is in a Sole Source Aquifer area; however, no detailed analysis is anticipated. It is anticipated that there are no cultural resources in the vicinity that could be impacted.

Estimated assessment duration:
3 – 5 months

Estimated assessment cost:
$40,000 - $80,000

6.3 Automated Vehicle Shuttle on Private Airport Road (Long-term, 20+ years)

Roll-out Plan

The initial step is to coordinate with key stakeholders to determine the feasibility of the autonomous shuttle operations. NYSDOT will likely need to issue regulatory approval for the AV program as the regulator. Consulting with automated vehicle (AV) vendors is necessary to determine the available vehicle specifications and the operating requirements of these vehicles. Depending on regulatory and technological changes in the future, an AV shuttle may require that some right-of-way *outside* the airport also be converted to exclusive AV routes. It is important to coordinate with the developers of Ronkonkoma Hub and Ronkonkoma South to understand any impacts to nearby land uses of changes to the road network and siting of the shuttle station.

If autonomous vehicles are deemed feasible, the next steps are to set forth vehicle specifications (capacity, features, number of vehicles required) and to begin the procurement process. At this stage, a new or updated bus depot and all roadway improvements needed to run the AV shuttle should be constructed. Updates to the AVL and real-time passenger information systems will proceed around this time.

If conventional vehicles are selected to operate on the airport, the airport may already be operating service with suitable vehicles. (If no service is in operation at that time, vehicles should be procured and an operator selected, per the previous section). However, if a sheltered shuttle station had been placed north of the LIRR, it may need to be relocated to the south side of the tracks to efficiently access the airport via Railroad Avenue. A final determination should be made whether this is necessary and feasible.

Regardless of the vehicle technology used, conceptual designs for the roadway alignment and tunnel underpasses should also be completed in an independent, parallel timeline. This initial design phase is necessary to apply for and obtain approvals by the FAA for Obstruction Evaluation/Airport Airspace Analysis (OE/AAA), by the New York State Department of Environmental Conservation (NYS DEC) for the State Environmental Quality Review (SEQR), and the United States Environmental Protection Agency (EPA) for the National Environmental Policy Act (NEPA) process (the last only if the project is funded at least in part from federal sources). Once approvals are received, final design and construction for the new roadway, tunnels, bus shelters, and associated infrastructure improvements can move forward. Once infrastructure improvements are made and the passenger information systems have been upgraded, the service may be launched to the public.

Key Considerations

The key considerations for an upgraded shuttle traveling on private roadways to the airport terminal are the vehicle technology, the regulatory environment, and complexity of construction.

Vehicle Technology

The concept of a shuttle service on airport roads does not depend on use of any vehicle technology. The service could be provided using conventional buses, in which case similar considerations to the shuttle operating on public roads concept would apply. Alternatively, a shuttle service could potentially be provided using autonomous shuttle vehicles. The implementation requirements will depend on the best-available technology at the time of deployment. Currently, pilot projects in the U.S., Europe, and Japan are underway using low-capacity (9-12 person) autonomous shuttles.[17]

17 AAA. (2017, November 8). *AAA and Keolis Launch Nation's First Public Self-Driving Shuttle in Downtown Las Vegas*. Retrieved from https://www.prnewswire.com/news-releases/aaa-and-keolis-launch-nations-first-public-self-driving-shut-

These vehicles generally meet the criteria for "high automation," meaning the vehicle is "capable…of all driving functions under certain conditions."[18,19,20] These vehicles are not yet capable of navigating busy public roads with mixed-traffic, but circulate in private areas or very limited sections of public roads. While the individual vehicles do not require drivers, the system is managed remotely by operators capable of handling exceptions and issues.

The technology to enable "full automation" – which allows vehicles to perform "all driving functions under all conditions" – is advancing rapidly.[21] Full automation would allow the autonomous shuttle to operate in mixed traffic safely and reliably.

If the "high automation" level represents the best available technology at the time of deploying the train-to-plane connection system, portions of the road network south of the train station may need to be closed to private traffic to operate the autonomous shuttle safely. Physically separated automated vehicle lanes could also be required on segments of Railroad Avenue used by shuttles to access the on-airport roadways. However, if "full automation" technology is commercially available, the shuttle vehicles could likely operate independently in mixed traffic under any scenario, generally without supervision from a remote operator.

tle-in-downtown-las-vegas-300551187.html

18 Easymile. (2018). ***Newsroom***. Retrieved from http://www.easymile.com/#Newsroom

19 Leary, Kyree. (2017, September 13). Japan is Testing Driverless Buses to Help the Elderly Get Around. *Futurism*. Retrieved from https://futurism.com/japan-is-testing-driverless-buses-to-help-the-elderly-get-around/

20 Navya. (2017, July 3). *Inauguration of the Autonomous Shuttles Services at La Defense in Paris*. Retrieved from https://navya.tech/en/inauguration-of-the-autonomous-shuttles-service-at-la-defense-in-paris-2/

21 National Highway Traffic Safety Administration. *Automated Vehicles for Safety*. Retrieved from https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

Regulatory Environment

As AV technology evolves over the next decade, so too will AV regulations. To provide this service, the final operator of the autonomous shuttle system (whether a public entity or a private contractor) will need to seek approval from NYSDOT to provide commercial service using unmanned vehicles. Currently, NYSDOT does not have a specific policy that would cover this type of train-to-plane connection. The agency may develop such a policy in the future or require an approval as the primary regulatory for commercial transportation in the State of New York.

The extensive construction in the airport will trigger the need to seek additional approvals. The roadways and tunnels under the RPZ would likely require an update to LI MacArthur Airport's Airport Layout Plan (ALP). The airport will need to coordinate with the FAA's New York Airports District Office to determine the scope of changes to the ALP. In addition, the capital works will trigger environmental reviews by State and Federal agencies (depending on the project's funding sources), and air space reviews by the FAA.

Cost Estimate

Capital expenditures for this option are expected to be in the rough-order-of-magnitude of $41 million. This figure includes construction of the new roadways and tunnels.

Not enough public information is available to inform an estimate of the capital and annual operating costs of procuring and operating AV shuttles. However, the initial investment in vehicles is likely to be small in comparison to the costs of providing the roadway and tunnel infrastructure.

Cost estimate classification and general assumptions for these figures are outlined at the end of this report.

Environmental Review Effort Assessment

It is assumed that the development of a new runway and tunnel will involve Federal funding, from sources other than the AIP, which currently cannot be committed for the project. A NEPA review would be required, and a Federal Lead Agency would need to be identified to determine NEPA documentation format. A detailed Design Report and Environmental Assessment (DR/EA) would be required, and, depending on its findings, an Environmental Impact Statement (EIS) will have to be prepared.

The DR/EA may also serve as the SEQR document. It is anticipated that there would be multiple SEQR Involved Agencies, so a coordinated review will be necessary. The DR/EA will be subject to a Public Hearing, and depending on the requirements of the eventual Federal NEPA Lead Agency, public information meetings may also be required.

Per current development plans, it is anticipated that that trees or other natural vegetation would need to be cleared. Depending on the season of clearing, surveys for the Northern Long-eared Bat (NLEB) may be required. Other than the NLEB, it is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. Preliminary review indicates a federally regulated wetland may be present on the airport property that will need to be avoided. Under federal wetland regulations, there is no regulatory boundary beyond the limits of the wetland. There are no surface waters or State regulated wetlands in the vicinity.

The project is within in a Sole Source Aquifer Area. If any new pavement is proposed, a groundwater analysis will be required. A State Pollutant Discharge Elimination System (SPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) will be required if the clearing equals or exceeds one (1) acre.

It is anticipated that there are no cultural resources in the vicinity that could be impacted.

Estimated assessment duration:
18 – 24 months

Estimated assessment cost:
$500,000 - $1,000,000

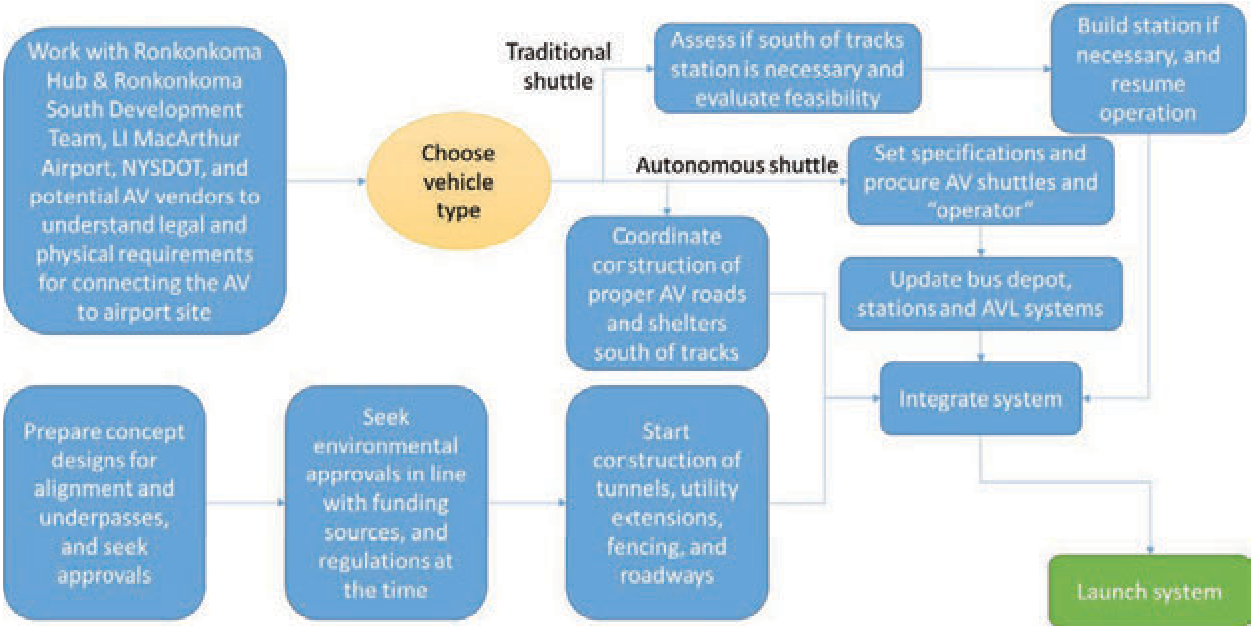

Figure 16: Roll-out Plan, AV Shuttles on Private Roadways (Long-term, 20+ years)

6.4 Moving Walkway to Relocated North Side Terminal (Long-term, 20+ years)

Roll-out Plan

With consideration of the County's transit-oriented development intentions for Ronkonkoma Station, the physical environment surrounding Ronkonkoma Station will be significantly different from current conditions in the next ten to twenty years. A moving walkway proposal and TOD growth would need to complement and not preclude one other as projects move forward during that time line. Thus, the first stage in developing the moving walkway system plan is to coordinate conceptual designs between the terminal development team and the developers of Ronkonkoma Hub and Ronkonkoma South sites. The location and mass of structures and future roadway alignments will influence the final alignment of the walkway system and help determine whether an at-grade or elevated walkway structure is preferable.

If the walkway is at-grade (at street level) several opportunities should be explored. First, there may be potential for providing additional access points to new development sites. In addition, reconfiguration of the street grid south of the train station may be required to provide the at-grade walkway system to avoid conflicts with circulating traffic on the street level.

Once the final elevation is determined, the access points and structures – including mechanical integration of the walkway – will be designed. During this period, the airport may begin the process of procuring the walkway components from a manufacturer. The next phase is to construct the moving walkway, meeting the construction timeline of the new terminal – with the new facilities opening to the public at the same time.

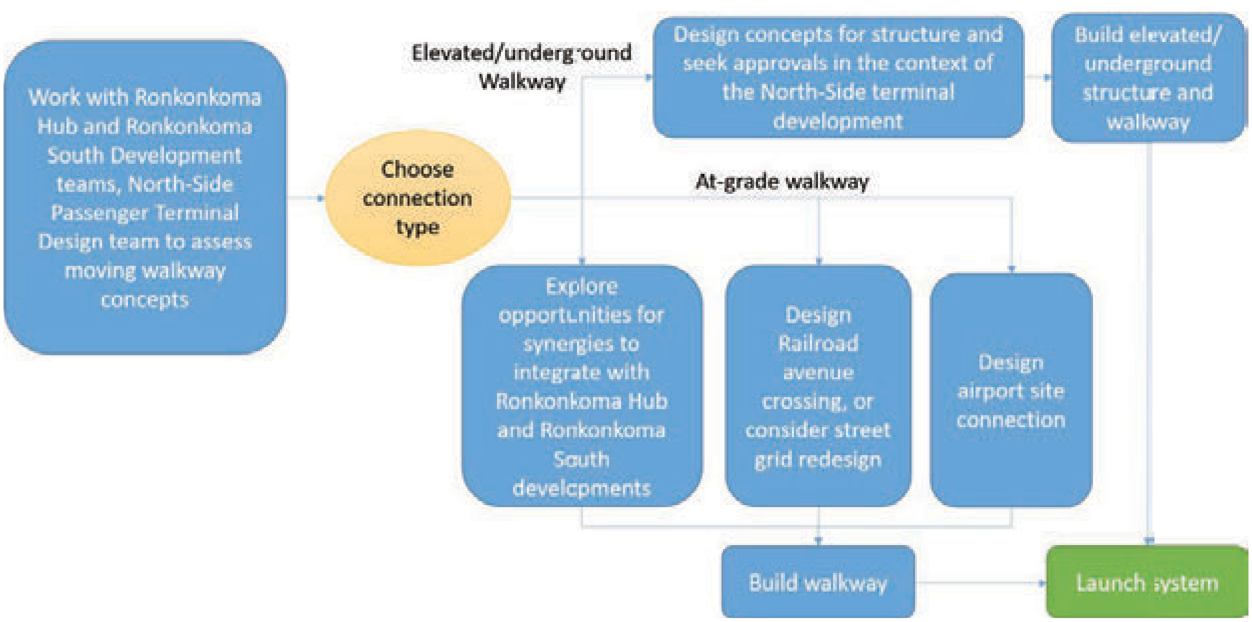

Figure 17: Roll-out Plan, Moving Walkway (Long-term, 20+ years)

Key Considerations

The key considerations for the moving walkway center on the timeframe, future development, and the supporting structure.

Airport Development and Coordination

The moving walkway system is not feasible without relocation of the LI MacArthur Airport passenger terminal to the north side of the airfield, adjacent to the Ronkonkoma LIRR station. Redevelopment of the airport is a major undertaking, placing the potential for a walkway connection firmly on a long term (20+ years) planning horizon. Any required environmental review related to the walkway would be folded into the larger assessment of an airport terminal development.

Future Development around Ronkonkoma Station

The system would be constructed concurrent to the development of the proposed North-Side Terminal, and should be integrated into the design of any proposed new build that occurs between Ronkonkoma Station and LI MacArthur Airport – the Ronkonkoma Hub South project. For example, the Moving Walkway could be integrated into new development proposed for the existing surface parking lot, providing an opportunity for users to exit the walkway for retail opportunity or comfort stations and re-enter to continue their journey.

Supporting Structure

The supporting structure for the Moving Walkway could be constructed at ground level or as an elevated skyway. Ground-level construction would require less structural support, greater flexibility for adjacent walkways, and reduced complexity for integration with the Station and the North-Side Terminal. However, a ground-level structure would obstruct roadways, requiring re-routing of surface transit, or under/overpass construction. An elevated structure would require greater technical and infrastructure considerations, and is thus costlier. However, it would preserve the flexibility of surface-level mobility with a minimal footprint.

As discussed above, the plans for the moving walkway – as well as the terminal relocation – will need to be closely coordinated with land use developments adjacent to the train station, the Ronkonkoma South, which should redevelop the existing park-and-ride lots south of the tracks.

Cost Estimate

The total capital expenditures the moving walkway equipment are expected to reach approximately $15 million. This figure includes the purchase and installation of walkway equipment. This figure does not include the costs of relocating the terminal itself. Due to the high level of uncertainty regarding the range of construction options, it also excludes any elevated structures, tunnels, or other features required for integration with the new terminal.

The annual operating costs for the walkway may reach approximately $150,000. This cost includes the energy requirements of the walkway as well as maintenance and cleaning.

Cost estimate classification and general assumptions for these figures are outlined at the end of this report.

Environmental Review Effort Assessment

Regulations will not permit an environmental review of this option to be segmented apart from the proposed development of the future North Side passenger terminal. Environmental review procedures are anticipated to evolve during the 20-year time frame anticipated to plan, design, fund and construct this facility. The summary below sets out environmental review considerations in line with current regulations.

It is assumed that this project will only take place with Federal funding, from different agencies, as well as other sources at different levels of government. A NEPA review would be required, and a Federal Lead Agency would need to be identified to determine NEPA documentation format. A detailed Design Report and Environmental Assessment (DR/EA) would be required.

The DR/EA may also serve as the SEQR document. It is anticipated that there would be multiple SEQR Involved Agencies, so a coordinated review will be necessary. The DR/EA will be subject to a Public Hearing, and depending on the requirements of the eventual Federal NEPA Lead Agency, public information meetings may also be required.

Per current development plans, it is anticipated that that trees or other natural vegetation would need to be cleared. Depending on the season of clearing, surveys for the Northern Long-eared Bat (NLEB) may be required. Other than the NLEB, it is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. Preliminary review indicates a federally regulated wetland may be present on the airport property that will need to be avoided. Under federal wetland regulations, there is no regulatory boundary beyond the limits of the wetland. There are no surface waters or State regulated wetlands in the vicinity.

The project is within in a Sole Source Aquifer Area. If any new pavement is proposed, a groundwater analysis will be required. A State Pollutant Discharge Elimination System (SPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) will be required if the clearing equals or exceeds one (1) acre.

It is anticipated that there are no cultural resources in the vicinity that could be impacted.

Illustrative time and cost considerations are not provided for the moving walkway, as the environmental assessment for this option would need to be undertaken in conjunction with the development of the proposed North Side Terminal.

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7. Next Steps

The completion and delivery of this study is a key component toward the creation of the Long Island Innovation Zone (I-Zone) and to enhancing the local and regional transportation choices in Suffolk County.

Following the completion of this study, the County's next steps include:

Ownership and Procurement of Upgraded Fleet

Two potential options for ownership of the upgraded taxi fleet were identified through this study. The County will investigate and evaluate mechanisms for both public ownership of the taxi fleet with Suffolk County Transit as well as private ownership by the operator by upgrading the vehicular requirements on the Taxi Service Contract with ISP. Based on the review of taxi vehicles – Small Cargo Vans (Nissan NV-200 and Ford Transit Connect) and Mini Vans (Toyota Sienna and Dodge Grand Caravan) are good potential options to explore further.

Selection of Operational Model

Depending on the ownership of the upgraded fleet, the private operator would either operate the County-procured vehicles under the term of lease and service agreement or the private operator would procure the fleet after an update to the taxi service provision contract.

Scoping for Taxi Hailing App

County will look into scoping the electronic hailing solution and potential vendors. This study provided a high-level overview of the electronic hailing and dispatching software systems currently available, which included Flywheel, TaxiStartup, ARRO and Curb.

Design of Ancillary Improvements

If hybrid vehicle is selected for the upgraded fleet, charging stations will have to be procured and installed in at least one of the waiting areas for the taxis. The study recommends installing the charging stations at Ronkonkoma LIRR Station. Other ancillary improvements associated with the upgraded taxi system will include improved wayfinding signage at Ronkonkoma LIRR Station to guide passengers to the taxi curb, and installation of video screen near the taxi station, providing up-to-date flight information.

Coordination with the Master Developers & Other Stakeholders

For the mid-term implementation plan, the County will coordinate with the master developers for the Ronkonkoma Hub and Ronkonkoma South, Airport and MTA to finalize the location and design of the shuttle stations, driver layover areas and bus depot; and to define the operational service plan.

Appendices

Appendix A.

Mode Book

Upgraded Taxis

New York City Hybrid Taxi, New York, NY (Image source: Karthik T J, Wikimedia)

Overview

Upgraded fleet for-hire vehicles offer rides for individual passengers or small groups. Rides are summoned by hailing a taxi parked at a stand or driving by.

Precedents

Many airports around the country advertise taxi services that connect terminals with rail stations. Examples include Trenton-Mercer, Long Beach, Harrisburg, and New Haven.

At MacArthur Airport

Orientation to pick-up areas would be facilitated by signage at Ronkonkoma Station. Service awareness and convenience of transaction would be improved with updated LIRR ticket vending machines and app.

Upgraded Taxis

Taxis are the current mode of connection between Ronkonkoma Station and MacArthur Airport. Village Taxi drives LI MacArthur-bound passengers from Ronkonkoma Station for a flat fare of $5.00 per person. At the airport, the taxi stand is located outside the baggage claim area.

Upgraded taxi service would offer an improved user experience without structural changes to operational schemes and infrastructure. After updates, LIRR ticket vending machines and app would recommend the purchase of the taxi voucher after user selection of Ronkonkoma as a destination. At Ronkonkoma Station, wayfinding and ease of orientation would be improved with more conspicuous signage guiding to the taxi stand.

An upgraded taxi fleet would have new vehicles to offer passengers a more comfortable ride. Cars would be branded as LI MacArthur connector, and would offer amenities such as A/C and USB charging ports. This managed fleet would ensure vehicles are available at Ronkonkoma Station at train arrival times, to make sure passengers complete their journeys to the airport without delay.

Delivery Time Frame

< 2 years | 2-5 years | 5 years +

Costs

Capital Expenditures
$200K-$1M

Operating Costs
$5 per passenger

- Users must leave the train station to reach the taxi waiting area
- Service has lower capacity than mass transit alternatives

Transportation Network Companies (TNCs)

Lyft Driver in Washignton, DC (Image source: Flickr User Perspective)

Overview

Also known as “ride-hailing” services, companies like Uber and Lyft provide customers the ability to arrange a ride using a GPS-enabled smartphone.

Precedents

Local agencies in Dallas, Los Angeles, Pinellas County, FL and Centennial, CO have developed pilot programs to enhance local transit through partnerships with TNCs.

At MacArthur Airport

Users would request rides between a designated location at terminal and the train station using their phones. Subsidies could be implemented via a discount code.

TNCs

TNCs, like Uber or Lyft, arrange rides between drivers and passengers using mobile devices. Drivers are independent and do not have scheduled shifts, working hours they deem convenient and profitable. TNCs operate as intermediaries between the drivers and passengers in want of a ride, and do not actively manage the service offer. These companies do, however, manage the pricing schemes and could negotiate special fares for an airport connection. Currently, a TNC ride between Ronkonkoma Station and the airport terminal costs approximately $10.00.

Throughout the U.S., various TNC partnership models have emerged for complementing transit service. With subsidies for the “first and last mile”, TNCs connect users to transit stations and leverage the potential of regional transportation networks. Such arrangements require commitments for minimum service, as the default approach is market-driven supply that may not be as reliable as an airport connector would have to be.

Multiple vehicles categories are offered by TNCs, and they can be equipped to service people with disabilities, or accommodate baggage.

Delivery Time Frame

< 2 years | 2-5 years | 5 years +

Costs

Capital Expenditures
$0

Operating Costs
$10 per ride, depending on arrangement

- Provides flexible, on-demand service
- Not a high-capacity, scheduled service
- May be difficult to share rides

Upgraded Shuttle

LAX Shuttle, Los Angeles, CA (Image source: Flickr User Lucian400)

Overview

A dedicated, upgraded shuttle bus service traveling along fixed routes on fixed schedules.

Precedents

Commonly used where rail or other higher-speed transit services are located on alignments near the airport, such as Boston, San Jose, Fort Lauderdale, and Baltimore.

At MacArthur Airport

A dedicated bus would link the Ronkonkoma LIRR station with the airport terminal. The service would be timed to connect to trains and feature amenities catering to air travelers.

Upgraded Shuttle

Traveling through public roads and mixed traffic, upgraded shuttle buses connect the airport terminal and the train station with no need for capital works. Because Long Island MacArthur would plan, manage and control the service, passengers would always have a shuttle waiting for them at each end of the trip, which would have departures timed to train and airplane arrivals.

Passengers board and off-board at dedicated shuttle stops, fitted with amenities to facilitate passenger comfort, movement and luggage handling.

Travel takes place over public roads along with mixed traffic, and therefore is subject to traffic congestion. Travel reliability could be mitigated by operating a upgraded shuttle on private airport roads to avoid recurring traffic backups and speed degradation.

There is a wide variety in vehicles, passenger amenities, fare policy, and operators, with some shuttles run by the airport themselves (typically contracted out), and others run by local transit agencies who operate the connecting services.

Delivery Time Frame

< 2 years | 2-5 years | 5 years +

Costs

Capital Expenditures
$500K - $1M

Operating Costs
$500K - $800K

- Shuttles can be optimized for air passengers
- Trips subject to traffic congestion on public roads.

Bus Rapid Transit (BRT)

NYC Select Bus Service Vehicle, New York, NY (Image source: Arup)

Overview

Enhanced buses, traveling along dedicated lanes with signal priority, offer reliable, convenient, and fast transit. Systemic operational control ensures high levels of service.

Precedents

Airports with BRT stations include LaGuardia Airport New York and Logan International in Boston. These routes provide service from various neighborhoods to the terminal.

At MacArthur Airport

New BRT stations at Ronkonkoma station and at the airport terminal. Transit signal priority and dedicated ROW along route to Airport.

BRT

Airports with BRT stations include LaGuardia Airport New York and Logan International in Boston. These routes provide service from various neighborhoods to the terminal.

BRT offers a transit system with high flexibility, reliability and convenience. It employs a suite of tools, including state-of- the-art vehicles; dedicated travel lanes, priority at traffic signals; and high-quality station amenities.

A new BRT link for ISP would be approximately 3 miles in length. Stations could feasibly be constructed at the island in front of the ISP terminal building, as well as at Ronkonkoma station. Dedicated transit-way would be constructed on airport property, with transit priority at intersections with public roads. Bus fleets could be outfitted with luggage racks. A typical service pattern for BRT would include 10-15 minute headways, and could link to the proposed Nicolls Road BRT at Ronkonkoma Station. A bus depot would likely be required.

Delivery Time Frame

< 2 years | **2-5 years** | 5 years +

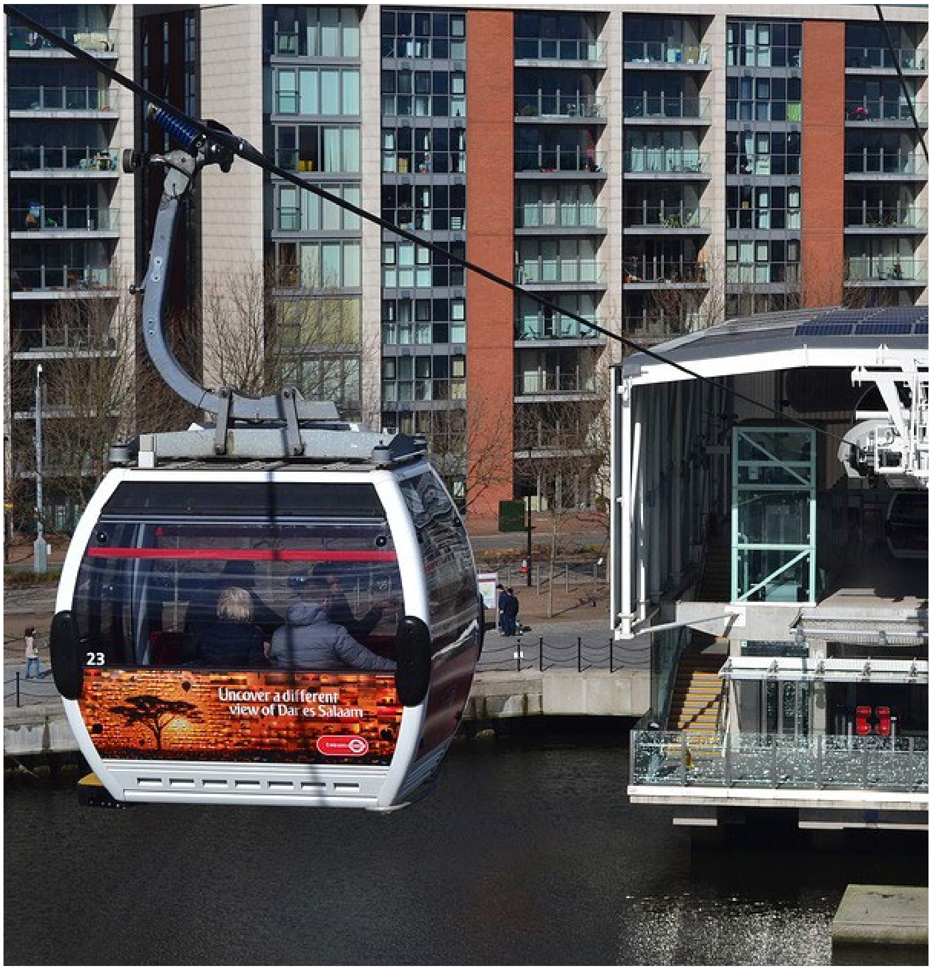
Costs

Capital Expenditures
$40 - $130M

Operating Costs
$500K - $1.5M

- High-frequency, mass transit option
- Fast and reliable travel

Gondola



Emirates Airline Cable Car, London, UK (Image source: Pixabay User NadinLisa)

Overview

Cabins supported and propelled by overhead cables connecting stations.

Used to cross landscapes where ground options are too costly or inconvenient.

Precedents

Portland, Oregon, opened an urban system in 2006.

The EU awarded funds to Genova, Italy, to connect the Erzelli train station and the airport.

At MacArthur Airport

Departing from the south side of Ronkonkoma, the cabins would head southwest and turn south on Smithtown Avenue, reaching the terminal from the west.

Gondola

Gondolas offer a fixed-guideway transit option at lower capital costs than rail modes, and travel with minimum impact to ground level activity. They also have lower operating costs – staff is only present at stations – and, because service is electrified, do not generate local emissions.

Cabling and shifting technologies produce different combinations of cost, capacity, speed and station footprints. Because cabins are not powered, there are inherent climate control challenges. Gondolas also have environmental impacts associated with elevated structures, including shadowing and obstructing view sheds.

While the project is feasible from a technical standpoint, the circuitous alignment to the airport would require four turning stations, increasing capital costs. Some right-of-way may need to be acquired for towers along Smithtown Ave.

To avoid operation with empty cabins, the gondolas can run as needed to match the LIRR schedule.

Delivery Time Frame

< 2 years | 2-5 years | **5 years +**

Costs

Capital Expenditures
$50-$100M

Operating Costs
$750K - $2M

- Fast, reliable travel
- Smooth rides
- Integrated to the track overpass level at Ronkonkoma Station
- Climate control limitations

Light Rail Transit (LRT)

Houston METRORail LRT, Houston, TX (Image source: Arup)

Overview

Rail service that can run in mixed traffic or dedicated right-of-way. Smaller vehicles and lower operating costs than traditional subways or commuter rail services.

Precedents

Light rail is an airport access option at a number of large cities and airports across the US, including Dallas-Fort Worth, Seattle, Minneapolis-Saint Paul, and Saint Louis.

At MacArthur Airport

A light rail connecting a station within the terminal to Ronkonkoma Station and potentially points beyond. The vehicle would have level boarding and luggage racks.

LRT

Light rail has been used at a number of airports in the United States, as it often represents a compromise between speed from the city center to the airport and ridership demands.

The footprint for a light rail right-of-way, its stations, and ancillary facilities often allow a light rail station to be built directly into a terminal. Passengers, both airport and non-airport, tend to view light rail as a fast, predictable, and easy to use form of transit.

LRT can serve as an impetus for development, as it represents a permanent investment in a particular corridor. LRT has long design and construction times, and high investment costs, and does not allow quick changes in its routes and services.

It is preferable that LRT has dedicated right-of-way in order to maintain fast and reliable service. The alignment must be determined through careful study, including land ownership and height restrictions related to runway proximity. This may include routing on public roads, through airfield property, or underground depending on regulatory requirements.

Delivery Time Frame

< 2 years | 2-5 years | **5 years +**

Costs

Capital Expenditures
$250 - $350M

Operating Costs
$1.5 - $5.5M

- Can be optimized for passenger use
- Fast and comfortable

Personal Rapid Transit (PRT)

Heathrow Airport ULTra PRT Pods, London, UK (Image source: thetransportpolitic.com)

Overview

Small autonomous vehicles providing on-demand pointto-oint service along a fixed guideway.

Precedents

Limited. System in operation at London-Heathrow between Terminal 5 and its parking garage. Four similar small-scale systems operating worldwide.

At MacArthur Airport

A PRT would connect the terminal to Ronkonkoma Station and potentially other points. The PRT vehicles would travel on demand and have full passenger amenities.

PRT

PRT offers a very high-quality trip in situations where demand is not great enough to justify a higher capacity form of transit. The capital costs are not as high as would be encountered with any form of rail service, but still requires right-of-way acquisition, environmental clearance, and guideway construction.

The guideways must be separate from any public accessible right-of-way, and would exist either alongside public roads or within the airport property.

PRT's small vehicles and small fleet provide a specific mobility solution, but cannot be considered mass transit. The lack of worldwide PRT examples means that each system is a bespoke design with significant capital expenditure and high costs per passenger. The relative rarity of PRT means that reliance on it as a primary transportation solution should be considered experimental.

By the time a PRT system has been approved, constructed, and commissioned, roadworthy autonomous vehicles may be deployed, rendering the PRT largely obsolete.

Delivery Time Frame

< 2 years | 2-5 years | 5 years +

Costs

Capital Expenditures
$150M - $450M

Operating Costs
$500K - $3M

- Private vehicle comfort
- Very advanced technology

Automated People Mover (APM)

JFK AirTrain, New York, NY (Image source: Flickr User Kaspar Metz)

Overview

APM is a grade-separated mass transit system with full automated, driverless operations, featuring vehicles that travel on guideways with an exclusive right-of-way.

Precedents

APM systems are widely used by airports around the world. There are 51 systems in operation. The number of APMs has more than doubled in the 21st century.

At MacArthur Airport

An APM would connect the terminal to Ronkonkoma Station.

APM

Due to their high reliability and distinct image, people movers create the perception of arrival at the airport at the moment passengers board the trains. Passengers experience a smooth and comfortable ride in vehicles designed with air travelers in mind, offering ample accommodation for baggage to be checked and other carry-on items. A feature familiar to many of the world major airports, people movers enhance the airport's image and brand.

People movers' trains travel through exclusive guideways completely segregated from other forms of traffic. The guideway can be laid within airport property (either at ground level or below grade with a tunnel or underpass), or over public roads with an elevated structure. Trains are electrically powered, and energy is supplied by a power distribution subsystem. While the trains are automated and driverless, the system requires a staffed control center, and a maintenance and storage facility.

An alignment that circumvents the airport site would be elevated, with land take for a supporting structure. Crossing the airport site, the trains would travel at grade or through an RPZ underpass.

Delivery Time Frame

< 2 years | 2-5 years | **5 years +**

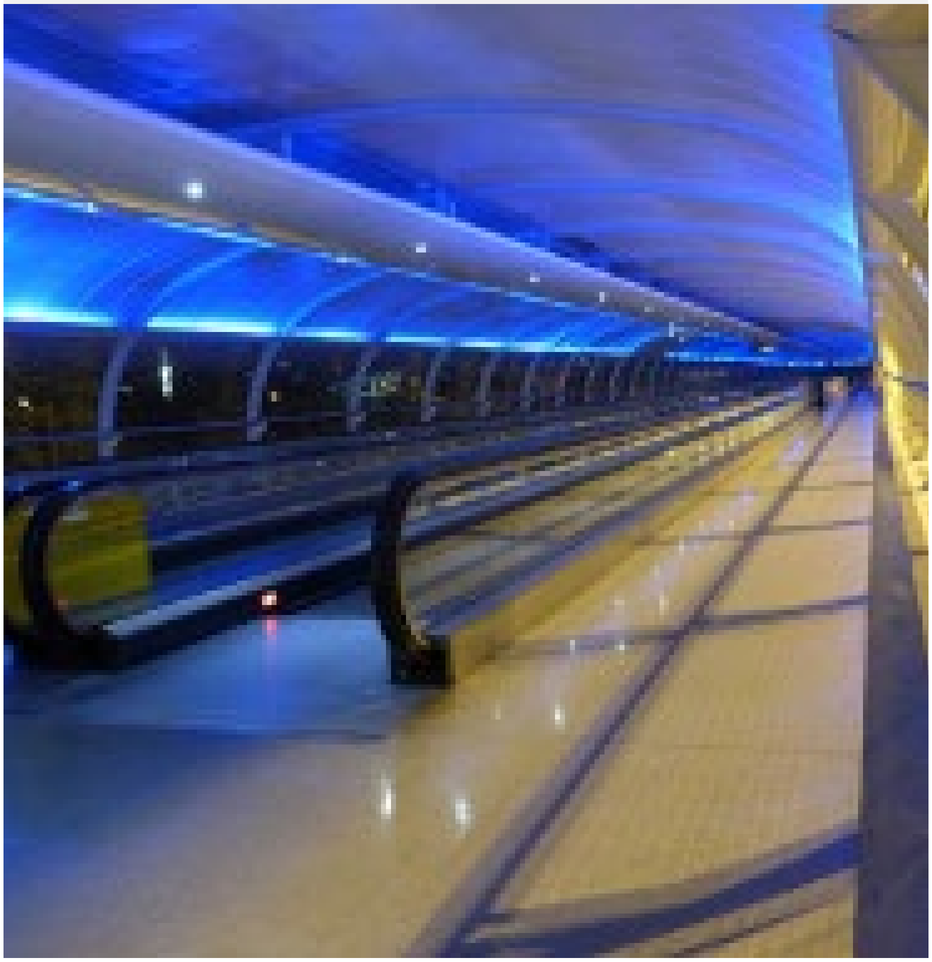
Costs

Capital Expenditures
$250M - $650M

Operating Costs
$1.5M - $3.5M

- Fast, reliable travel
- Smooth rides
- Station integration to the train station and MacArthur terminal.

Moving Walkways



Moving Walkway in Manchester, UK (Image source: G. Hogg, geograph.org.uk/photo/4263645)

Overview

A moving walkway is a slow-moving conveyor mechanism that transports people across a horizontal or inclined plane over a short to medium distance.

Precedents

Walkways are present on a large number of airports. The longest planned walkway is at Boston Logan International Airport, with 2,640 ft. Federal guidance advises distances up to 1,500 ft.

At MacArthur Airport

A covered, climate-controlled, moving walkway to connect the terminal with a nearby transportation facility as part of an overall solution for a connection with the LIRR.

Moving Walkway

Moving walkways are used widely at airports. IATA suggests a maximum unaided passenger walking distance of 985 feet; moving walkways increase the appropriate distance up to 2,133 feet. The longest moving walkway yet proposed is 2,640 feet, and would connect Terminal E at Boston Logan International Airport with the Blue Line's Airport Station.

In the long-term, and contingent on a relocated north side terminal at LI MacArthur Airport, a moving walkway could be an appropriate integrated transportation solution for the airport.

It may be desirable to locate new transportation facilities adjacent to the existing airport terminal or LIRR station, rather than directly at the entrances. In this case, a moving walkway could improve the overall passenger experience by reducing the effort and time required to walk between the LIRR, the new airport link, and the terminal.

While generally inexpensive to operate, walkways can breakdown, requiring repairs, and should be located within an interior structure with climate control. A new entrance to the existing terminal might be required to interface with the walkway alignment.

Delivery Time Frame

< 2 years | 2-5 years | 5 years +

Costs

Capital Expenditures
$15M - $40M per 1,000 ft

Operating Costs
Walkway - negligible

- Solution can be combined with other transportation modes to improve mobility at terminal and stations

Streetcar

Streetcar in Portland, OR (Image source: M.O. Stevens, Wikimedia)

Overview

Streetcars are electric, rail vehicles, operating in mixed-traffic and on tracks embedded in the pavement. Station design is similar to a high quality bus stop.

Precedents

Many cities throughout the US use heritage and modern streetcars, including Portland, OR, Seattle, WA, Washington, DC, and Boston, MA. None reviewed connect to airports.

At MacArthur Airport

Streetcars running between terminals constructed at LIRR station and adjacent to Airport terminal

Streetcar

Streetcars are rail vehicles typically operated in a single-unit configuration over tracks embedded in asphalt or concrete roadway in mixed traffic. Streetcars are propelled by electric motors, powered by overhead wires, and thus do not produce local emissions.

Streetcars have operating speeds similar to buses, but have larger cars that are able to carry more passengers (90-200+) and which provide a smoother, quieter ride than buses. Because the quality of streetcars is perceived as higher than bus systems, they have higher economic development impact on its surroundings. Streetcars have shallow track foundations that require limited relocation of utilities, and require little additional communications and signaling infrastructure.

A streetcar system could be added to existing roadways around the airport, or through the east side of the airfield, with termini at Ronkonkoma Station and a station near the terminal. Overhead wires may be a concern. Tail tracks or turnarounds would be required at both ends to change direction.

Delivery Time Frame

< 2 years | **2-5 years** | 5 years +

Costs

Capital Expenditures
$150M - $250M

Operating Costs
$1M - $4M

- Streetcars are perceived as a high-quality solution by users
- Capable of handling high ridership volumes without major capital projects

Appendix B.

Existing Conditions and Connection Modes Identification Memo

Memorandum

ARUP

To	Lou Bekofsky, Deputy Commissioner, SCEDP Ankita Rathi, Planner, SCDEDP	Date March 19, 2018
Copies		Reference number
From	Denis Mani, Arup Kelly Peterson, Arup Andrew Kay, Arup	File reference
Subject	Ronkonkoma Long Island Rail Road Station / Long Island MacArthur Airport (ISP) Train-to-Plane Connectivity Study – Summary of Existing Conditions, Purpose and Needs Assessment and Connection Modes Identification	

1 Existing Conditions

1.1 Context

1.1.1 Air Travel in the New York Region

The commercial air travel market in the New York region is the nation's busiest, moving over 100 million passengers annually. Ninety-five percent of this traffic is served by the region's three large hub airports: John F. Kennedy International (JFK), Newark Liberty International (EWR), and LaGuardia Airport (LGA) (Figure 1). These three airports combined have the highest percentage of flights delayed in the U.S., a consequence of operating close to capacity, with high demand and congested airways.

Long Island MacArthur Airport (ISP), on the other hand, serves just over 1 million annual passengers, and has available capacity. Additional service at LI MacArthur Airport could boost the economy of Long Island, improve regional air capacity, and relieve air traffic congestion in the region.

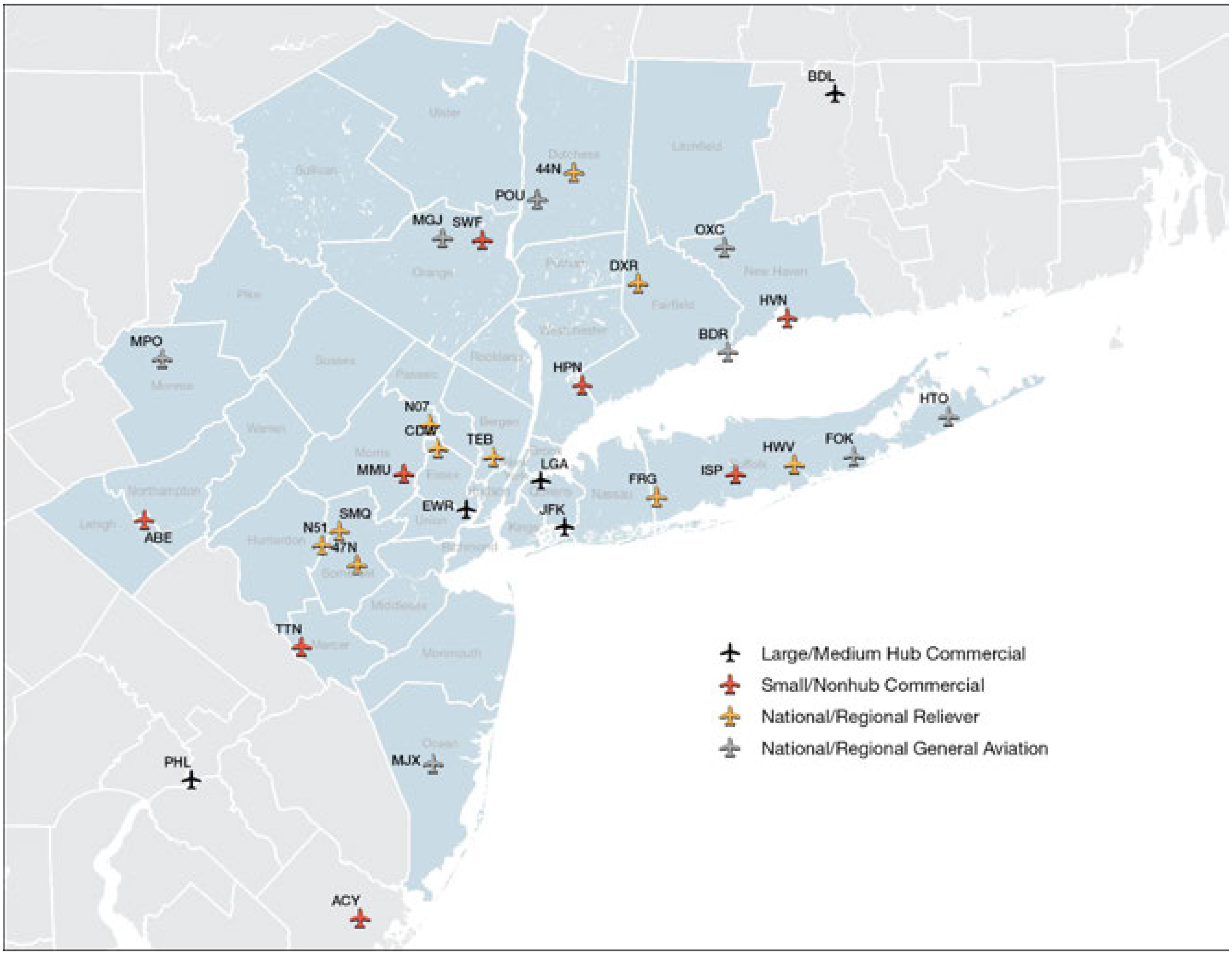


Figure 1: Commercial primary and non-primary airports in the New York region.[1]

1.1.2 Long Island MacArthur Airport

Long Island MacArthur Airport is located in Suffolk County, and is owned and operated by the Town of Islip. Though it is designated by the Federal Aviation Administration (FAA) as an Official Metro Airport, it is not grouped by the International Air Transport Association (IATA) with JFK, Newark-Liberty, LaGuardia, Stewart International, and Skyport SPB[2] in travel and information searches for New York airports. LI MacArthur Airport has 11 gates and four runways. With 1,311acres, the airport's footprint is twice as large as LaGuardia's (
Table 1).

[1] Data Source: (Federal Aviation Administration, 2017a, pp. Appendix A, 64 - 67), image credits: Arup

[2] Skyport SPB is a seaplane base in the East River, Manhattan. It is a General Aviation airport identified by FAA as 6N7.

Memorandum

Table 1: Key airport metrics for LaGuardia and LI MacArthur

	LI MacArthur Airport[3]	LaGuardia Airport[4]
Footprint	1,311 acres	680 acres
Number of Runways	4	2
Maximum Runway Length	7,006 feet	7,000 feet

The primary catchment area for the airport is Suffolk County, which has a population of 1.4 million people. The secondary catchment is Nassau County on Long Island, which has a population of 1.5 million. The airport's aspirational catchment area includes the New York City boroughs of Manhattan, Queens, and Brooklyn, with a combined population of 6.5 million (Figure 2). Over 1.2 million people live within a 30-minute drive of LI MacArthur Airport, and over 3.8 million people live within a 60-minute drive[5].

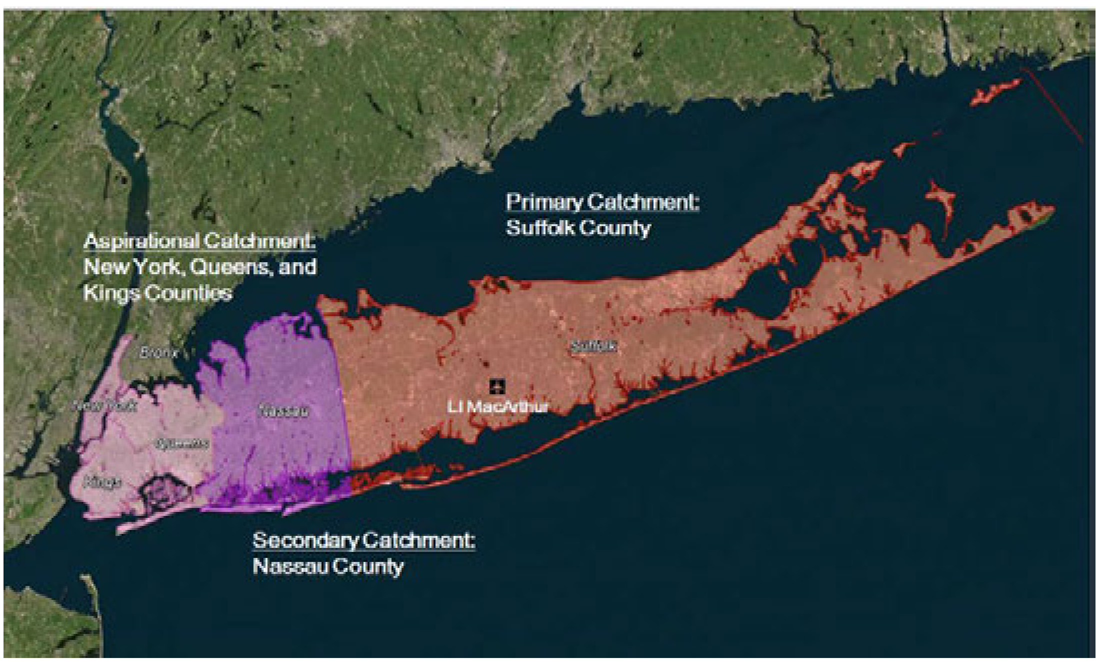


Figure 2: Catchment Areas for LI MacArthur Airport

[3] (Town of Islip, 2017a)
[4] (LaGuardia Airport, 2017)
[5] (U.S. Census Bureau)

1.1.3 Land Use Context

Long Island MacArthur Airport is surrounded by medium- to low-density land uses (Figure 3). The areas immediately to the north and east of the airport are zoned for medium residential density, characterized primarily by single-family homes. North of the LIRR tracks, the transit-oriented development Ronkonkoma Hub is on its first phase of development and should soon break ground.

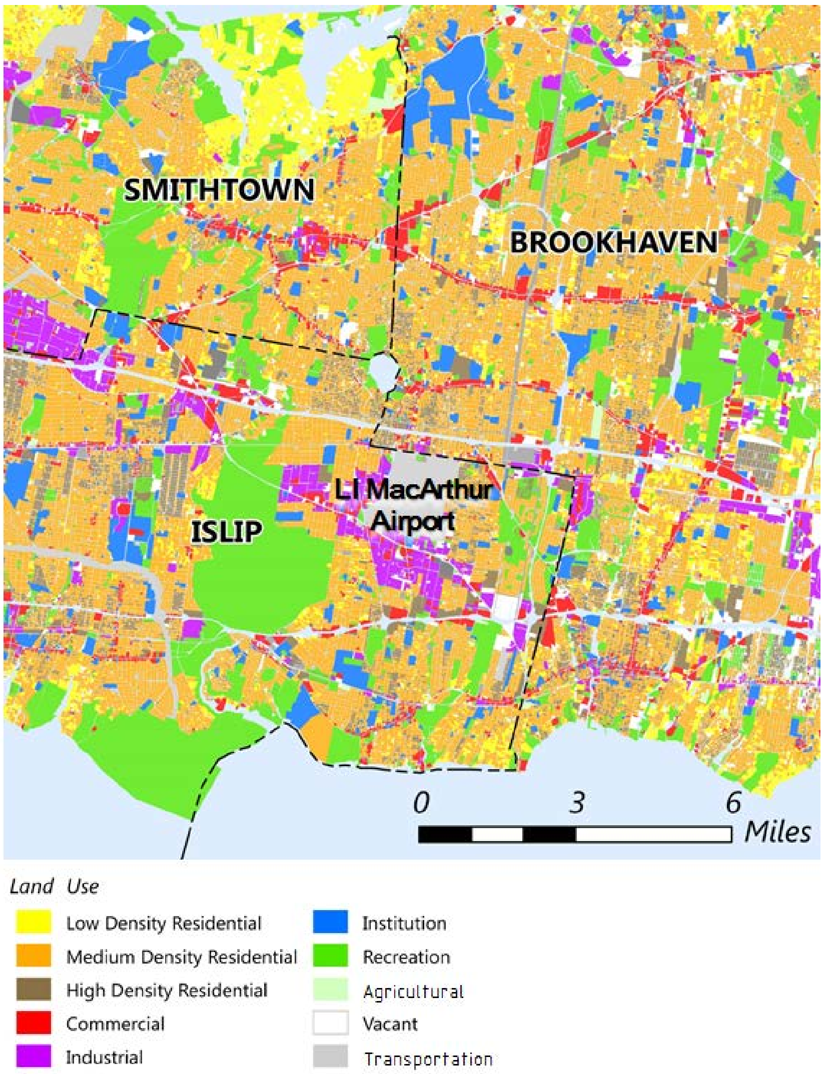


Figure 3: Land Use near MacArthur Airport

To the south and west of the airport there are areas of industrial land use, as well as commercial corridors along key roads, such as New York State Route 112, Middle Country Road, and Portion Road/Horseblock Road. Further away, there are commercial uses at Smith Haven Mall to the north and along Nicolls Road to the east.

1.1.4 Airport Accessibility Context

Long Island MacArthur Airport is situated south of Long Island Expressway (LIE/I-495), close to exits 59, 60 and 61. It is also north of Veterans Memorial Highway (State Route 454). There are 3,449 parking spaces available at the airport, in short- and long-term parking lots.

The airport is also adjacent to the Ronkonkoma Long Island Rail Road (LIRR) station (Figure 4). Ronkonkoma Station is a 78-minute train ride from Penn Station in Manhattan, on average at peak hours.[6] The station sees over 17,000 daily riders[7]. There are 5,897 parking spaces at the train station and over 700 feet of curb space for bus and taxi pickup and drop-off.

Figure 4: Ronkonkoma Station

The airport's passenger terminal is located on the opposite side of the property from Ronkonkoma Station, a 15-minute drive on local streets (Figure 5). Through an agreement between LI MacArthur Airport and Village Taxi, a shuttle service from the station to the terminal is available for a $5 fee per rider. Rides with Transportation Network Companies (TNCs) cost on average $10 per trip. The station is also served by Suffolk County Transit's S57 bus route, connecting it to Sayville to the south and

[6] (MTA Long Island Rail Road, 2017)
[7] (Suffolk County Department of Economic Development and Planning, 2014a, p. 23) and (Town of Brookhaven Department of Planning, Environment and Land Management, 2011, p. 2) (Suffolk County Department of Economic Development and Planning, 2014b)

Smith Haven Mall to the north. Public transit bus service, however, only runs once an hour in each direction and schedules are currently not coordinated with LIRR train arrivals or departures.

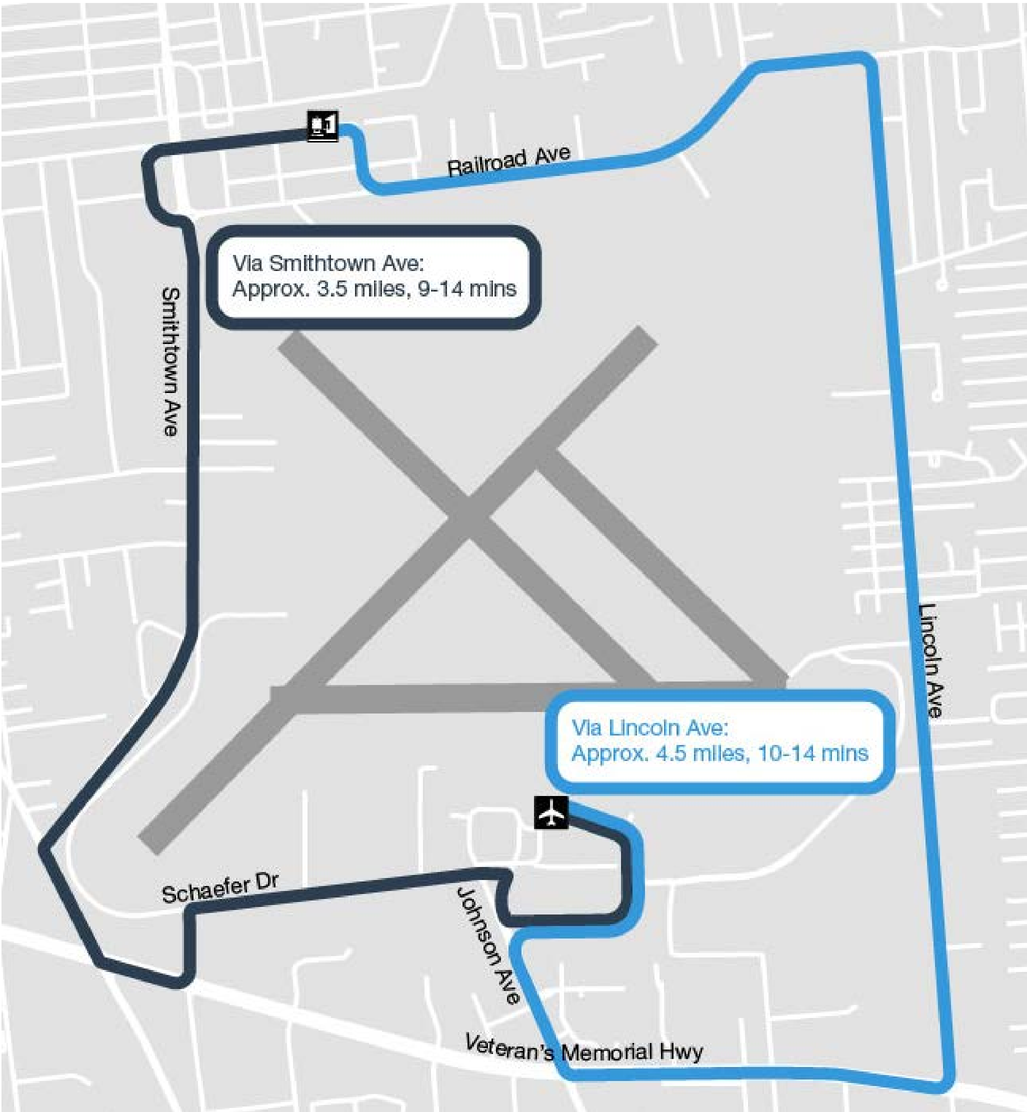


Figure 5: Driving times from Ronkonkoma Station to LI MacArthur Airport

1.2 Air Traffic

1.2.1 Commercial Service

Currently, LI MacArthur Airport is served by three commercial carriers: Southwest Airlines, Frontier Airlines, and American Airlines.

Southwest offers daily nonstop flights to the following destinations:

- Baltimore–Washington International, MD (BWI)
- Fort Lauderdale, FL (FLL)
- Orlando, FL (MCO)
- Tampa, FL (TPA)
- West Palm Beach, FL (PBI)

American Airlines currently offers daily nonstop flights to Philadelphia, PA (PHL) (Figure 6).

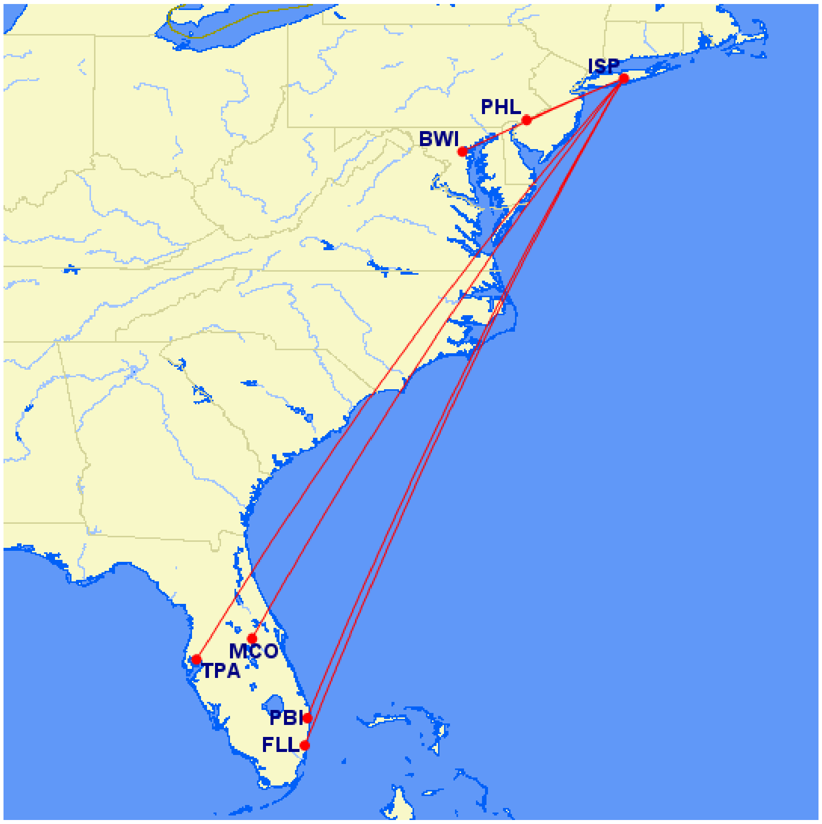


Figure 6: Southwest Airlines and American Airlines destinations

Frontier Airlines operates two daily nonstop flights to Orlando, FL (MCO), and will begin service to the following locations over the next year (Figure 7):

- Miami, FL (MIA)
- Tampa, FL (TPA)
- West Palm Beach, FL (PBI)
- New Orleans, LA (MSY)
- Fort Myers, FL (RSW)
- Atlanta, GA (ATL)
- Chicago O'Hare, IL (ORD)
- Detroit, MI (DTW)
- Minneapolis-St. Paul, MN (MSP)

Memorandum

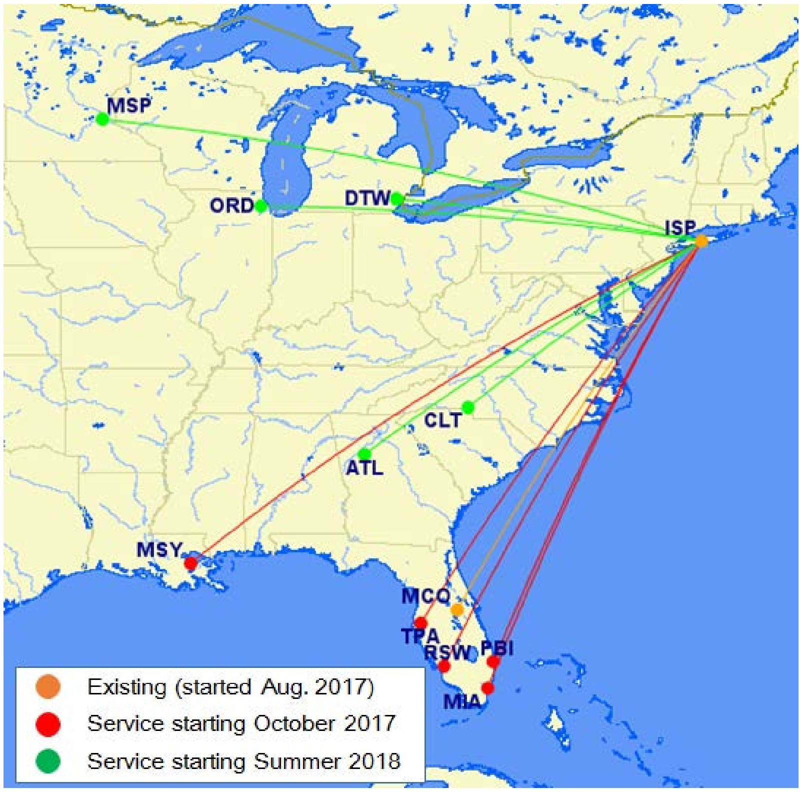


Figure 7: Frontier Airlines destinations

1.2.2 Airport Customers

Currently, the airport caters mostly to passengers with an origin or destination in Suffolk County. According to a 2005 passenger survey, over 93% of passengers departing from the airport started their journey on Long Island. Of these passengers, 79.9% came from Suffolk County and 13.9% came from Nassau County. The remaining 6% of surveyed passengers began their journey in Manhattan. The survey also found that 81% of these passengers were travelling for non-business reasons, and about 55% were finishing a visit to Long Island.[8]

Customers seek nonstop flights for added convenience and time savings. According to a 2016 survey, 1.2 million passengers used LI MacArthur Airport for nonstop flights during that year. This represents an 87% share of all nonstop traffic in LI MacArthur Airport's trade territory. In other words, 87% of airline passengers seeking nonstop flights in the airport's trade territory chose to fly through MacArthur Airport. In the territory competitive with LaGuardia, 37% of passengers seeking nonstop flights chose MacArthur.[9]

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[8] (Federal Aviation Administration, 2007a)
[9] (Lex Volo / Ailevon Pacific Study)

1.2.3 Potential Market

Among other factors, the number of destinations served by nonstop flights limits passenger growth at LI MacArthur Airport, since potential passengers can drive to JFK or LaGuardia for more nonstop alternatives. An expansion of nonstop flights to and from LI MacArthur Airport has the potential to attract more passengers from the region seeking the convenience of nonstop flights.

Long Island MacArthur Airport has an international customs processing center that handles its international arrivals, which amount to 200 per year. This space, however, dos not meet the last update of U.S. Customs and Border Protection (CBP) facility requirements, and therefore is slated for rehabilitation and expansion in 2019, to bring it up to the latest CBP standards. The renovated space will be fit for processing both general aviation and scheduled airline passengers. This will allow LI MacArthur Airport to market potential carriers to provide international flights to Canada, Mexico, and the Caribbean, greatly expanding the airport's potential markets.

1.2.4 Demand Growth and Potential Benefits

With Frontier Airlines as a new carrier, which opened service in 2017 and plans to add four additional nonstop destinations in 2018, LI MacArthur Airport should increase its number of annual passengers. Even with this increase, the airport will remain operating at a good level of service; the airport master plan 2017 update allows the airport to handle an additional 92% of passenger volume, reaching a total of 1,165,700 enplanements in 2037. The success of LI MacArthur Airport in growing service and attracting demand over the years would not only benefit Suffolk County, but also the New York region as a whole.

It has long been identified by the industry that the core New York Region airports operate at congested levels and will struggle to handle the region's increase for air traffic demand. As early as 2007, the FAA indicated that "It is widely accepted that at some point in the future, John F. Kennedy International (JFK), Newark Liberty International (EWR), and LaGuardia Airport (LGA), will ultimately exceed their capacity to accommodate the demand for commercial air service in the NY/NJ metropolitan area"[10]. In 2011, the Regional Plan Association (RPA) issued a report on the state of the region's air traffic, and stated that "Today, the region's three airports rank 1st, 2nd and 3rd for worst delays in the nation, a product of more flights that the region's constrained airports and airspace can handle. While delays at most airports in the nation averaged about 10 minutes, takeoff and landing delays at each of our airports exceeded an average of 20 minutes per flight.[11]" Both reports pointed out that Long Island MacArthur would have a positive impact in the region by absorbing demand that would otherwise strain JFK and LaGuardia, and the RPA study went as far as stating that, under certain conditions of expanded passenger service, LI MacArthur could attract between 645,000 to 1,407,000 annual passengers from the region's major airports[12].

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[10] (Federal Aviation Administration, 2007a, pp. I-1)
[11] (Zupan, Barone, & Lee, 2011, p. 11)
[12] (Zupan, Barone, & Lee, 2011, p. 75)

Nowadays, the region's problems not only persist but are aggravated. In its latest report on airport capacity needs, FACT3, issued in 2015, the FAA indicated that by 2020 "Delays at LGA and JFK are expected to increase to severe levels, exceeding the FACT3 criteria significantly"[13], even if near-term improvements are implemented. Currently, the FAA places limitations on JFK's and LGA's schedule, as it finds that they are capacity constrained and improvements to manage capacity are not feasible in the near future[14]. FACT3 also recognizes the challenges in building new runways at JFK and LGA, and encourages initiatives that consider a regional solution for the New York region air travel market. At this year's State of the State address, Governor Cuomo recognized the demand and capacity issues at JFK, and stated that "As early as the mid-2020s, JFK demand will exceed capacity by up to three million passengers annually". At the same speech, the Governor reiterated his commitment to improving Long Island, and proposed investments to connect the LIRR to MacArthur Airport[15].

The positive role that LI MacArthur Airport plays in the New York Region has also been identified by the Long Island's business community, and the LI MacArthur Airport's administration. In 2015, the Long Island Economic Development Council met with councils from New York City and Mid-Hudson, and "…the greater utilization of our transportation infrastructure, such as the Stewart Airport in Mid-Hudson and the MacArthur Airport on Long Island, to alleviate some of the volume from New York City."[16] Long Island MacArthur Airport expressed a similar point of view, first in 2014: "ISP is seeking to continue its efforts to develop air service that is complimentary to air service at LGA and JFK and that provides benefits to the airlines, the passengers, the region's airport operators and the region's economy" [17], and again in 2017: "L.I. MacArthur Airport's proximity to New York City and nearby access to a mass transit connection makes the airport a logical alternative as a reliever for domestic and international demand as John F. Kennedy International and LaGuardia Airport reach capacity."[18]

The increase in service at Long Island MacArthur would also directly benefit Suffolk County and its communities. The Town of Islip Industrial Development Agency Executive Director, in 2014, stated "The growth of air service at ISP is critical to the economic development of the Town if Islip, Suffolk County and the Long Island region" and "Recent economic impact studies for ISP and other similar US airports have shown that increases in passenger traffic at airports such as ISP provide direct increases in jobs, payroll and economic activity in the region". [19] At its Master Plan issued in 2014, Suffolk County pointed out that "The full potential of MacArthur Airport to serve as an important economic engine for the region remains untapped", and identified proximity to airport as one of criteria for prioritizing growth center locations for "advanced manufacturing", and "office areas, including R&D and start-up space". [20]

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[13] (Federal Aviation Administration, 2015, p. 15)
[14] (Federal Aviation Administration, 2017b)
[15] (Cuomo, 2017, pp. 37, 43)
[16] (Long Island Regional Economic Development Council, 2015, p. 48)
[17] (Long Island MacArthur Airport, 2014, p. 11)
[18] (AECOM, 2017, p. 5)
[19] (Mannix, 2014)
[20] (Suffolk County Department of Economic Development and Planning, 2014b, pp. A-159, B-40 - B-48)

Long Island MacArthur Airport has lower cancelation rates and higher on-time performance than either JFK or LaGuardia. Fares at those airports are also considerably higher than at LI MacArthur Airport: 16% higher at LaGuardia and 45% higher at JFK.[21] A passenger at LI MacArthur Airport will likely spend less time getting to the airport, less time at the airport, and less money on their flight than if they had gone to an airport in New York City.

1.3 Long Island MacArthur Airport Site Plans

Long Island MacArthur Airport currently has one terminal that has 10 active gates and 7 remote loading positions. The terminal was built in 1966 and expanded in 1999 and 2006. The airport has four runways and two helipads, and covers a footprint of 1,311 acres within the Town of Islip. In addition to commercial service, the airport has general aviation and U.S. Army Guard facilities.

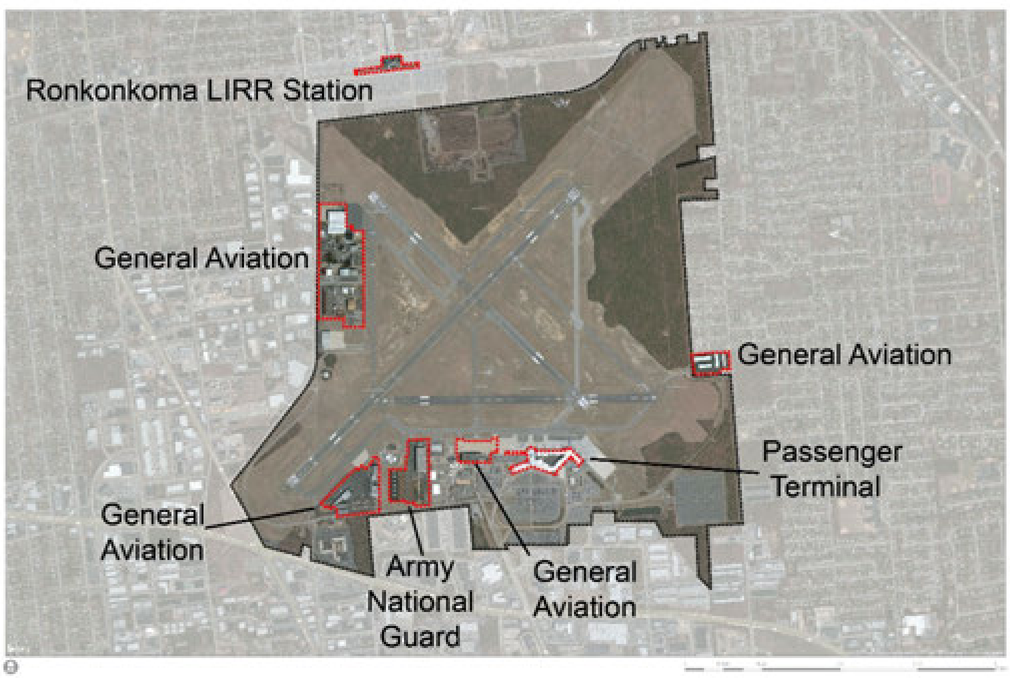


Figure 8: Long Island MacArthur Airport's key facilities and Ronkonkoma LIRR station

Long Island MacArthur Airport plans to build a new ground Transportation Facility on the east side of the property to consolidate and support car rental operations, taxis, and other ground transport services. This facility is scheduled to be constructed in 2018. Currently, car rental services are available outside of the baggage claim area from Alamo, Budget, Avis, Hertz and Enterprise. The taxi pickup/drop-off location and the local bus stop are both located on the curb outside of the baggage claim area.

[21] (Town of Islip, 2017b)

1.3.1 Planned and Proposed Improvements

2017 Master Plan

The length of the current runways limit the planes that can use the airport. At these lengths, international flights to Mexico, Caribbean, and Canada could be operated without restrictions but only the new generation of narrow-body aircraft, such as 737MAX or A321neoLR, could fly to Europe. These types of aircraft, however, would face a reduction in payloads, possibly restricting passenger loads. The only aircraft that can currently fly transatlantic from LI MacArthur without a payload restriction is the Boeing 757-200.

Runway extensions could eliminate any payload restrictions and potentially attract international ultra-low-cost carriers. Since minimum takeoff lengths vary by carrier and aircraft performance, only the airlines can indicate the minimum runway lengths required to operate to specific markets.

The 2017 Long Island MacArthur Airport Master Plan proposes extending the two main runways. Runway 6/24 would be lengthened from 7,006 feet to 7,500 feet, and runway 15R/33L would be lengthened from 5,186 feet to 7,000 feet. Runway 15L/33R would remain at its current length of 3,175 feet, and runway 10/28 would be converted into a taxiway (Figure 9).[22]

[22] (Town of Islip, 2017a)

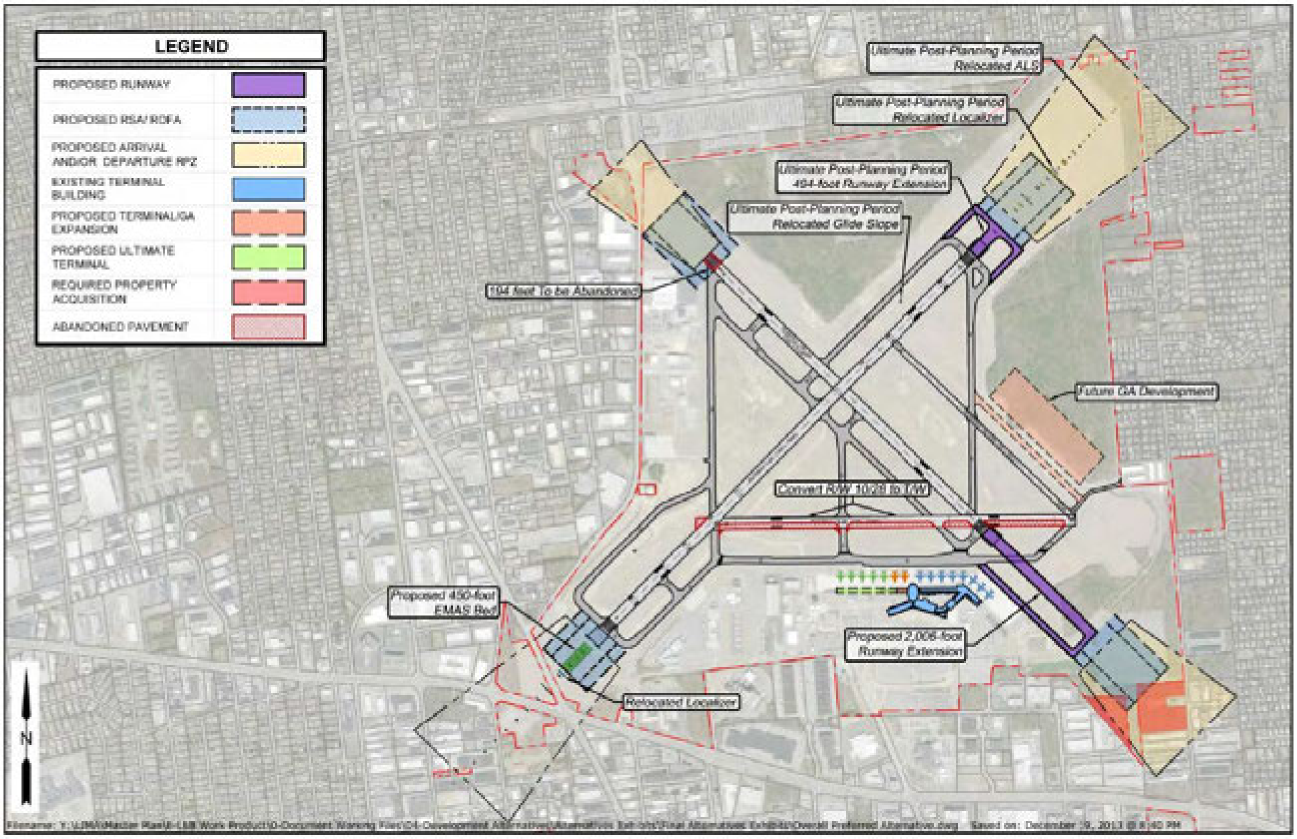


Figure 9: 2017 LI MacArthur Airport Site Master Plan

Capital Improvement Program

Long Island MacArthur Airport has $50.1 million in capital improvements programmed for the fiscal years 2018 through 2023, of which most are airfield improvements[23]. The program funds come from federal, state, and local sources. In relation to plans for runway extension, the LI MacArthur Airport Administration stated:

> "The Federal Aviation Administration can only support and provide federal funding for runway extensions based on need. At this time, Long Island MacArthur Airport has adequate runway length and capacity to accommodate the type of aircraft using the airport in 2017. Prospective carriers over the past years have commented on the runway length available. It is in the best interest of the airport and Town, to prepare for future air carriers that require additional runway length to serve new markets. The airport will seek capital funding to conduct a feasibility study to determine which runway should be extended and how much length is necessary to support future prospective operations."

[23] (Long Island MacArthur Airport, 2017a)

Replacement Customs Facility

A replacement U.S. Customs and Border Protection facility is set to open in 2019 in the central terminal area. This facility will allow the airport to continue to accommodate international general aviation, and to serve the needs of scheduled international airline flights, should they arise.

1.4 Long Island MacArthur Airport Accessibility

1.4.1 Personal Vehicle Access

Ninety-three percent of households in Suffolk and Nassau Counties have access to at least one vehicle, and 63% have access to more than one vehicle. Vehicle ownership rates in New York City, though, are very different. City households are far more reliant on transit and taxis. In Queens, only 62% of households have access to at least one vehicle, in Brooklyn just 44%, and in Manhattan only 22%.[24]

Over 1.2 million people live within 30 minutes of LI MacArthur Airport by car, under weekday peak hour traffic conditions. An additional 2.5 million residents are between 30 minutes and 1 hour of auto travel under the same travel conditions (Figure 11).[25]

Long Island MacArthur Airport is served by a robust local and state road network. Four major roadways in the immediate vicinity provide connections to communities across Long Island. The Long Island Expressway is a limited-access highway extending from Queens to Riverhead. Sunrise Highway, a component of New York State Route 27, is a limited-access highway from Queens to the Shinnecock Canal. Veterans Memorial Highway is a four-lane divided arterial from Commack to Patchogue. Nicolls Road, a four-lane limited access arterial, is the main north-south connection in central Suffolk County and is a key employment corridor in the county (Figure 10).

[24] (U.S. Census Bureau)
[25] Population information from (U.S. Census Bureau), travel time analysis by Arup with Google Maps API.

Memorandum

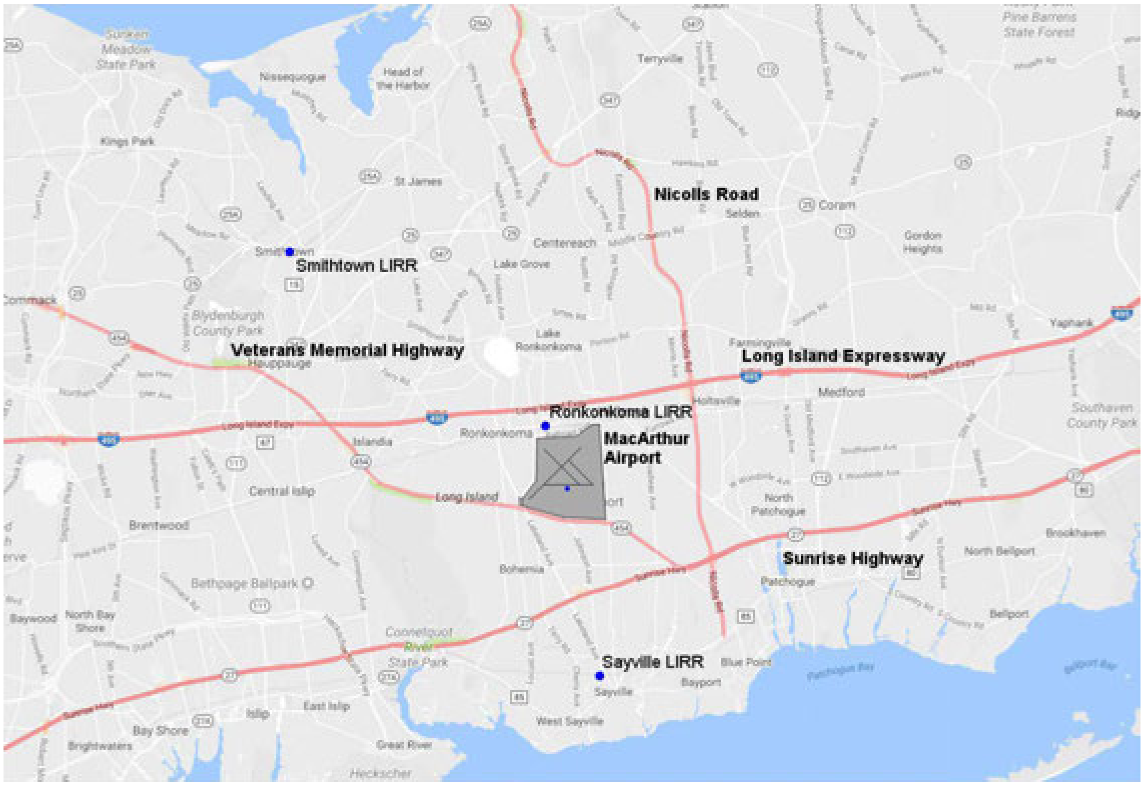
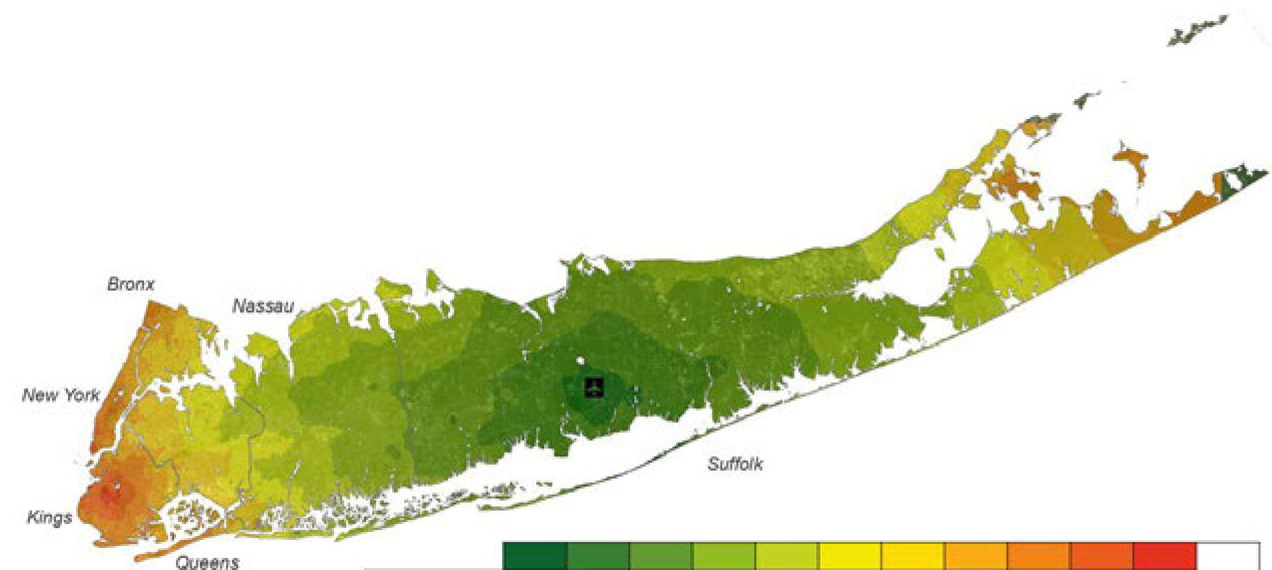


Figure 10: Major Roadways near LI MacArthur Airport



Drive Time (Mins)	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100	101 +	No data
Population (000s)	88.9	509.9	663.4	708.4	732.7	1,116.0	2,274.7	2,023.8	1,844.0	749.8	98.4	0.2
Population (%)	1%	5%	6%	7%	7%	10%	21%	19%	17%	7%	1%	0%
Households (000s)	30.3	158.4	215.7	231.8	249.6	370.6	780.0	771.3	775.3	268.8	30.2	0.1
Households (%)	1%	4%	6%	6%	6%	10%	20%	20%	20%	7%	1%	0%

Figure 11: Drive times to LI MacArthur Airport

New and proposed transit-oriented developments (TODs) in Suffolk County, and denser communities under development within this 60-minute drive shed (Figure 12) will further increase the relative airport accessibility to Long Island residents.

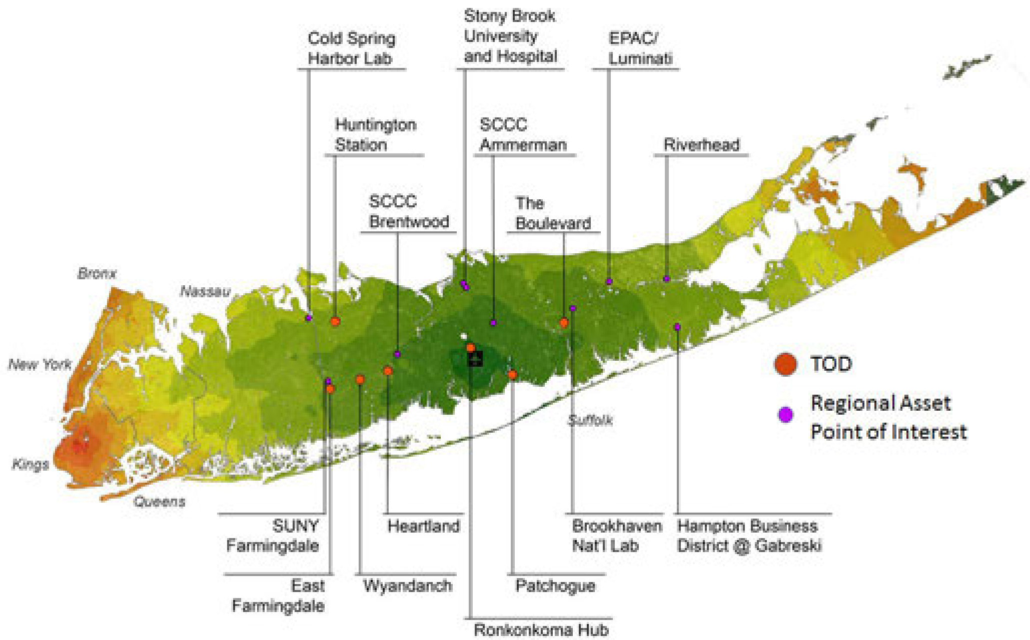


Figure 12: Major Developments in Suffolk and Nassau Counties

There are 3,449 parking spaces available on-site at LI MacArthur Airport (Figure 13), offered at lower daily rates than those at JFK and LaGuardia.

Memorandum

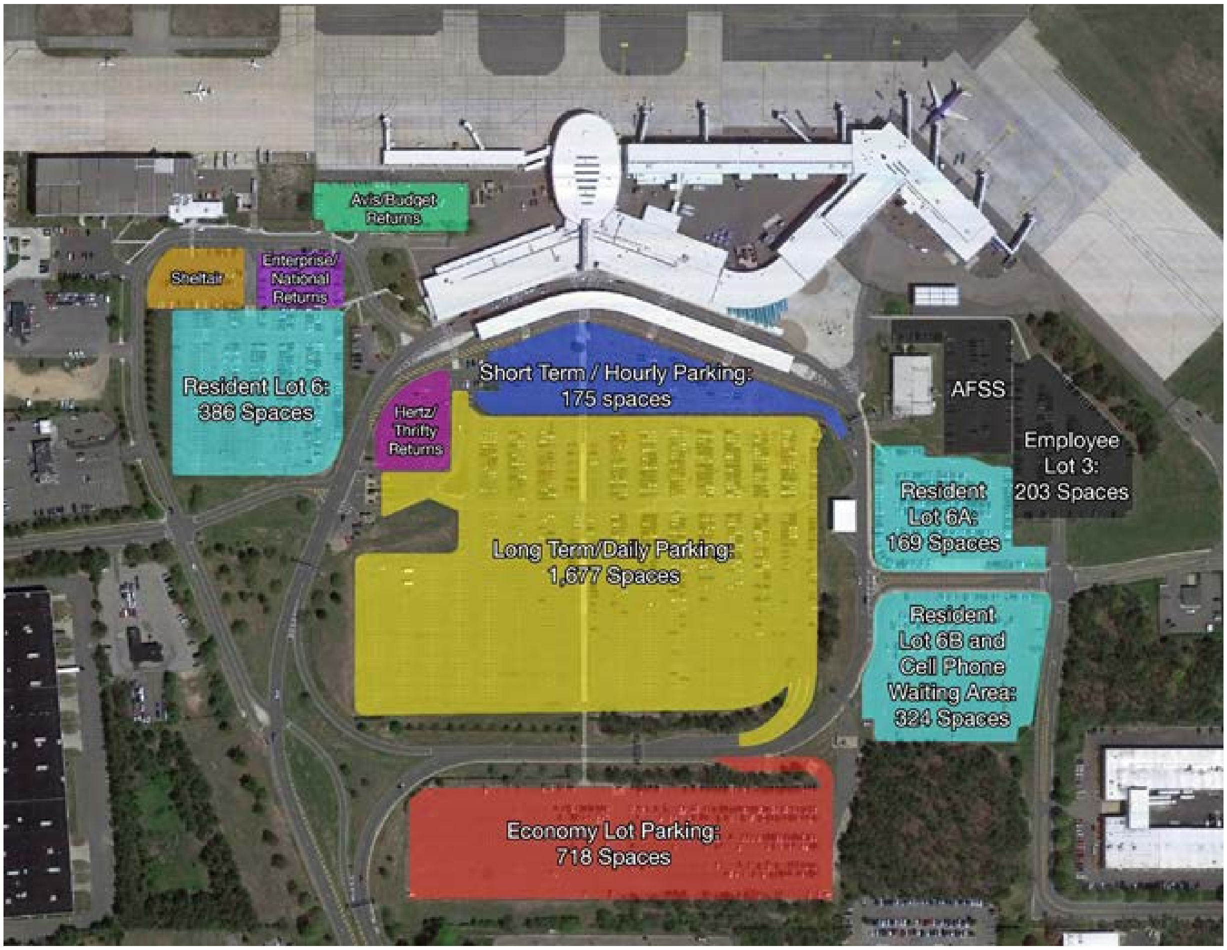


Figure 13: Parking capacity at MacArthur Airport

- Short-term parking
    - 175 spaces
    - $3.50 per hour / Daily maximum of $25
- Long-term/Daily parking
    - 1,677 spaces
    - $4 per hour / Daily maximum of $15.50
- Economy parking
    - 718 spaces
    - $4 per hour / Daily maximum of $14
- Resident parking
    - 879 spaces
    - $40 annual permit

1.4.2 Rail Transit Access

Long Island MacArthur Airport is accessible by rail transit on the Ronkonkoma branch of the LIRR at Ronkonkoma Station. Other nearby stations include Smithtown on the Port Jefferson Branch and Sayville on the Montauk Branch (Figure 14). Express service to Ronkonkoma LIRR Station is available from Penn Station in Manhattan, Jamaica and Woodside LIRR stations in Queens, and from Mineola LIRR Station in Nassau County.

In 2007, the FAA published the results of a survey with LI MacArthur Airport passengers that indicated that 8% of the Airport's passengers had used the LIRR as their mode of access to the airport (6% as primary mode, and 2% as secondary mode).[26] Given the fluctuations in demand the Airport experienced in the past ten years, and the fact that there is new Frontier service to be rolled-out in 2018, it is hard to make projections on the current and future levels of LIRR participation in the Airport's accessibility matrix without additional surveys. Nonetheless, this study is still the sole reference available, and an estimate of annual LIRR riders bound to LI MacArthur based on this 8% share and on a grand total of 606,491 enplanements in 2016 would result in the total of 48,519 LIRR-based passengers in 2016.[27]

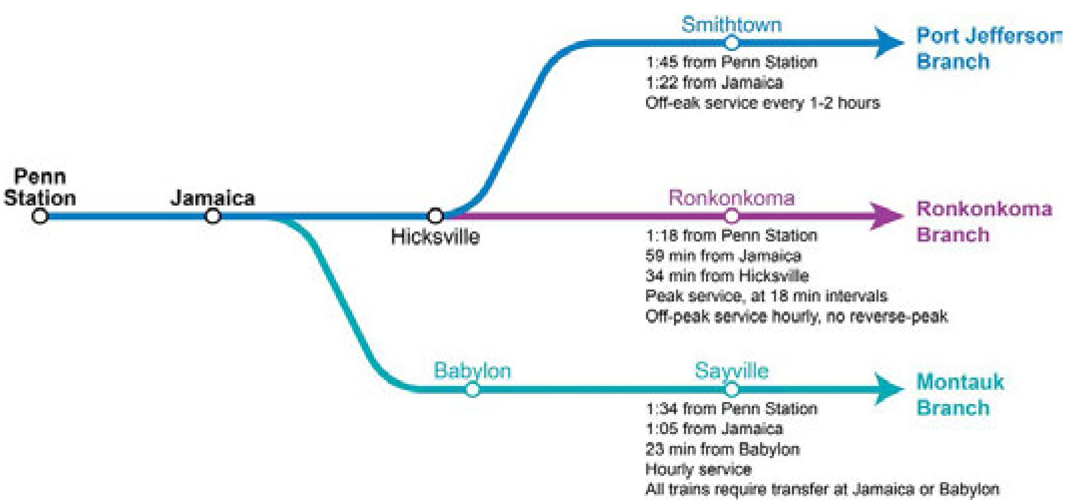


Figure 14: LIRR service near LI MacArthur Airport[28]

If traveling by transit to LI MacArthur Airport, New York City residents can take subways or buses to the nearest LIRR stations, from where they board to Ronkonkoma station. When factoring in this first-leg, travel times to Manhattan and Queens are in the range of 1½ to 2 hours, while trips to Brooklyn can take over 2 hours.

A Long Island resident who wishes to arrive at LI MacArthur Airport via LIRR, can reach his or her nearest LIRR station either by bus, by automobile (one's own auto, taxi or a shared ride), or on foot. Figure 15 illustrates typical travel times to Ronkonkoma LIRR Station at morning peak hours.

[26] (Federal Aviation Administration, 2007a, pp. III-2)
[27] (Long Island MacArthur Airport, 2017b, p. 3)
[28] Source: MTA.info

Once rail passengers reach Ronkonkoma Station they must take a taxi or bus to reach the airport terminal building, about a 15-minute drive away.

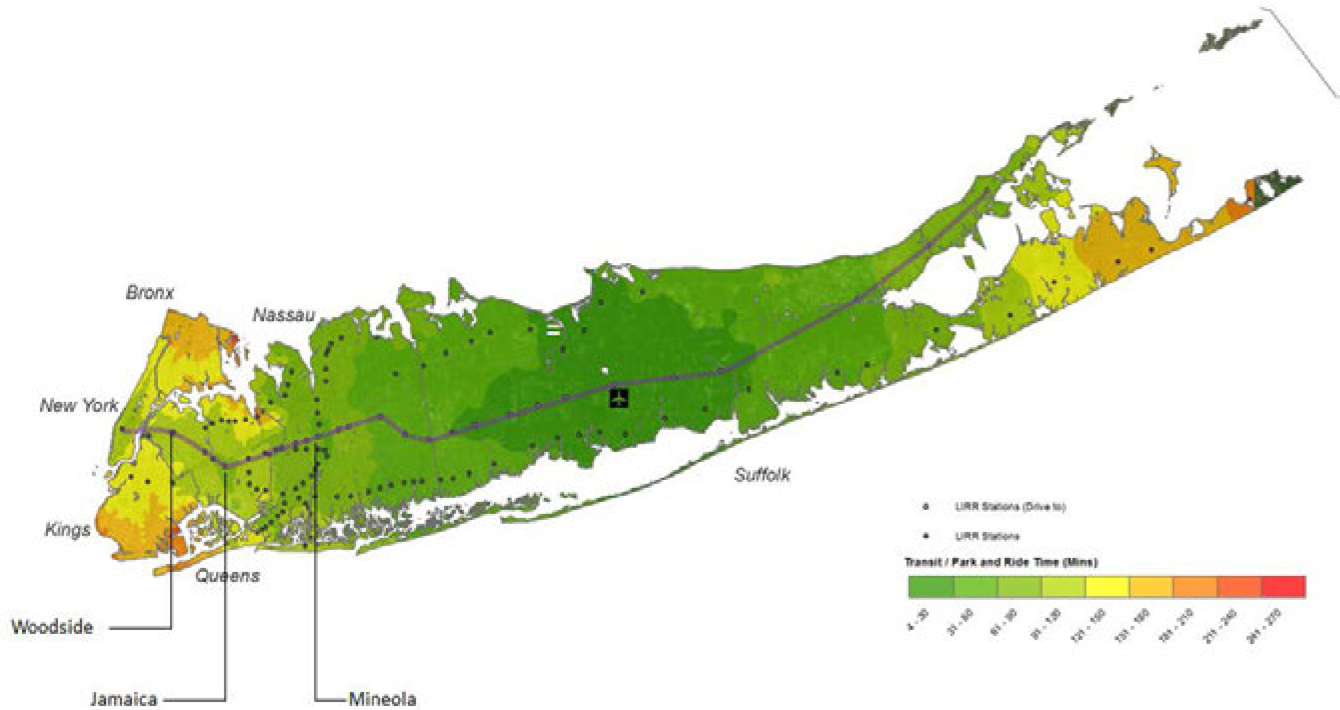


Figure 15: Transit times to Ronkonkoma LIRR Station[29]

LIRR Double Track Project

Ronkonkoma LIRR Station has a 2½-hour gap in non-peak-direction service, between 6:38 a.m. and 8:59 a.m. for eastbound trains, and between 4:48 p.m. and 7:13 p.m. for westbound trains. To eliminate this gap in service, LIRR is building a second track between Farmingdale and Ronkonkoma stations that will allow off-peak and shoulder service expansion on the Ronkonkoma branch. This project will be a key access improvement to LIRR MacArthur Airport as its peak hours may not align with typical LIRR peak hours.

The first phase of the project, between Ronkonkoma and Central Islip was completed in 2016, and the second phase, between Central Islip and Farmingdale is scheduled for completion in December 2018.[30] The project will support population growth in Long Island, and the associated ridership increase, including intra-island mobility, with no significant impact to existing land uses. The project's environmental assessment indicates it would not result in significant increase of traffic around rail stations, and that intersection approaches in the study area would keep operating at acceptable level-of-

[29] Image: Arup, Data Source: Google Maps Directions API – Trips beginning in NYC were simulated as a bus/subway trip to the nearest LIRR station; trips beginning in Nassau and Suffolk Counties were simulated as an auto trip to the nearest LIRR station.

[30] (Metropolitan Transportation Authority, 2016)

service. The assessment also indicated that there is a likely reduction in vehicle trips in the study area.[31] In 2016, LIRR's Ronkonkoma Branch had weekday ridership above 48,000[32], and LIRR forecasts a ridership growth factor 1.69% year-on-year until 2018[33].

The station's train yard is currently undergoing expansion, to increase its storage tracks from 12 to 23 by 2018. According to the MTA, this new facility will "enable the Railroad to improve interior car cleaning and servicing and carry out mandatory Federal Railway Administration inspections." The expanded facility is not only needed to increasing peak-hour trains, but also to provide "direct service to Grand Central Terminal as part of the East Side Access project."[34]

Discount Ticket Package LIRR + Village Taxi\Shuttle – "Deals & Getaways"

The LIRR currently offers a discount package including a rail ticket and a Village Taxi voucher for connection to LI MacArthur Airport terminal, with savings of $4.50 per package[35]. While the package is promoted online at MTA's website, as part of its '*Deals & Getaways*' program and '*Take the LIRR to New York Area Airports*' page. The discount package is not offered to ticket machine users that select Ronkonkoma as a destination, and instead is only an option to those who select '*Deals & Getaways*' at the home screen. The package can be purchased at LIRR ticket windows or ticket machines, but it is not available at the Airport or through LIRR's mobile ticketing app, MTA eTix.[36] The package has not been widely used, with just 162 one-way combined tickets sold in all of 2015, and only 119 sold in 2016.[37]

1.4.3 For-Hire Vehicle Access

Taxis & Shuttle Vans

Village Taxi, the on-site taxi service at LI MacArthur Airport, offers a $5 ride per passenger between Ronkonkoma LIRR Station and the airport terminal. Service is made available at all times during which the airport is operating. A sizable portion of the fleet is used to meet each LIRR train in a dedicated parking area to ensure LIRR customers are able to obtain immediate service (Figure 16).

At the airport, taxi pickup and drop-off is located outside of the baggage claim area. A dispatcher is present at the airport to manage queues and provide information to passengers. Vehicles are dispatched to the airport to meet arriving flights in numbers that are Passengers wishing to connect with the LIRR are directed to a separate queuing area from the general taxi line.

Village Taxi's fleet – comprised of town cars, SUVs and vans with capacity for 10 passengers. Passenger service using the van is offered at the same price as a standard taxi trip ($5 per person).

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[31] (MTA Long Island Rail Road, 2013, pp. 33, ES-8 - ES-11)
[32] (Metropolitan Transportation Authority, 2016)
[33] (MTA Long Island Rail Road, 2013, p. 32)
[34] (Metropolitan Transportation Authority, 2015)
[35] (Metropolitan Transportation Authority, a)
[36] (Metropolitan Transportation Authority, c)
[37] Source: Metropolitan Transportation Authority via email

While Village Taxi experimented with fixed-interval shuttle van service in the past, this scheme was found to be inefficient because train and flight schedules are uncoordinated. Service is now provided on an as-needed basis (determined by the dispatcher). During especially busy periods, Village Taxi sometimes runs two, closely-timed trips using the shuttle van. This allows for immediate pickup of air passengers with only carry-on luggage followed by a second trip for those awaiting checked luggage.

Village Taxi stated in a telephone interview that the number of taxi and shuttle customers has been growing since the inception of Frontier Airlines service at LI MacArthur, with as many as 40 people seeking service after the arrival of one of Frontier's flights. The company is considering purchasing a new shuttle vehicle with capacity for 40 persons should demand continue to rise.[38]

Figure 16: Village Taxi office at Ronkonkoma LIRR Station

Transportation Network Companies

App-based transportation services like Lyft and Uber, also known as Transportation Network Companies (TNCs), launched service in Suffolk County in June 2017. Though these services are new to the area they are already drawing customers at Ronkonkoma Station, taking up space at the pickup and drop-off areas. In the first two months on Long Island, Ronkonkoma LIRR Station has been recorded as one of the top LIRR station destinations for Lyft.[39]

1.4.4 Suffolk County Transit Access

Suffolk County Transit's bus route S57 provides daily service to LI MacArthur Airport. The service runs Monday through Saturday between 7:00 a.m. and 7:00 p.m., with hourly service between Smith Haven Mall and Sayville. The route also connects to Ronkonkoma LIRR station, and has a scheduled

[38] (Village Taxi, 2017)
[39] (Blasey, 2017)

10-minute travel time between the station and the airport. However, the current bus schedule is not aligned with the LIRR train schedule, which means passengers who rely on this service may face long wait times at either end of their trip.`

1.4.5 Proposed Nicolls Road Bus Rapid Transit

In June 2016, Suffolk County released a final report for the Nicolls Road Alternatives Analysis. The recommended alternative was a Bus Rapid Transit (BRT) system, operating mostly along Nicolls Road, with a spur providing service to Ronkonkoma LIRR Station and Ronkonkoma Hub TOD (Figure 17). The route would be 23.5 miles long and have 19 stations. BRT service would operate seven days a week, with weekday peak service operating on 10-minute intervals.[40]

[40] (Suffolk County, 2016) (Suffolk County, 2016)

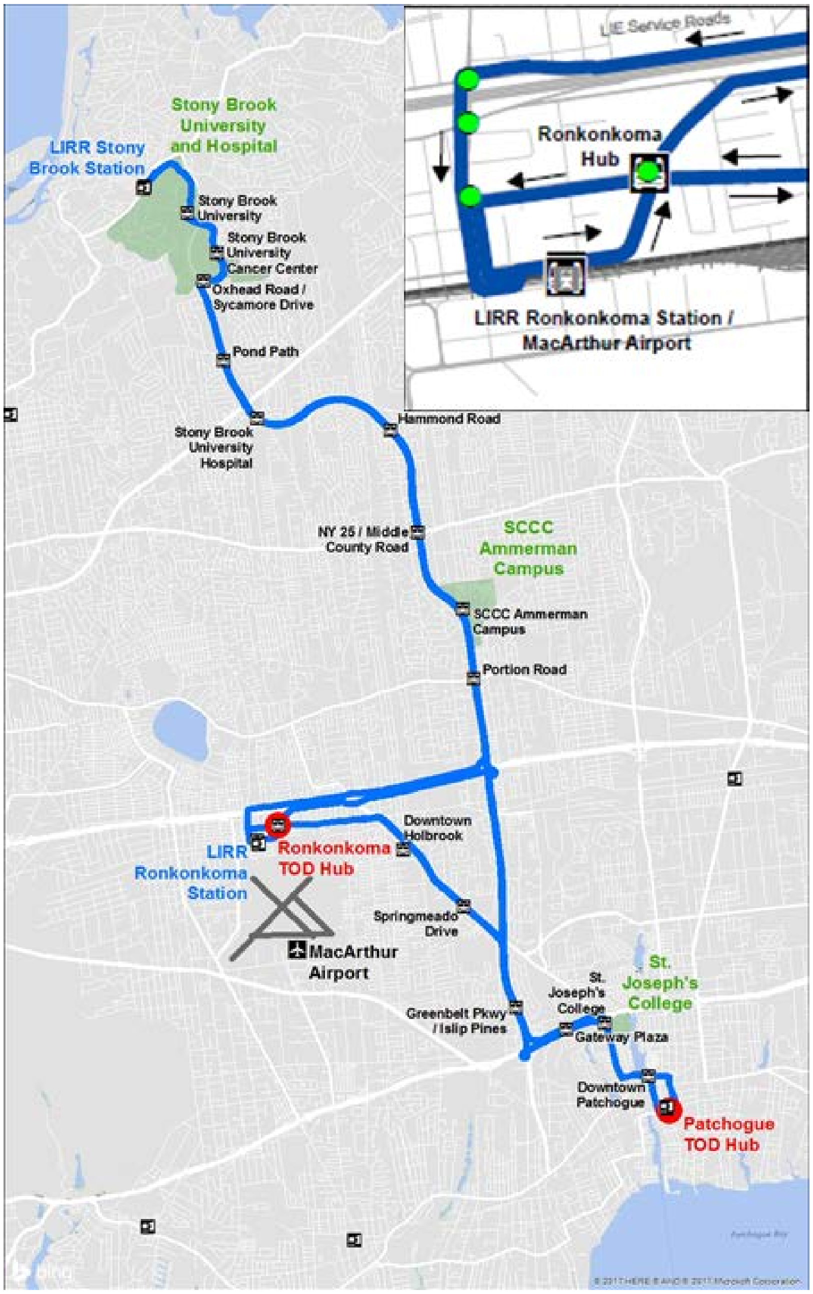

Figure 17: Nicolls Road proposed BRT route

1.4.6 Potential Impacts of Improved Accessibility

In regions served by multiple airports, travelers have to choose which airport best meets their air travel needs. A variety of factors play into consumers' airport choice, and the Transportation Research Board (TRB), through its Airport Cooperative Research Program (ACRP) identified that the two key factors are "air service quality (availability, frequency, capacity, and routing); and price (airfare, taxation, and ancillary fees).[41]" Still, in addition to these primary factors, ACRP also finds that airport ground accessibility has influence in passenger's choice, especially for business travelers.

Airport accessibility is an attribute with many dimensions. In broad terms, it can be thought of as the extent to which it is easy or difficult for the passengers to get to the airport. In strict sense, accessibility is defined as the combination of travel times, reliability, and cost.

Travel Times

Travel times are the most important component of accessibility. Even when passengers enjoy roughly similar levels of accessibility to multiple airports – as is the case in the New York Region – small differences in travel times may be important. The ACRP has found that "passengers are highly sensitive to [travel times] … and even small changes in access time, such as a 5-minute reduction, can induce notable shifts in air travel demand at an airport[42]". Passenger surveys conducted at the New York region's airports in 2007 indicated that "travel time to the airport, especially from home, is an import factor for airport choice. Given equal air service quality and similar pricing, passengers will usually choose the closer airport[43]". This same study indicated that most air passengers in the region choose airports "within about 60 minutes of their local trip origins."

Travel times are mostly affected by external factors, such as regional traffic congestion and transit schedules, and the train-to-plane connector is one of the few tools within the Airport's reach. In 2007, the FAA reported survey results that indicated that 6% of LI MacArthur air travelers used the LIRR as their primary mode for accessing the Airport, with an additional 2% using it as a secondary mode[44]. In 2011, the RPA supported the notion that an enhanced rail connection to LI MacArthur would have a positive impact in the Airport usage, reporting that "faster and more frequent rail service" brought about by the LIRR's Double Track Project would be essential for increased shift of passengers from other airports[45].

Reliability

Reliability is the property of a transportation system to perform in a consistent manner. A reliable system will have few disruptions over its life time, or will have a diminished impact of these disruptions. In 2010, the Organization for Economic Co-Operation and Development defined Reliability as "the ability of the transport system to provide the expected level of service quality, upon which users have organized their activities"[46]. The U.S. DOT Federal Highway Administration (FHWA) is more specific, and defines reliability in terms of travel times, by calling reliable a

[41] (Airport Cooperative Research Program, 2013, p. 12)
[42] (Airport Cooperative Research Program, 2013, p. 13)
[43] (Federal Aviation Administration, 2007b, pp. II-3)
[44] (Federal Aviation Administration, 2007a, pp. III-2)
[45] (Zupan, Barone, & Lee, 2011, pp. 71 - 77, 144)
[46] (Organization for Economic Co-Operation and Development, 2010, p. 17)

system that "provides users with a consistent range of predictable travel times.[47]" Typical sources of unreliability are non-recurring traffic congestion and delays in the transit system.

In addition to in-vehicle travel times, transit modes are subject to other sources of potential unreliability: consistency of wait times, availability of seating, and ability to consistently and easily make required connections.[48] Therefore, transit modes are not only subject to interferences while in-travel, but also at stops, where vehicles can dwell longer than planned. These sources of unreliability can be mitigated by an operational plan that provides a buffer for possible vehicular delays arising from eventful boardings, alightings and maintenance routines.

Partly because passengers account for unreliability in their travel to the airport by building in additional time to their travel plans,[49] travelers consider reliability one of the key dimensions of accessibility. Among LI MacArthur travelers surveyed in 2007, reliability was the most frequently cited factors for mode choice to the airport, at 42%[50]. Among transit modes, dedicated transitways, such as rail tracks, are usually perceived as more reliable than mixed-traffic roadways. Business travelers are also more sensitive to reliability than are leisure travelers. With less flexible schedules, they are more willing to pay a premium to ensure on-time arrival.[51]

Costs

Travel time and reliability tend to be much more important factors in mode choice to airports than monetary costs. However, costs can trump other factors when "the cost of one mode is much higher than that of an alternative.[52]" The literature suggests that leisure passengers, who are likely to pay these costs directly, are more sensitive to costs than business travelers, who are more concerned with convenience and time. The costs associated with airport access include parking, tolls, fuel costs for passengers who choose private vehicle modes, and fares for those choosing transit or taxi modes.

At LI MacArthur Airport, the costs ground transportation seem to play a small role into how travelers choose their access mode. Only 14% of passengers surveyed in 2007 said that cost was an important factor in their choice of mode for airport access.

1.5 Ronkonkoma LIRR Station

1.5.1 Connection Wayfinding

The Ronkonkoma LIRR station has three platforms and two tracks, with an overpass connecting all platforms to exits on the north and south sides of the tracks. The passenger waiting room is located on

[47] (Federal Highway Administration (FHWA), 2017)
[48] (Transit Cooperative Research Program, 2013, pp. 3-13 - 3-14)
[49] (Airport Cooperative Research Program, 2013, pp. 13 - 14)
[50] (Federal Aviation Administration, 2007a, pp. III-3)
[51] (Airport Cooperative Research Program, 2013)
[52] (Airport Cooperative Research Program, 2013, p. 14)

the north side of the station. Neither the platforms nor the overpass have any signage indicating where to go for LI MacArthur Airport, the taxi stand, or the bus stop (Figure 18).

Figure 18: Ronkonkoma LIRR station overpass

1.5.2 MTA Capital Program: Enhanced Stations Initiative

The MTA has budgeted $150 million for its LIRR Enhanced Stations Initiative (ESI), which will improve aesthetics and user experience for 17 stations in Long Island[53]. The Initiative will deliver "new facilities, Wi-Fi, charging stations, public art, new platform waiting areas, general station renovations and improved signage"[54].

The MTA is currently procuring design and construction services for ESI improvements. Ronkonkoma is in the Phase 2 package along with 4 other stations ($45 to $55 million for all stations)[55].

1.5.3 Station Parking

The station has a total of 6,233[56] parking spaces, the majority of which are public, free, and unrestricted. There are two privately operated parking lots on the north side of the station. The capacity for each parking lot is indicated on Figure 19.

[53] (Metropolitan Transportation Authority, 2017b)
[54] (Metropolitan Transportation Authority, 2017a)
[55] (Metropolitan Transportation Authority, b)
[56] Lot ownership/operation: (Metropolitan Transportation Authority, 2017c); Suffolk County lots: Arup; Allpro Parking garage counts: Allpro Parking; Town of Brookhaven, free unrestricterd/undeveloped, and other private operators' lots: (VHB Engineering, Surveying and Landscape Architecture, P.C., 2010).

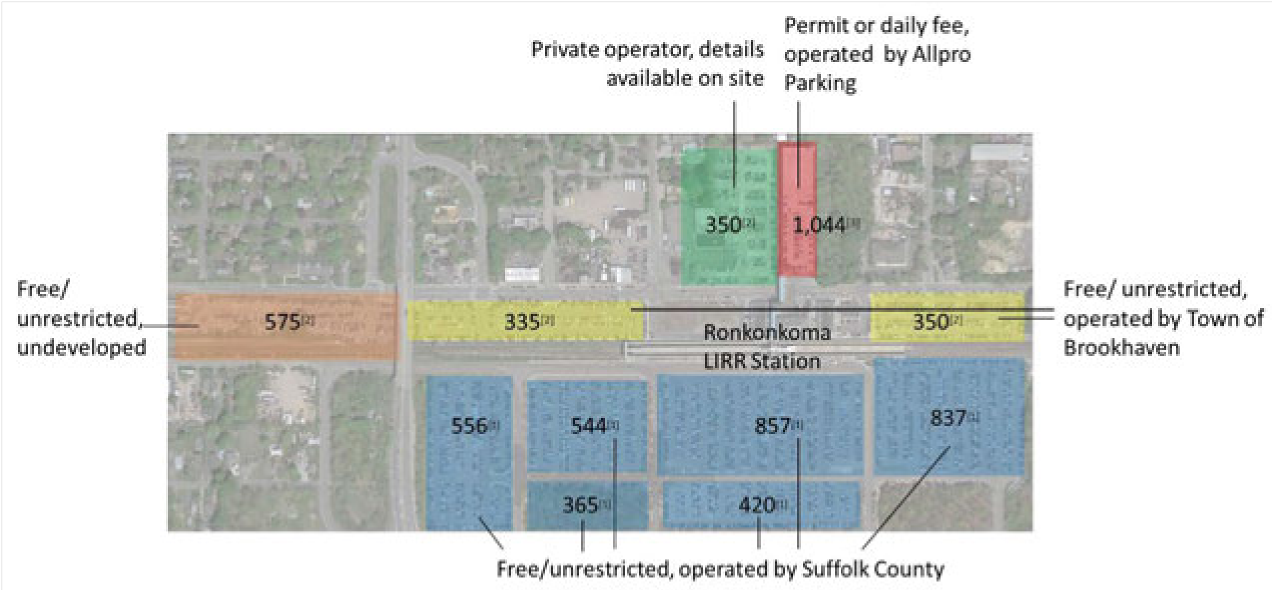

Figure 19: Ronkonkoma Station Parking

1.6 Current and Studied Train-to-Plane Connections

1.6.1 Train-to-Plane Drive Times

There are currently two routes between Ronkonkoma LIRR Station and the passenger terminal at LI MacArthur Airport. The first route, via Smithtown Avenue, is 3.5 miles and takes between 9-14 minutes. The second route, via Lincoln Avenue, is 4.5 miles and takes between 10-14 minutes.

Review of traffic forecast tools indicates that, on the route between Ronkonkoma LIRR Station and MacArthur Airport, only Veterans Highway faces congestion during peak hours of traffic (Figure 20). Suffolk County's Master Plan indicates that level-of-service for this segment of roadway in 2015 was LOS B, and is forecast to be LOS C in 2035[57].

[57] (Suffolk County Department of Economic Development and Planning, 2014b, pp. A-13)

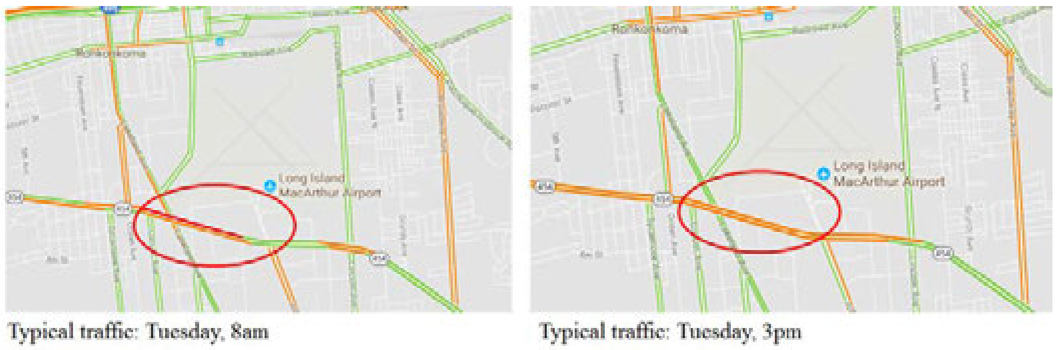

Figure 20: Typical Traffic on Veterans Memorial Highway

For the shortest route from Ronkonkoma LIRR station to LI MacArthur Airport terminal, analysis of typical weekday traffic patterns produce the following results[58]:

- Minimum travel time is 9mins and 52 seconds;
- Average travel time is 11 mins and 6 seconds;
- Recurring congestion adds up to 2 minutes and 11 seconds of delay;
- Recurring travel times above 11 minutes are more frequent in the periods 5 a.m. to 9 a.m., 10:30 a.m. to 12:00 p.m., and 2:00 p.m. to 9:00 p.m.
- Non-recurring congestion may add up to 3 minutes and 27 seconds
- Non-recurring congestion that drives travel times above 13 minutes is most frequent in the period 7:00 a.m. to 7:30 p.m.

The travel time profile is presented on Figure 21. Recurring congestion is the product of the mismatch of road capacity and the typical traffic volume; non-recurring congestion are caused by temporary disruptions such as crashes, disabled vehicles, work zones, adverse weather events, and planned special events.

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[58] Analysis: Arup, Data Source: Google Maps Directions API. (Origin: 40.807882, -73.106133, Destination: 40.789259, -73.097534, Start Date: 20/12/2017, Waypoints: 40.789722, -73.115067, 40.785683, -73.111007, recurring congestion: traffic model = best_guess, non-recurring congestion: traffic model = pessimistic, Analysis from 00:00 to 24:00 each 30 mins).

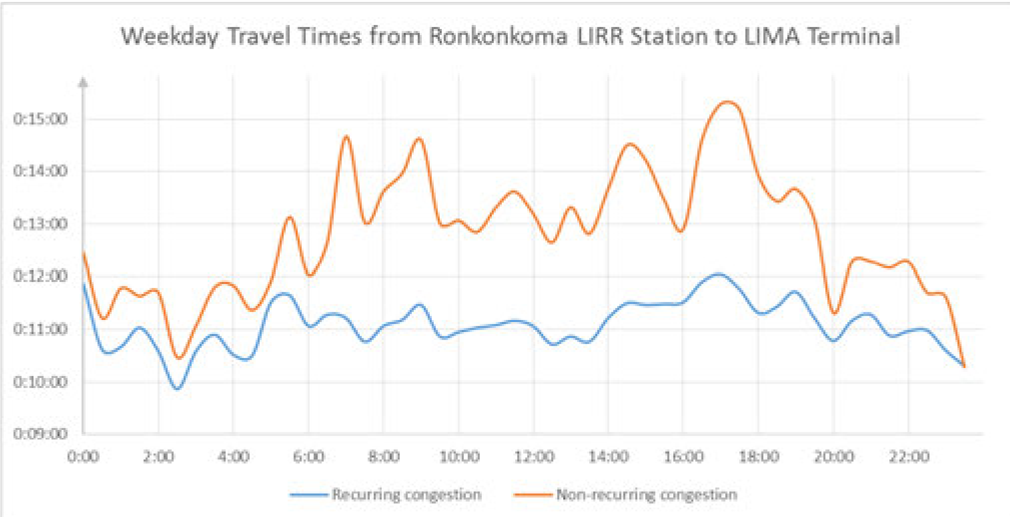

Figure 21: Typical Traffic Pattern Analysis

1.6.2 Previous Planning Studies

A study to evaluate locations for the replacement U.S. Customs and Border Protection facility at LI MacArthur Airport was released in June 2017.[59] The study looked at locations within the existing terminal as well as a new north side customs facility. The study found the most favorable options include alterations to the existing Central Terminal Area.

The study also offered a concept-level assessment identifying options and rough order-of-magnitude cost estimates for improved intermodal access between the airport and Ronkonkoma Station. The study reviewed options for a new connection to the existing terminal as well as a new north side terminal (Table 2).

Table 2: MacArthur Airport Customs Facility Location Study

Current Facility Location	Transit Connection Mode	Frequency of Service (min)	One-Way Travel Time (min)	Capital Cost Estimate (millions)
Existing Terminal	BRT (at-grade)	12	10-11	$43
	BRT (at-grade & elevated)	12	9-11	$128.3
	Automated Guideway Transit (AGT)	10	7.5	$641.9
New North Side Facility	Bus Shuttle	10	4.2	$1.2
	Automated Guideway Transit (AGT)	10	3.6	$134.6
	Moving Sidewalk	Continuous	6	$59.6

[59] (AECOM, 2017)

The study indicated that at-grade BRT service to the existing terminal was the most feasible option. The capital cost for a five-vehicle bus system would be approximately $43 million.

1.6.3 Environmental Considerations

In recent years, Suffolk County has demonstrated a strong commitment to environmental quality and sustainable development. In 2012, The Suffolk County Legislature registered with the Climate Smart Communities Pledge and passed a resolution "in the interest of reducing greenhouse gas emissions and adapting to a changing climate…"[60] The Pledge is part of a program that "provides support and assistance for reduction of greenhouse gas emissions and climate adaptation at the local level."[61] The Town of Islip also adopted the Pledge, and in doing so "partnered with their state government to build a resilient, low-emission future."[62]

Along with other municipalities, non-governmental organizations, and consultants, the Town of Islip participated in the Cleaner Greener Consortium of Long Island. In 2013, the Consortium published the Cleaner Greener Long Island Regional Sustainability Plan. The plan establishes a transportation goal to "Improve transportation options for all Long Islanders: reduce Long Island's vehicle miles traveled, fuel consumption and GHG emissions"[63], and articulates a community-based vision for a more sustainable future.

In 2015, Suffolk County saw the adoption of two plans that reiterated and shaped the County's commitment to the environment and sustainable development. In March, the Suffolk County Climate Smart Community Standing Committee drafted, and in June the Legislature adopted, the County's Climate Action Plan, which states "[the County] has similarly set a 20 percent GHG emissions reduction target by 2020 from a 2005 baseline for community-wide emissions." While the plan recognizes that the County has less control over community emissions, it nevertheless states that it "has utilized its ability to provide regional leadership and adopt policies that encourage improved efficiency and adoption of renewables."[64]

The second plan, adopted in June 2015, is the Suffolk County Comprehensive Master Plan 2035. The plan lists "Protect the Environment and Enhance Our Human Capital" as one of its six key policy areas, and provides guidance that can be followed to achieve the broad regional goal of providing "the foundation for sustainable growth and resiliency of Suffolk County." The plan offers initiatives to address transit improvements and meet the essential needs for clean air, among other goals.[65]

An improved train-to-plane connection would support these goals, especially if it succeeds in increasing the share of travelers accessing the Airport via the LIRR. GHG emissions from on-road

[60] (Suffolk County - The Administrative Code, 2012, p. 1)
[61] (New York State Department of Environmental Conservation, a)
[62] (New York State Department of Environmental Conservation, b)
[63] (Cleaner Greener Consortium of Long Island, 2013, p. 75)
[64] (Suffolk County Climate Smart Community Standing Committee, 2015, pp. 1, 6)
[65] (Suffolk County Department of Economic Development and Planning, 2014a, pp. 43, 58-59)

vehicles are the second largest contributor to Long Island's climate-change related carbon footprint,[66] with "84% stemming from gasoline used in passenger vehicles."[67] The American Planning Association found that more energy-efficient transportation – infrastructure, vehicles, modes – can create a significant positive impact in reducing climate change-related greenhouse gas emissions (GHGs).[68] The County Master Plan identifies as recommended actions to 'encourage participation in rideshare programs and multimodal bus / train / bicycle and auto use', and to "develop mass transit infrastructure necessary for local and non-local tourists…"[69]

The possible adoption of low- or zero-emission vehicles in the train-to-plane connection would also improve the air quality in the County. The Environmental Protection Agency (EPA) documents that automobiles are a significant contributor to ozone generation and suspended particulate matter ($PM_{2.5}$), and notes that driving a private car is "probably a typical citizen's most "polluting" daily activity", and states that actions geared towards reducing ozone and $PM_{2.5}$ include reducing automobile use or by switching to low or zero-emission vehicles.[70] The County Master Plan recommends "the expansion of the use of vehicles powered by alternative/low carbon fuels"[71], and the 'Cleaner Greener' Plan promotes alternative transport options and transition to a cleaner vehicle fleet as an effective strategy to improve ambient air quality in the short-to-medium term, and create a higher quality of life and increased health and well-being for Long Islanders to ensure a more sustainable future.[72]

1.7 Planning for Suffolk County Growth

1.7.1 Connect Long Island Plan

The 2014 Connect Long Island Regional Transportation and Development Plan, commissioned by Suffolk County aims to create sustainable economic growth through coordinated land use and transportation planning, and investments in transportation infrastructure that strategically connect Suffolk's educational and research institutions, TODs, and Long Island Rail Road stations. A major component of the Connect Long Island plan is the vision to develop north-south mass transit connections between key County assets and existing east-west transportation modes, transforming mass transit commuting into a viable and attractive alternative for young job-seekers, to drive economic growth. The plan supports development of mixed-use communities around LIRR stations.

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[66] (Cleaner Greener Consortium of Long Island, 2013, p. 9)
[67] (Suffolk County Climate Smart Community Standing Committee, 2015, p. 37)
[68] (American Planning Association, 2011, p. 39)
[69] (Suffolk County Comprehensive Master Plan 2035, 2014, pp. 2-12, 2-14)
[70] (U.S. Environmental Protection Agency, Cars and Air Pollution, https://www.adeq.state.ar.us/air/planning/ozone/cars.aspx)
[71] (Suffolk County Department of Economic Development and Planning, 2014b, pp. 2-12)
[72] (Cleaner Greener Consortium of Long Island, 2013, pp. 75 - 83)

1.7.2 Transit-Oriented Development

At present, there are a number of transit-oriented developments planned in Suffolk County, centered at or near eight different LIRR stations.[73] These projects will feature dense, mixed-use development and other capital improvement to help improve connectivity. Outside of these developments, Suffolk County is planning various improvements to increase corridor-connectivity countywide. Long Island MacArthur Airport will be adjacent to the Ronkonkoma Hub development, and lies at a key junction between north-south and east-west corridors.

Ronkonkoma Hub

Ronkonkoma Hub is a planned transit-oriented development adjacent to Ronkonkoma LIRR Station and just north of LI MacArthur Airport (Figure 22). It will be a 50-acre development with high multi-modal accessibility. The Hub will be served by local bus, the future Nicolls Road BRT and the LIRR. It is just south of Long Island Expressway. The Hub will include 1,450 residential units, of which 20% will be set aside as affordable housing, and over a half-million square feet of retail and commercial space. There are also nearby clusters of professional and technical employment in the towns of Smithtown and Islip, and along the Long Island Expressway. The project's phase 1 should soon break ground, and funds for sewer hookup have been appropriated by the County[74].

Figure 22: Ronkonkoma Hub rendering and site plan

1.7.3 Economic Development

The Suffolk County 2035 Master Plan sets out to grow the business base and create jobs around Long Island's top research facilities at Stony Brook University, the Brookhaven National Laboratory, and along the Route 110 corridor.

Innovation Zone

[73] (Suffolk County Department of Economic Development and Planning, 2014a)
[74] (Suffolk County, 2017)

The Innovation Zone, or I-Zone, is Suffolk County's initiative to connect TODs with the region's research institutions[75]. The plan brought together multiple levels of government and leaders of the region's top research institutions. The goal is to create a "quality of life ecosystem" to support smart economic growth within the county.[76] The key projects that will contribute to the success of the I-Zone are the Nicolls Road BRT, Ronkonkoma Hub, plane-to-train connection at MacArthur Airport, and a future connection to the Brookhaven National Laboratory.

1.7.4 New York State "Transforming Long Island" Proposal

Improving transit access to LI MacArthur Airport figures prominently into Governor Andrew M. Cuomo's $160 million plan to "Transform Long Island," one of 37 key budgetary proposals announced in the January, 2017 State of the State address. The Governor identified $20 million dollars to support the development of a direct connection between LI MacArthur Airport and the Ronkonkoma LIRR station. The proposal also includes $5 million for enhancements at the station that will improve passenger experience.[77]

1.8 Existing Conditions Key Takeaways

Airport demand

Different factors point towards potential demand growth for LI MacArthur Airport in the coming years:

- Frontier Airlines is expected to double the number of passengers that travel through LI MacArthur by 2018.
- Runway extensions and a renovated CBP facility will allow carriers to serve other markets, should they chose to do so.
- The three major airports in the New York City region are constrained[78].

Suffolk and Nassau Counties have a strong demand base for the airport, albeit most residents have a set-up favorable for driving:

- Suffolk and Nassau Counties have over 2.8 million residents[79]:
- 1.2 million live less than a 30-minute drive to the airport
- Currently, airport-bound travel in Suffolk and Nassau counties is mostly carried out by automobile, with most households planning their mobility strategy around private vehicles:
    - o 93% of Suffolk and Nassau counties' households have access to at least one vehicle

[75] (Suffolk County Government, 2016)
[76] (Suffolk County Government, 2015)
[77] (New York State Office of the Governor, 2017)
[78] (Long Island MacArthur Airport, 2014, p. 11), (Zupan, Barone, & Lee, 2011, p. 11), (Federal Aviation Administration, 2017b)
[79] Source: U.S. Census Bureau, 2016 American Community Survey 1-Year Estimates

- o 63% have access to more than one vehicle

Suffolk County plans to expand and enhance its transit network and to foster compact, walkable communities:

- Planned TODs around LIRR stations[80]:
  - Huntington
  - Heartland
  - Ronkonkoma Hub
  - Riverside
  - East Farmingdale
  - Wyandanch
  - Patchogue
  - The Meadows at Yaphank

- Planned north-south BRT corridors:
  - Nicolls Road
  - Sagtikos Parkway
  - Route 110.

These initiatives are key to reduce auto-reliance in Suffolk County, and to create a mobility environment favorable for public transportation. A transit-friendly landscape is essential for building demand for a train-to-plane connection.

Accessibility

Penn Station in Manhattan is 78 minutes from the Ronkonkoma LIRR Station. The LIRR has room to improve its connection to LI MacArthur Airport:

- Station wayfinding does not support an airport-bound rider
- Ticket vending kiosks do not have intuitive menus to buy the taxi and train bundle

Ronkonkoma Station is within a 15-minute drive from the passenger terminal at LI MacArthur Airport. Village Taxi offers $5 per person flat fare to the airport. A taxi voucher may be purchased as part of a "Long Island Getaway" package ticket at LIRR ticket vending machines, but the existing process for doing so is likely confusing to customers.

A ride offered by a TNC costs about $10, however:

- There is no guarantee that cars will be available for service[81]
- Far surcharges, a key component of many TNCs' business model, increase uncertainty for travelers

Long Island MacArthur Airport

Previous studies analyzed BRT and AGT and concluded that investments between $40 million and $650 million would be required to build the connection[82]. While the airport does not envision moving

[80] (Suffolk County, 2016, p. 3)
[81] (Metropolitan Transportation Authority, a)
[82] (AECOM, 2017)

the terminal to the north side of the property in the short- to mid-term, it is open during this timeline to consider connection alignments through its site, so long as they adhere to airport and FAA regulations[83], Town planning and zoning codes.

2 Purpose and Need Statement

2.1 Project Purpose

The project purpose is to connect the Ronkonkoma LIRR Station with LI MacArthur Airport, providing an integrated and reliable linkage for air travelers served by Long Island Rail Road and county transit services.

The new connection will pursue the County's key policy of building a 21st century transit network, and will complement the development projects that foster compact, walkable communities.

The project will support the growth of MacArthur Airport's catchment area and reaffirm the airport's values of offering an efficient and comfortable experience to its customer base. The train to plane connection should be affordable, reliable and convenient as it meets the needs of air travelers.

2.2 Project Needs

The train-to-plane connection will address current and future gaps in the transportation network, which were identified and detailed previously in the Existing Conditions section.

There are significant opportunities, both current and future, that the project can leverage and benefit from. The strong existing and growing customer base for MacArthur Airport create opportunities for projects that benefit from economies of scale. The new Frontier Airlines service will offer alternatives to travelers looking for flight options that are more convenient than those at other congested New York City-area airports.

Suffolk County's focus on increasing transit use through TODs near LIRR stations and new BRT routes will invite travelers that choose to travel by alternative modes. Improvements to Ronkonkoma Station will further enhance the utility of a new train-to-plane connection.

Project challenges include cost, timing, complexity, and congestion. Funding needs may reach the hundreds of millions, and multiple sources may have to be procured. The airport's previous connection study considered BRT or AGT connections ranging from $40 - $650 million. The connection will consider the boundaries and safety zones for the expanded runways. Growth of airport demand coupled with increase in background traffic, especially on Veterans Highway, would lead to increase in recurring congestion in the surrounding road network, and more frequent events of non-recurring congestion due to vehicle disruptions. An airport connector with a dedicated alignment, could alleviate

[83] Code of Federal Regulations Title 14, §77 – Safe, Efficient Use, and Preservation of the Navigable Airspace, and §139 – Certification of Airports

some of the pressure in roadway bottlenecks, and offer airport-bound travelers a transportation option wits reduced exposure to traffic conditions and higher travel time reliability.

Considering these opportunities and challenges, the needs for this project fall under three categories: System Linkage, Transportation Demand, and Economic Growth, which are each detailed below.

System Linkage:

- To link LI MacArthur Airport with the Ronkonkoma LIRR Station.
- To link LI MacArthur Airport with Suffolk County's transit services.

Transportation Demand:

- To integrate LI MacArthur into the LIRR network, serving markets in Suffolk County, Nassau County and New York City.
- To offer a scalable and flexible connection that accommodates future airport growth plans.

Economic Growth:

- To pursue Suffolk County's policies for expansion of public transit as a means to enable growth without degrading current quality of life standards.
- To strengthen compact, walkable communities that will foster economic development.
- To catalyze economic growth in Suffolk County, strengthening LI MacArthur Airport's position as a regional asset.

2.3 Project Impacts

The impacts of this project fall under three categories: transportation networks, land uses, and the economy. The impacts listed in Table 3 indicate the possible outcomes and contributions of the train-to-plane connection.

Table 3: Project Impacts

Transportation Networks	
1	Increased accessibility to LI MacArthur Airport, especially for LIRR riders
2	Additional reliable and timed connection between trains and LI MacArthur Airport
3	Enhanced link between regional transportation assets (MacArthur Airport and LIRR)
4	Flexible connection to accommodate potential future extensions of transit service
5	Increased use of transit to/from MacArthur Airport would reduce the impact of the airport passenger access traffic in the surrounding roadway
Land Uses and Environment	
1	Delivery of a transport link in line with the vision of walkable, compact communities
2	Protected flexibility for future development options and runway extensions
3	Protected and enhanced local environment (e.g., noise, vibration, and air quality)

4	Reduced auto reliance for travel to LI MacArthur Airport, and associated mitigation of CO_2 emissions
Economic Development	
1	Direct employment creation for construction and operation of the connection
2	Increased competitiveness of MacArthur Airport, being more attractive to passengers
3	Catalyzed economic growth throughout Long Island

3 Connectivity Modes Identification and Technology Assessment

As stated by its purpose, LI MacArthur Airport's improved connection to the Ronkonkoma LIRR Station will be integrated and reliable, enhancing the airport's values of high quality service. This connection will also support key policy areas of Suffolk County's Comprehensive Masterplan 2035 such as building a 21st century transit network; and priority actions such as the development of compact, walkable communities.

This train-to-plane connection will contribute towards solutions for needs related to regional transportation system linkage, economic growth and travel demand. Nonetheless, it will come to reality only after addressing existing future challenges, related to limited funding options; strict airport standards, rules and procedures; and the spatial constraints that result from an airport site woven into the urban fabric. After overcoming these challenges, the connection should offer a better option for the airport's strong customer base.

Airports around the world employ a wide range of modes to connect into regional transportation networks. This variety of solutions arises from the specific economic, social and physical challenges involved with each airport context. This section introduces ten transportation modes that either have been used, are in planning stage, or could be used to connect airports to regional transportation networks.

This section is comprehensive in listing public transportation modes to airports, and introduces technologies covering different implementation schedules (from under one year to above five years of rollout), capacity thresholds, performance standards, and funding levels. While some solutions presented are time-tested, others are very recent and still do not offer with extensive business cases that can be used for reference. Some solutions are applicable in virtually any context, some are restricted.

These transportation modes and technologies are introduced with high-level considerations for:

- efficiency of use;
- potential environmental impacts;
- technology, land use and development opportunities;
- passenger experience;
- integration with existing transportation network;
- costs and cost effectiveness.

This characterization will support an effort of ranking these modes across a screening criteria matrix, and a constructability assessment, to be carried out on Task 5 of this project, and recorded at an upcoming document. The four highest-ranking modes will be advanced into an implementation plan development phase.

The modes included in this assessment were selected based on the Arup's team experience, LI MacArthur's CBP study, and research into ground transportation access at other airports, and other origin-destination pairs with some operational similarities.

3.1 General Considerations

3.1.1 Connector Station / Boarding Area

The design of the connector's stations or boarding areas will make the system's first impression. From the approach to the station – signage, length and level of pathways – to the experience while waiting – climate control, real-time information – station features can affect a passenger's perception of the airport. While most station details are designed after the planning stage, the potential location of the stations is discussed in this section, for it factors into route alignments, and may even render a specific transportation mode unfeasible, in case of lack of space to reasonably accommodate a station in the Ronkonkoma LIRR Station.

The current boarding area is located at the north side of the LIRR tracks, adjacent to the Ronkonkoma LIRR Station's waiting room and support buildings (Figure 23). From the station overpass, passengers may take an elevator or stairs to the ground level, where they walk 170 ft or 90 ft respectively, under a covered path to reach the Village Taxi waiting room. While the Airport is located south of the LIRR tracks, crossing the nearby Ronkonkoma Ave/Smithtown Ave overpass adds less than a minute to the total travel time. Furthermore, the north-side location is not subject to peak-hour traffic at Easton St., resulting from access and egress of the Suffolk County parking lots to the south of the tracks.

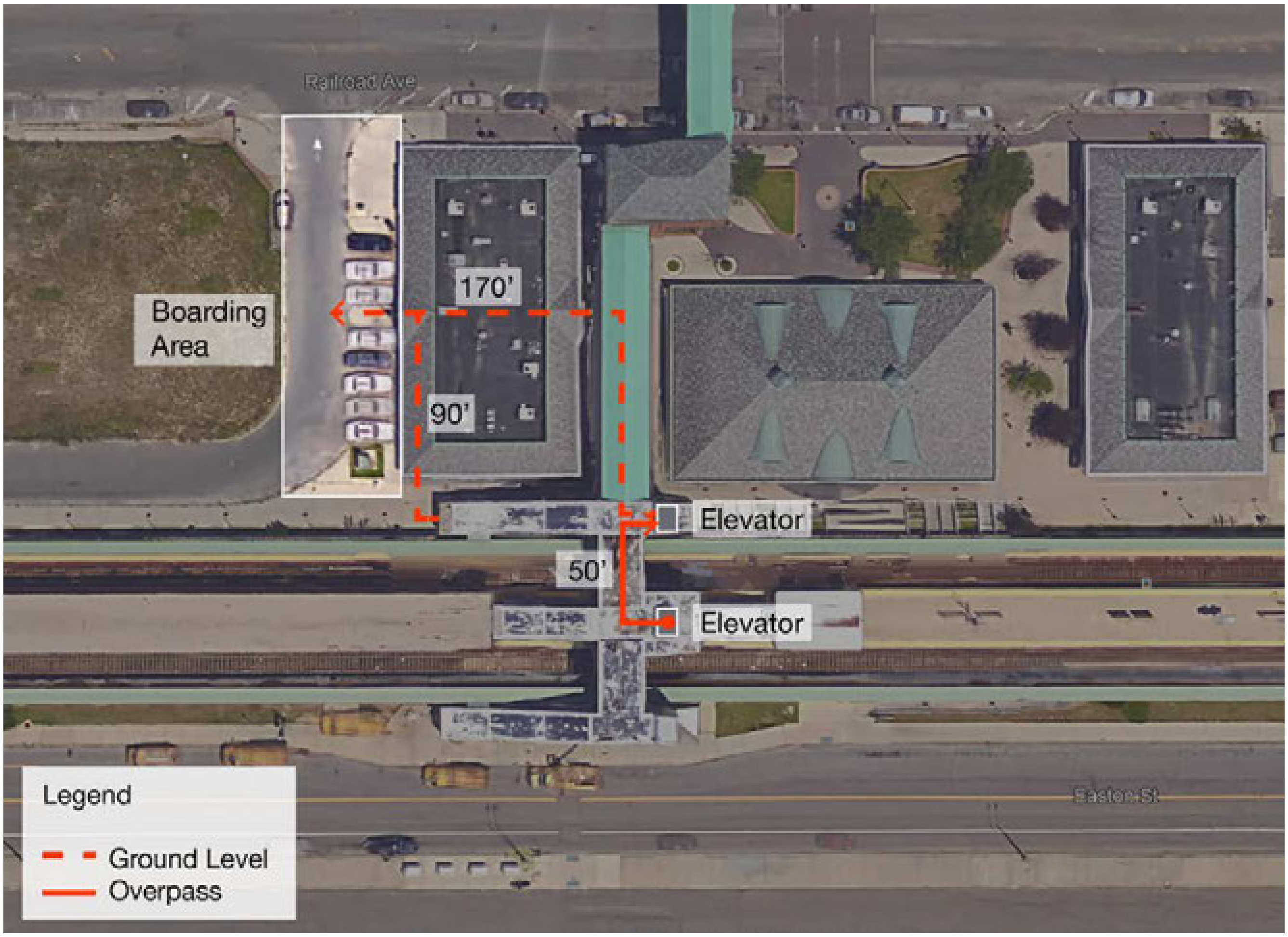

Figure 23: Current LI MacArthur Airport Shuttle boarding zone at Ronkonkoma LIRR Station

Passenger shelter is provided in the retail space currently used as Village Taxi's dispatching and business office. If this space were to become unavailable, and there were still a need to operate a shuttle, it would be necessary to build a new sheltered passenger waiting area. On the north side of the tracks, there is an opportunity to do so at the undeveloped parcel at the center of the bus/taxi loop. Should this parcel become unavailable, a station would have to be developed on the south side, east of the elevator entrance (Figure 24), possibly requiring some additional construction to re-accommodate, shuttle loading areas, traffic lanes, lighting poles and ADA requirements.

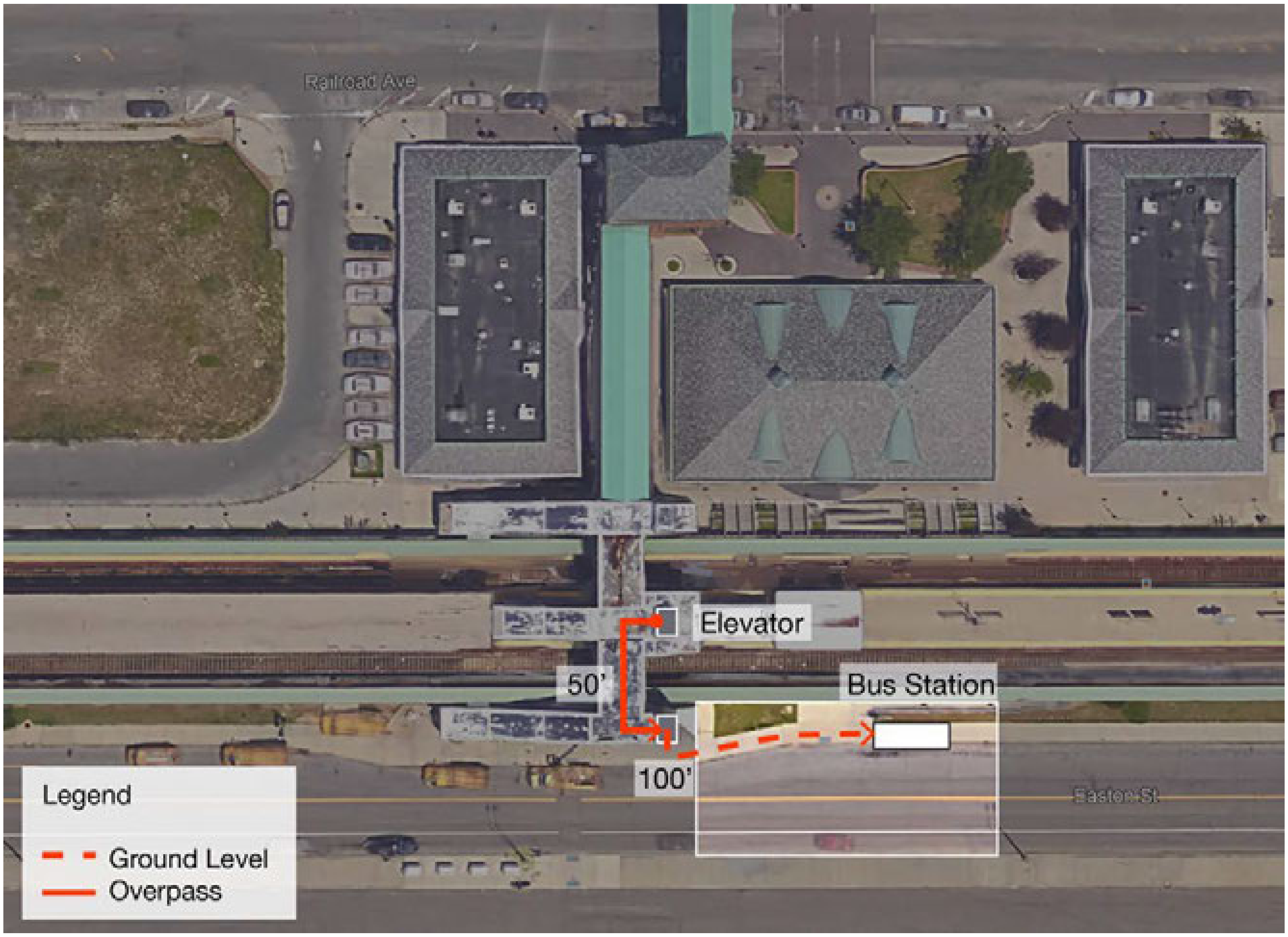

Figure 24: Possible south-of-tracks location for a shuttle passenger waiting area, plan view

There are two situations in which a south side station and boarding area would become the better option: if the connector travels along an on-airport road to the east of the runways, and if the connector needs to travel solely on exclusive guideways, as is the case for automated people movers. The north-south on-airport road would likely start at the gate close to the intersection of Knickerbocker and Railroad Avenues. Knickerbocker Avenue crosses the LIRR tracks at grade, an arrangement that would lead to delays in the shuttle route. In this location, a track overpass could be an impossibility due to conflicts of the potential overpass landing within the RSA or RPZ of an extended runway 6/24, depending on final siting. Figure 25 illustrates a potential location of a south-of-track station for a bus shuttle.

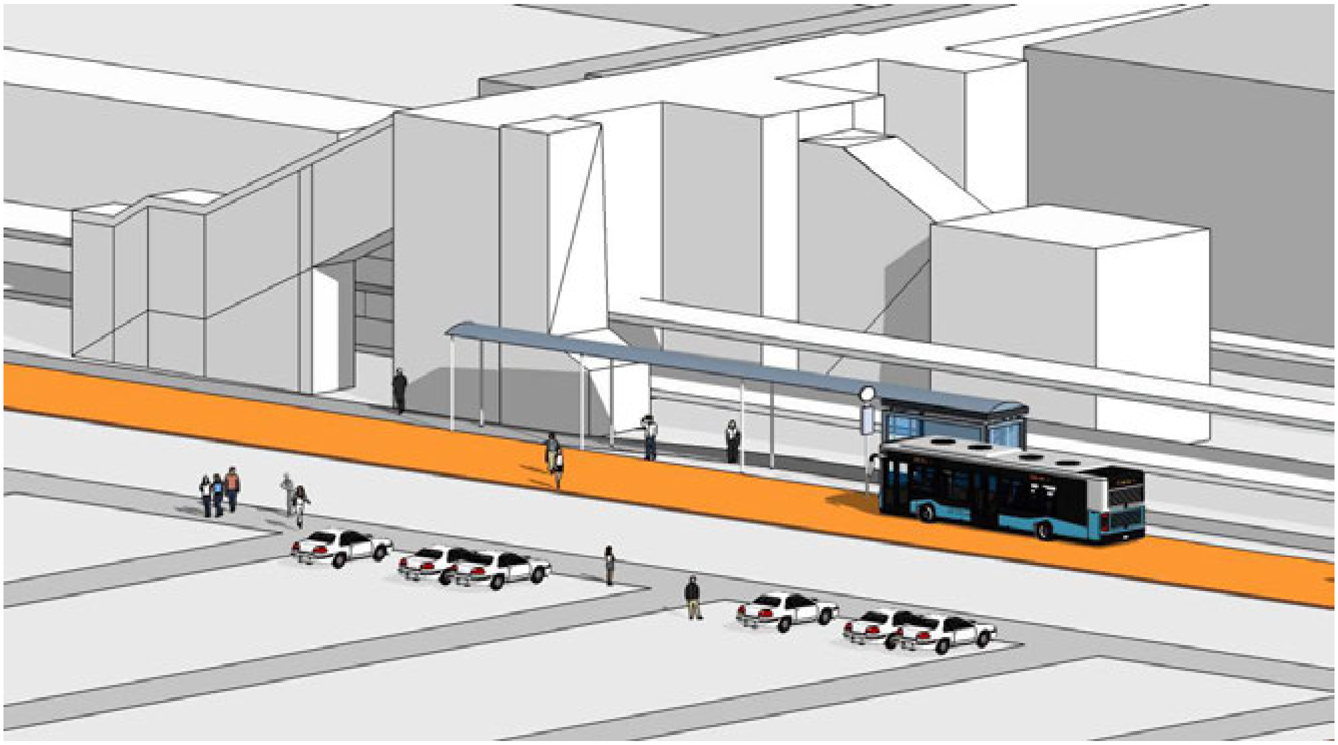

Figure 25: Possible south-of-tracks location for a shuttle passenger waiting area, axonometric view

In the case of travel modes with dedicated guideways, such as people movers and personal rapid transit, a station south of the LIRR tracks is much preferred. The access roads leading to the airport terminal do not have enough width to accommodate dedicated guideways, and therefore elevated structures would be required to carry the tracks over certain segments. A station south of the tracks would require less construction, as it would unlock the possibility of shorter route alignments, and avoid the need of crossing the LIRR tracks.

Still, the presence of elevated structures on an on-airport alignment would raise other issues. Federal restrictions ban the presence of structures on the runways protection zones, so any elevated structure carrying the guideway would have to be sloped down to an underground overpass before entering these zones, possibly leading to substantial engineering challenges in achieving this grade change in constrained spaces.

An elevated station that would allow passengers to go from the track overpass straight into the connector would improve the ease of connection but also entail in more extensive construction (Figure 26).

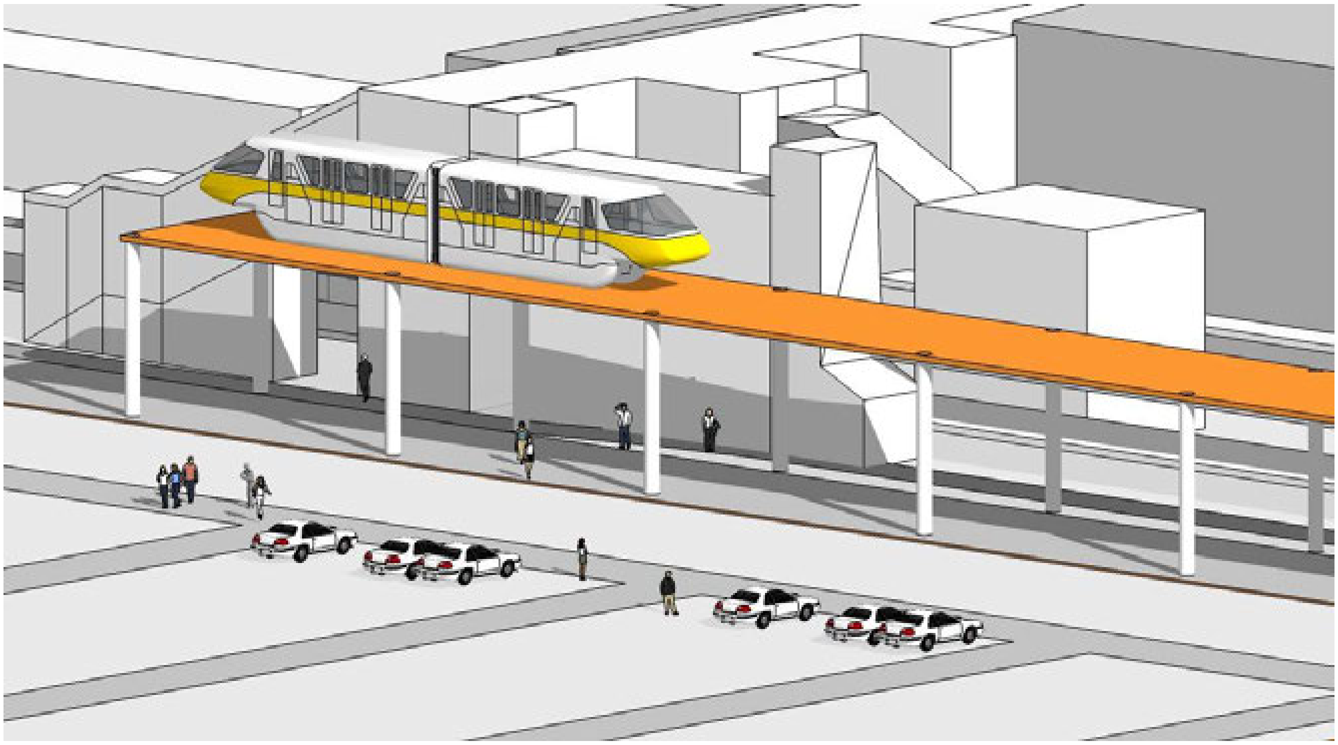

Figure 26: Possible south-of-tracks location for an elevated shuttle passenger waiting area, axonometric view

3.1.2 Route Alignments

Route alignment is one of the key factors for consideration of a transportation mode for the connector. It affects both operating and capital costs, trip length, travel times, reliability and the extent of environmental impact. Alignments options vary with each transportation mode, according to their different requirements of footprint, height, and turning radius. But for slight variations, the current terminal, at the south of the airport site, would have two alignment options, one on-airport and one off-airport. A north-side terminal would have the possibility of having an almost straight-line connection to the Ronkonkoma LIRR Station.

Currently, taxis and vans shuttling between the Ronkonkoma LIRR Station and LI MacArthur's Airport terminal share the roadway with mixed traffic, traveling along off-airport public roads. Coming from the taxi waiting area, located north of the LIRR tracks, the shuttle heads south on Smithtown Avenue before taking short segments of Lakeland Avenue and Veterans Memorial highway to reach the Airport's access roads. The straight-line distance between the Ronkonkoma Station and the Airport Terminal is 1.3 miles, but the driving distance along this typical route, at 3.6 miles, is significantly longer (Figure 26). The opposite direction travel is similar in both length and routing.

Memorandum

Figure 27: Connector alignment from a station north of LIRR tracks to the Airport Terminal

The off-airport alignment would present challenges to some potential new modes for the connector. For the most part of the alignment, Smithtown Avenue and Veterans Memorial Highway are bound by buildings on both sides, and therefore cannot be widened to accommodate a travel mode that requires exclusive right-of-way. In addition, travel along mixed-traffic is subject to disruptions from non-recurring congestion, such as traffic crashes, work zones and broken vehicles. While infrequent, these events hurt the reliability of the connection system.

An on-airport alignment would, on the other hand, travel mostly along a new, dedicated roadway. The length of this roadway would be approximately 3.5 miles in length. While similar in terms of distance to the off-airport option, it would isolate the connector from non-recurring congestion caused by vehicle breakdowns and crashes in mixed-traffic, and would offer right-of-way for construction of an at-grade, rail-based mode. Starting at the south side of the LIRR Ronkonkoma Station, vehicles would travel along either a new road in the north perimeter of the airport site, or Railroad Avenue before entering the airport side. After they cross the safety areas of runway 6/24 (through a tunnel or another underground structure) where they would turn right to travel south. This alignment is not suitable for modes that require support structures or overhanging wires, for it would cross the RPZs (or potentially the RSAs) of runways 6/24 and 15R/33L with underground structures (such as tunnels or underpasses), in a future scenario in which the runways are extended. In terms of distance, this option is similar to the off-airport, with 3.5 miles in length (Figure 28).

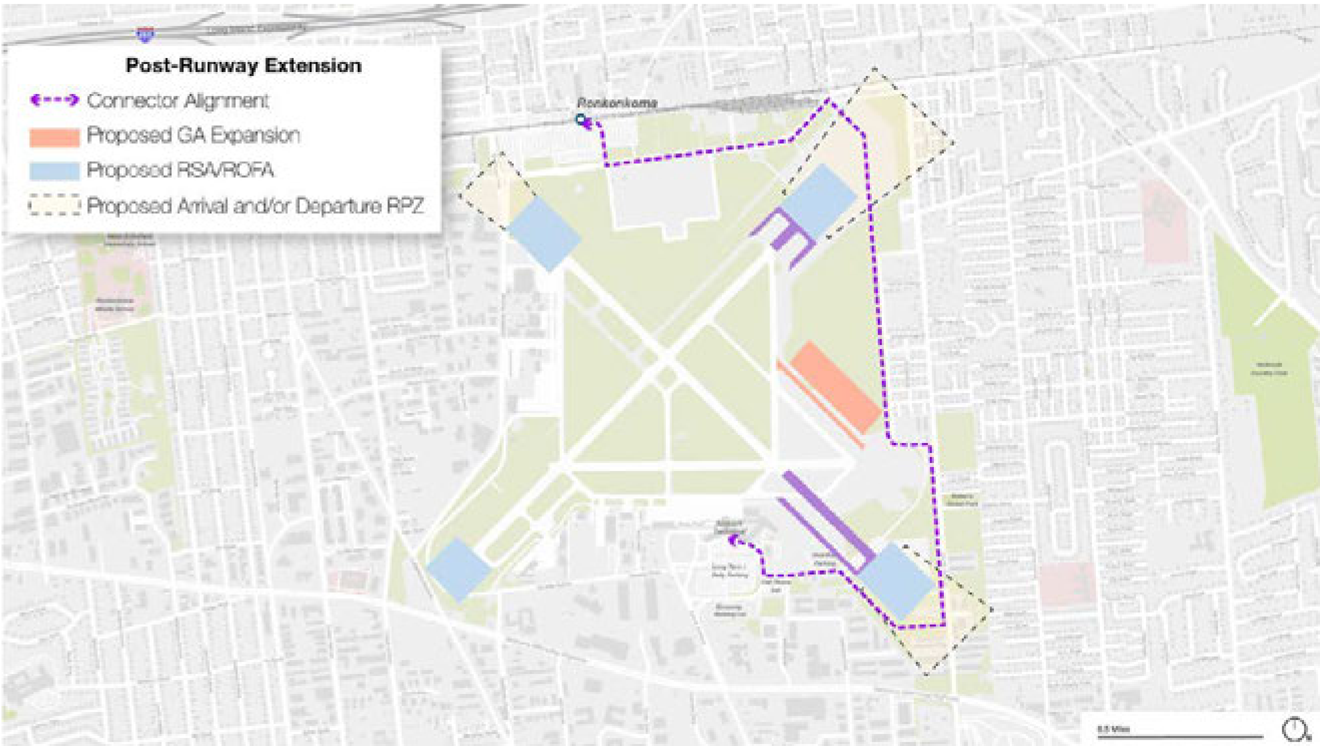

Figure 28: Connector alignment from a station south of LIRR tracks to the Airport Terminal, though on-airport roads

In a long term scenario in which the airport terminal is relocated to the north side of the airport, the connector would have to just cross the commuter parking lot and Railroad Avenue before reaching the new facility. This alignment would likely be less than half a mile long, and would have no height limitations, being an alternative for modes with elevated support structures or overhead wires. Given the short distance, the train station and the airport terminal could even be connected with an underground moving walkway.

Figure 29: Connector alignment from a north-side Airport Terminal

3.1.3 Automated Vehicles

The impacts of automated vehicles (AVs) on our mobility systems will be so deep, that they may reshape our spatial relationship with urban areas, and which implications "will cut across every facet of government, society, and the economy." [84] Commercial fully automated vehicles are not yet the reality, but we already experience some degree of vehicular automation, and technology and regulations are in progress.

Vehicle automation exists in a spectrum of increasing scope and efficacy for driving support functions. In 2016, the U.S. Department of Transportation (USDOT) adopted SAE International's levels of automation for defining driving automation.[85] This scale ranges from 0 – for 'No Automation' – to 5 – for 'Full Automation'. Technologies on level 4 – 'High Automation' – are undergoing pilot projects and could see commercial deployment in the next few years.

'Highly automated' vehicles have a system capable of monitoring the environment and can control the vehicle under some conditions. Several companies have functioning prototypes of shuttles (with capacity between 9 to 12 people) with this technology; pilot projects are taking place in the U.S.[86],

[84] (Bloomberg Philantropies, The Aspen Institute, 2017, p. 7)
[85] (SAE International, 2016)
[86] (Navya, 2017c), **Invalid source specified.**

Europe[87] and Japan.[88] These vehicles are not yet capable of navigating busy public roads with mixed-traffic, and are available for circulation in private areas or very limited sections of public roads. While the individual vehicles do not require drivers, the system as a whole is managed remotely by operators capable of handling exceptions and issues. The RPA predicts that microtransit[89] operators will start to incorporate these vehicles in their fleets before the year 2022.

The combination of technologies that will enable vehicles to be fully automated, i.e. to be "…capable of performing all driving functions under all conditions" [90], is in fast development and automated vehicles will have a "significant number of trips" in the New York Region "over the next two decades."[91] The RPA predicts that some AVs will enter the market by 2022, but that only after 2027 they will start to be increasingly adopted. Legislation is still a major obstacle in the way of automated vehicles, since they will upend the current practices of licensing, liability and insurance, in addition to creating new issues with privacy. Once fully automated vehicles enter the roads *en masse*, the benefits of the technology will be amplified and significant changes in the built environment will take place.

The connector between Ronkonkoma LIRR Station and LI MacArthur Airport would be a good fit for adoption of AVs, once the technology and regulatory systems become more mature. Benefits would include not only reduction of operating costs, but also reduction in costs associated with crashes and liability payments. The bus transit industry has shown in recent years a trend of increase in liability expenses, even with a trend of reduction of crashes.[92] Because 94% of road accidents[93] result from human errors, driving automation would reduce the connector's exposure to this risk.

3.2 Transportation Modes

As a first step in the analysis of alternatives, the project team has conducted a summary assessment of 10 transportation modes and technologies which could satisfy the needs of a new train-to-plane connection. This assessment details high-level considerations for efficiency of use, potential environmental impacts, technology, land use and development opportunities, passenger experience, integration with existing transportation network, and costs/cost effectiveness for each of the ten modes.

An approximate delivery timeframe is also included for each mode: less than two years; between two and five years; and more than five years. This represents a planning-level estimate of when service could be initiated once Suffolk County and LI MacArthur agree upon preferred mode and should primarily be understood to provide a reasonable comparison of deployment time between the modes assessed for this project.

[87] (Easy Mile, 2016), (Navya, 2017b)
[88] (Navya, 2017)
[89] "App and technology-enabled shuttle services, typically in a can-size vehicle; some with dynamic routing, others with semi-fixed routes", ex: Via, and Chariot. (Regina R. Clewlow, 2017, p. 4)
[90] (National Highway Traffic Safety Administration (NHTSA), 2017, p. 4)
[91] (Regional Plan Association, 2017, p. 2)
[92] (Jerome M. Lutin, 2013)
[93] (Barclays, 2016, p. 11)

The information compiled will be used identify which transportation systems have the greatest potential to meet the project's needs and should developed for further analysis in the task 5 memo.

The transportation modes and technologies assessed fall roughly into three categories:

- **Point-to-point** – Modes that do not require significant investment on stations, tracks and rolling stock; and that may pickup and drop-off passengers at almost any location. The service would require limited additional investment and capacity can be easily shifted to and from other transportation markets in Suffolk County:
    - **Existing taxi service**
    - Upgraded taxi service
    - Transportation Network Company (TNC) / ride-hailing service
- **Structured centered on airport –** Modes that require investment on stations, transitways or rolling stock that would mostly be mobilized in the train-to-plane connection. These modes are mostly considered when designing a transportation system entirely focused on airport passengers and employees:
    - Shuttle
    - Gondola
    - Automated People Mover (APM)
    - Personal Rapid Transit (PRT)
    - Moving walkway
- **Structured branched to airport** – Modes that require investment on stations, transitways or rolling stock that would be mobilized in a county transit network, with an extension to the train-to-plane connection. These modes are mostly considered as solutions to regional mobility goals, and can either be extended to or start from the train-to-plane link:
    - Bus Rapid Transit (BRT)
    - Streetcar
    - Light Rail Transit (LRT)

3.2.1 Upgraded Taxi Service

Figure 30: Nissan NV 200 in use as a taxi in NYC, New York, NY (Image source: Lawrence, J)

Overview

A fleet for-hire vehicles offers rides for individual passengers or small groups. Rides are summoned either by hailing a taxi or by communicating through a mobile device app.

Precedents

Many airports around the country advertise taxi services that connect terminals with rail stations. Examples include Trenton-Mercer, Long Beach, Harrisburg, and New Haven, and LI MacArthur itself. [94,95,96,97]

At MacArthur Airport

Orientation to pick-up areas would be facilitated by improved signage at Ronkonkoma Station. Service awareness and convenience of transaction would be improved with updated LIRR ticket vending machine system and app. Application would allow users to book rides in advance, pay for fare, and secure a vehicle with enough storage for luggage. Vehicles could be updated to incorporate modern design comfort standards.

Assessment

Taxis are the current mode of connection between Ronkonkoma Station and MacArthur Airport. Village Taxi drives MacArthur Airport-bound passengers from Ronkonkoma Station for a flat fare of

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[94] (Mercer County, New Jersey, n.d.)
[95] (Long Beach Airport, n.d.)
[96] (Harrisburg International Airport, n.d.)
[97] (Tweed New Haven Airport, n.d.)

$5.00 per person.[98] At the airport, the taxi stand sits outside baggage claim. Airports of all sizes utilize taxi services as a key ground transportation option.

The taxi service could be improved to offer a better user experience without structural changes to operational schemes and infrastructure. After updates, the LIRR ticket kiosks and mobile device app would recommend the purchase of the taxi voucher after user selection of Ronkonkoma as a destination. At Ronkonkoma Station, wayfinding and ease of orientation would be improved with more conspicuous signage guiding to the taxi stand.

The taxi fleet would have new vehicles to offer passengers a more comfortable ride. Cars would offer amenities such as USB charging ports, wheelchair accessibility, flat passenger floor area, independent climate control on all vehicles. Keeping today's operating practice, this managed fleet would always make vehicles available at Ronkonkoma Station at train arrival times, to ensure passengers complete their journeys to the airport without interruptions.

Delivery Time Frame

Less than two years.

Planning Level Cost Estimate

Capital Expenditures: $200,000 - $1,000,000[99] (for modernization of fleet, signage improvements and improvements on boarding zones to offer level boarding)

Operating costs: $5 per passenger[100,101]

[98] (Long Island MacArthur Airport, n.d.)
[99] Arup estimate, assuming an updated vehicle fleet
[100] (Long Island MacArthur Airport, n.d.)
[101] Operating costs on annual basis are unknown; costs represent those borne by passengers.

3.2.2 Transportation Network Companies (TNCs)

Figure 31: Lyft Driver (Image source: Flickr User Perspective)

Overview

Also known as “ride-hailing” services, companies like Uber and Lyft provide customers the ability to arrange a ride using a GPS-enabled smartphone. Micro-transit firms, such as Chariot and Via, offer demand-driven mass transit routes on high occupancy vehicles (such as vans and mini-buses).

Precedents

Local agencies in Dallas, Los Angeles, Pinellas County, FL and Centennial, CO have developed pilot programs to enhance local transit through partnerships with TNCs.[102,103,104,105]

At MacArthur Airport

TNCs like Uber and Lyft are already operating in Suffolk County and are being used to connect to LI MacArthur Airport. Users request rides between a designated location at terminal and the train station using their phones. An operational agreement with TNCs could be adjust fares to regulate competition with the traditional taxi system.

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[102] (DART, 2015)
[103] (The Source, 2016)
[104] (PSTA, 2016)
[105] (Centennial Innovation Team, Fehr & Peers, 2017)

Microtransit services like Chariot ad Via currently do not offer train-to-plane routes. These services could offer a complement the existing system, and possibly be extended to address mobility needs on other points of the County.

Assessment

TNCs, like Uber or Lyft, arrange rides between drivers and passengers using mobile devices. Drivers are independent and do not have scheduled shifts, working hours they deem convenient and profitable. TNCs operate as intermediaries between the drivers and passengers in want of a ride, and do not actively manage the service offer. These companies do, however, manage the pricing schemes and could negotiate special fares for an airport connection. TNCs are widely used for ground transportation access to airports of all sizes, and do not present significant demand considerations.

Currently, a TNC ride between Ronkonkoma Station and the airport terminal is priced at approximately $10.00. Throughout the U.S., various TNC partnership models have emerged for complementing transit service. With subsidies for the "first and last mile", TNCs connect users to transit stations and leverage the potential of regional transportation networks. Such arrangements require commitments for minimum service, as the default approach is market-driven supply that may not be as reliable as an airport connector would have to be. TNCs are also a low-capacity mode: service is usually provided in sedans or SUVs capable of comfortably carrying a maximum of three to four passengers with luggage.

Multiple vehicles categories are offered by TNCs, and they can be equipped to service people with disabilities, or accommodate baggage.[106]

Delivery Time Frame

Less than two years.

Planning Level Cost Estimate

Capital Expenditures: $0

Annual Operating Costs: $10 per ride, depending on arrangement[107]

[106] (Transit Center, 2016)
[107] Based on a trip booked with Uber app at 5:00 pm on August 22, 2017.

3.2.3 Shuttle Bus

Figure 32: LAX Shuttle, Los Angeles, CA (Image source: Flickr User Lucian400)

Overview

A dedicated bus service traveling along fixed routes on fixed schedules.

Precedents

Shuttle service is already provided by Village Taxi at LI MacArthur, but without fixed schedules.[108] Commonly used where rail or other higher-speed transit services are located on alignments near the airport, such as Boston, San Jose, Fort Lauderdale, and Baltimore, and Milwaukee.[109,110,111,112]

At MacArthur Airport

A dedicated bus links the Ronkonkoma LIRR station with the airport terminal. The service is timed to connect to trains and feature amenities catering to air travelers. An improved service could have dedicated stations offering level boarding, real-time information on flights and connection status,

[108] (Village Taxi, 2017)
[109] (Massport, 2017a)
[110] (Santa Clara Valley Transportation Authority, 2017)
[111] (South Florida Regional Transportation Authority, 2015)
[112] (Baltimore/Washington International thurgood Marshall Airport, n.d.)

climate control and fare payment kiosks. In a scenario with and alignment through the airport, a south of tracks station would be more conveniently located for passengers.

Assessment

Traveling through public roads and mixed traffic, shuttle buses connect the airport terminal and the train station with no need for capital works. Passengers meet a bus waiting for them at each end of the trip, with departures timed to train and airplane arrivals. Airports of all sizes use shuttles for circulation between terminals and parking lots. The smallest airport identified with a short-haul shuttle to a nearby rail link was Milwaukee's General Mitchell Airport.

Passengers board and alight at dedicated areas fitted with amenities to facilitate movement and luggage handling. Travel takes place over public roads along with mixed traffic, and therefore is subject to traffic congestion. Travel reliability can be improved by construction of a dedicated alignment through the airport site. The shuttle buses would jump ahead road segments with recurring traffic backups and speed degrading.

There is wide variety in vehicles, passenger amenities, fare policy, and operators, with some shuttles run by the airport themselves (typically on a contracted-out basis), and others run by the local transit agencies who operate the connecting services. Currently and LI MacArthur, the airport shuttle is operated by Village Taxi. A high-quality service would likely require two vehicles (plus a spare). Operating 2 to 4 trips per hour, the person capacity of such a system would be approximately 80 to 170 persons per hour at the peak direction.

Delivery Time Frame

Less than two years.

Planning Level Cost Estimate

Capital Expenditures: $500,000 - $1,000,000[113]

Annual Operating Costs: $500,000 - $800,000[114]

[113] (John A. Volpe National Transportation Systems Center, 2016), Arup
[114] (Federal Transit Administration, 2016), (Strunsky, 2016)

3.2.4 Gondola

Figure 33: Emirates Airline Cable Car, London, UK (Image source: Pixabay User NadinLisa)

Overview

Cabins supported and propelled by overhead cables connecting stations. Used to cross landscapes where ground options are too costly or inconvenient.

Precedents

Portland, Oregon, opened an urban system in 2006. The EU awarded funds to Genova, Italy, to connect the Erzelli train station and the airport.[115, 116]

At MacArthur Airport

Gondolas are not a feasible connection solution for the current LI MacArthur terminal. To reach the terminal where it stands today, south of the runways, a gondola would have to depart from the south side of Ronkonkoma, head southwest along Smithtown Avenue, and turn left to reach the passenger terminal from the west, conflicting with the RPZs for the runways.

Only a new passenger terminal facility, north of the runways, would allow a feasible gondola alignment, which could connect the track overpass straight into the new passenger terminal.

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[115] (Portland Aerial Tram, n.d.)
[116] (Center for Urban Projects, 2013)

Assessment

Gondolas offer a fixed-guideway transit option at lower capital costs than rail modes, and travel with minimum impact to ground level activity. They also have lower operating costs – staff is only present at stations – and, because service is electrified, do not generate local emissions. Capacity of ropeway transit systems varies by technology, but typical planning capacities are about 4,000 to 6,000 persons per hour in the peak direction for gondola systems.[117]

Cabling and shifting technologies produce different combinations of cost, capacity, speed and station footprints. Because cabins are not powered, there are inherent climate control challenges. Gondolas also have environmental impacts associated with elevated structures, including shadowing and obstructing view sheds.[118] To avoid operation with empty cabins, the gondolas can run as needed to match the LIRR schedule.

Delivery Time Frame

Five years or more.

Planning Level Cost Estimate

Capital Expenditures: $150,000,000 - $250,000,000[119]

Annual Operating Costs: $1,500,000 - $4,000,000 [120]

[117] (Center for Urban Projects, 2013)
[118] (Dale, 2013)
[119] (Dale, 2013)
[120] Arup, based on prior project research

3.2.5 Airport People Mover (APM)

Figure 34: JFK Air Train (Image source: Ad Meskens, Wikimedia)

Overview

APM is a grade-separated mass transit system with full automated, driverless operations, featuring vehicles that travel on guideways with an exclusive right-of-way.

Precedents

APM systems are widely used by airports around the world. There are 51 systems in operation. The number of APMs has more than doubled in the 21st century.

At MacArthur Airport

Stations would be located at the passenger terminal, and at the track overpass at Ronkonkoma LIRR Station, where passengers would access the vehicle without having to moving down to ground level. From that station, the APM would gradually slope down to ground level, where it would enter the airport site, to cross it with an entirely at-grade alignment, arriving at the passenger terminal from the east.

Memorandum

Assessment

Due to their high reliability and distinct image, people movers create the perception of arrival at the airport at the moment passengers board the trains. Passengers experience a smooth and comfortable ride in vehicles designed with air travelers in mind, offering ample accommodation for baggage to be checked and other carry-on items. A feature familiar to many of the world major airports, people movers enhance the airport's image and brand.

People movers' trains travel through exclusive guideways completely segregated from other forms of traffic. The guideway can be laid within airport property (either at ground level or below grade with a tunnel or underpass), or over public roads with an elevated structure. Trains are electrically powered, and energy is supplied by a power distribution subsystem. While the trains are automated and driverless, the system requires a staffed control center, and a maintenance and storage facility.

Airports with APM systems are typically medium or large hub airports serving between 12 million annual passengers (MAP) and 30 MAP of O/D passengers. Current APM systems serve various landside and airside facilities, including multiple terminals, parking facilities, car rental locations, and regional rail. Typical demand and capacity for these systems vary depending the number and type of locations served by the APM. Passenger demand ranges from 1,000 to 3,500 persons per hour in the peak direction (pphpd). A high-frequency, landside system can carry a maximum of between 3,000 and 6,000 pphpd.[121] For a simple airport connection at LI MacArthur operating using two trainsets, the person-capacity of an LRT line would range from approximately 300 ppdph (at twice hourly frequency with a 2-car train) to 900 ppdph (at frequencies of four trains per hour with a 3-car train).

An alignment that circumvents the airport site would be elevated, with land take for a supporting structure. Crossing the airport site, the trains would travel at grade or through an RPZ underpass.

Delivery Time Frame

Five years or more.

Planning Level Cost Estimate

Capital Expenditures: $250,000,000 - $650,000,000[122]

Annual Operating Costs: $1,500,000 - $3,500,000[123]

[121] (Airport Cooperative Research Program, 2010)
[122] (AECOM, 2017)
[123] (Federal Transit Administration, 2016)

3.2.6 Personal Rapid Transit (PRT)

Figure 35: Heathrow Airport ULTra PRT Pods, London, UK (Image source: thetransportpolitic.com)

Overview

Small autonomous vehicles providing on-demand point-to-point service along a fixed guideway.

Precedents

Limited. System in operation at London-Heathrow between Terminal 5 and its parking garage. Four similar small-scale systems operating worldwide.[124]

At MacArthur Airport

Stations would be located at the passenger terminal, and at the track overpass at Ronkonkoma LIRR Station, where passengers would access the vehicle without having to move down to ground level. From that station, the PRT would gradually slope down to ground level, where it would enter the airport site, to cross it with an entirely at-grade alignment, arriving at the passenger terminal from the east.

Assessment

PRT offers a very high-quality trip in situations where demand is not great enough to justify a higher capacity form of transit. The capital costs are not as high as would be encountered with any form of rail service, but still requires right-of-way acquisition, environmental clearance, and guideway construction.

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[124] (LHR Aiports Limited, n.d.)

The guideways must be separate from any public accessible right of way, and would exist either alongside public roads or within the airport property. PRT's small vehicles and small fleet provide a specific mobility solution, but cannot be considered mass transit. The lack of worldwide PRT examples means that each system is a bespoke design with significant capital expenditure and high costs per passenger. The relative rarity of PRT means that reliance on it as a primary transportation solution should be considered experimental.

The capacity of these systems is highly scalable to meet the needs of individual applications. The Heathrow Pod system is designed to carries approximately 800 passengers daily between Terminal 5 and the T5 parking lot, but is theoretically capable of carrying 1,125 pphpd.[125] A higher demand system could reach capacities upwards of 10,000 pphpd.[126]

By the time a PRT system has been approved, constructed, and commissioned, roadworthy autonomous vehicles may be deployed, rendering the PRT largely obsolete.

Delivery Time Frame

Five years or more.

Planning Level Cost Estimate

Capital Expenditures: $150,000,000 - $450,000,000[127]

Annual Operating Costs: $500,000 - $3,000,000[128]

[125] (Ultra Global PRT, n.d.)
[126] (Furman, Fabian, Ellis, Muller, & Swenson, 2014)
[127] (Yoder, Weserman, & DeLaurentis, 2000)
[128] Arup

3.2.7 Moving Walkway

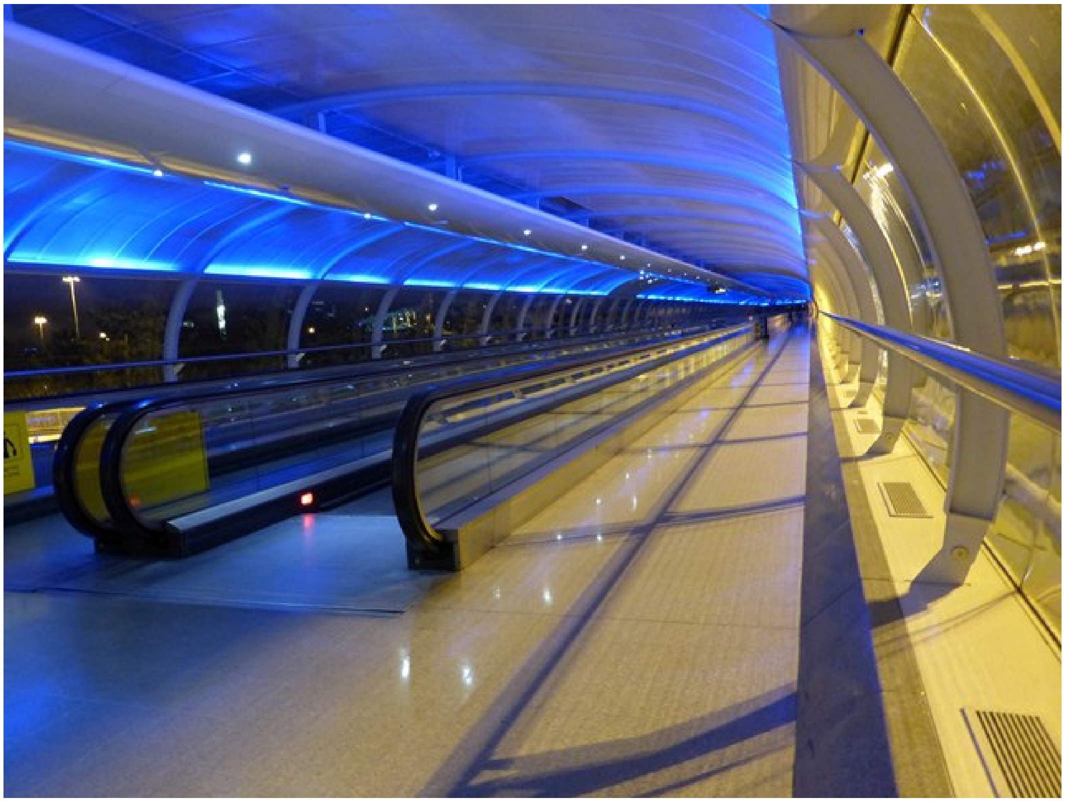

Figure 36: Moving Walkway in Manchester, UK (Image source: G. Hogg, geograph.org.uk/photo/4263645)

Overview

A moving walkway is a slow-moving conveyor mechanism that transports people across a horizontal or inclined plane over a short to medium distance.

Precedents

Walkways are present on a large number of airports. The longest planned walkway is at Boston Logan International Airport, with 2,640 ft. Federal guidance advises distances up to 1,500 ft.[129]

At MacArthur Airport

A covered, climate-controlled, moving walkway to connect the terminal with a new passenger terminal, located north of the runway, or as part of an overall solution for a connection with the LIRR.

[129] (Airport Cooperative Research Program, 2012)

Assessment

Moving walkways are used widely at airports. IATA suggests a maximum unaided passenger walking distance of 985 feet; moving walkways increase the appropriate distance up to 2,133 feet.[130] The longest moving walkway yet proposed is 2,640 feet, and would connect Terminal E at Boston Logan International Airport with the Blue Line's Airport Station. [131]

In the short- to medium-term, a moving walkway could be an appropriate addition to an overall transportation solution for the airport. It may be desirable to locate new transportation facilities adjacent to the existing airport terminal or LIRR station, rather than directly at the entrances. In this case, a moving walkway could improve the overall passenger experience by reducing the effort and time required to walk between the LIRR, the new airport link, and the terminal.

While generally inexpensive to operate, walkways can breakdown, requiring repairs, and should be located within an interior structure with climate control. A new entrance to the existing terminal might be required to interface with the walkway alignment.

Delivery Time Frame

Less than two years.

Planning Level Cost Estimate

Capital Expenditures: $15,000,000 - $40,000,000 per 1,000 feet.[132]

Annual Operating Costs: Walkway – negligible

[130] (IATA, 2004)
[131] (Rocheleau, 2015)
[132] (AECOM, 2017)

3.2.8 Bus Rapid Transit (BRT)

Figure 37: Swift BRT Vehicle, Snohomish County, WA (Image source: Flickr User Oran Viriyincy)

Overview

Enhanced buses, traveling along dedicated lanes with signal priority, offer reliable, convenient, and fast transit. Systemic operational control ensures high levels of service.

Precedents

Airports with BRT stations include LaGuardia Airport New York and Logan International in Boston. These routes provide service from various neighborhoods to the terminal, and do not serve as dedicated connections to other transit facilities.[133, 134]

At MacArthur Airport

The planned Nicolls Road BRT will have a stop at Ronkonkoma LIRR Station. The train-to-plane connection could be served by a dedicated BRT route connecting the airport passenger terminal to this planned BRT station. This new branch would have the same vehicle standard and operator as Nicolls

[133] (The Port Authority of New York & New Jersey, 2017)
[134] (Massport, 2017b)

Road BRT, to better integrate both routes, and reduce transaction costs of setting up the train-to-plane branch. Transit signal priority and dedicated ROW along route to Airport.

Assessment

BRT offers a transit system with high flexibility, reliability and convenience. It employs a suite of tools, including state-of- the-art vehicles; dedicated travel lanes, priority at traffic signals; and high quality station amenities. Theoretical capacities for high-frequency BRT systems range from 10,000 pphpd on arterial streets to 30,000 pphpd on fully dedicated rights-of-way.[135]

Airports with BRT stations include LaGuardia Airport New York and Logan International in Boston. These routes provide service from busy transit stations in dense neighborhoods to the terminal, rather than a dedicated rail-to-air connection. A new BRT link for LI MacArthur Airport operate on a circuitous alignment that avoids the airfield and would be approximately 3 miles in length, and would likely require two vehicles (plus a spare). Operating 2 to 4 trips per hour, the capacity of such a system would be approximately 125 to 250 ppdph. Dedicated transit-way would be constructed on airport property, with transit priority at intersections with public roads.

Stations could feasibly be constructed at the island in front of the LI MacArthur Airport terminal building, as well as at Ronkonkoma LIRR station. For a pure airport connector, only these two stations would be proposed, although the connector could potentially share a station facility with the proposed Nicolls Road BRT system at the train station. Bus fleets could be outfitted with luggage racks. A typical service pattern for BRT would include 10-15 minute headways, but a dedicated airport connector could be also timed to simply meet trains approximately every 30 minutes.

Delivery Time Frame

Between two and five years.

Planning Level Cost Estimate

Capital Expenditures: $40,000,000 - $130,000,000[136]

Annual Operating Costs: $500,000 - $1,500,000[137]

[135] (U.S. Department of Transportation Federal Transit Administration)
[136] (AECOM, 2017), (Federal Transit Administration, 2017)
[137] (Federal Transit Administration, 2016),

3.2.9 Streetcar

Figure 38: Streetcar in Portland, OR (Image source: M.O. Stevens, Wikimedia)

Overview

Streetcars are electric, rail vehicles, operating in mixed-traffic and on tracks embedded in the pavement. Station design is similar to a high quality bus stop.

Precedents

Many cities throughout the US use heritage and modern streetcars, including Portland, OR, Seattle, WA, Washington, DC, and Boston, MA. None reviewed connect to airports.[138,139,140,141]

At MacArthur Airport

Streetcars running between terminals constructed at LIRR station and adjacent to Airport terminal. The streetcars would operate without the overhanging wires in the alignment through the airport, relying on batteries for power.

A train-to-plane streetcar link could be the first branch of a wider streetcar network connecting other travel markets in Suffolk County. The train-to-plane streetcar would solve the airport ground

[138] (Portland Streetcar, Inc., 2017)
[139] (Seattle Streetcar, n.d.)
[140] (DDOT, 2017)
[141] (About the T, n.d.)

connection to LIRR, and would bring technological know-how to the County, that could be leveraged to expand the system. Rail-based systems, such as streetcars, have shown potential to increase property values, and to unlock new opportunities for transit-oriented developments.

Assessment

Streetcars are rail vehicles typically operated in a single-unit configuration over tracks embedded in asphalt or concrete roadway in mixed traffic. Streetcars are propelled by electric motors powered by overhead wires, and thus do not produce local emissions.[142] Some modern streetcars are capable of operating off-wire for portions of their route using battery power. Batteries may be charged via induction at stops or while traversing route segments with overhead catenary. Vehicles capable of switching between wired and battery operation were recently procured in Dallas.[143] Streetcars have shallow track foundations that require limited relocation of utilities, and require little additional communications and signaling infrastructure. [144]

Streetcars have operating speeds similar to buses, but have larger cars that are able to carry more passengers (90-200+) and which provide a smoother, quieter ride than buses.[145]

Because the quality of streetcars is perceived as higher than bus systems, they have higher economic development impact on its surroundings in those contexts.[146]

A streetcar line could be added to existing roadways around the airport, or through the east side of the airfield, with stations at Ronkonkoma Station and a station near the terminal. No stops would be proposed between these two stations. However, such a system could be theoretically be extended to other major residential and employment centers nearby the airport, leading to potential economic impacts. A simple streetcar connector at LI MacArthur, operating using two vehicles at frequencies of two to four trips per hour, would have a person-capacity of approximately 210 to 420 ppdph.

Overhead wires may be a concern, necessitating use of off-wire technology Tail tracks or turnarounds would be required at both ends to change direction.

Delivery Time Frame

Between two and five years.

Planning Level Cost Estimate

Capital Expenditures: $150,000,000 - $250,000,000[147]
Annual Operating Costs: $1,000,000 - $4,000,000[148]

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[142] (APTA, 2014)
[143] (Brookville Equipment Corporation, 2013)
[144] (Tumlin, 2011)
[145] (APTA, 2013)
[146] (Weiner, 2014)
[147] (Federal Transit Administration, 2017)
[148] (Federal Transit Administration, 2016)

3.2.10 Light Rail Transit (LRT)

Figure 39: Link LRT SeaTac/Airport Station, Seattle, WA (Image source: Flickr User andynash)

Overview

Rail service that can run in mixed traffic or dedicated right-of-way. Smaller vehicles and lower operating costs than traditional subways or commuter rail services.

Precedents

Light rail is an airport access option at a number of large cities and airports across the US, including Dallas-Fort Worth, Seattle, Minneapolis-Saint Paul, and Saint Louis.[149,150,151,152] Service typically links the airport with important residential and employment centers as part of an overall transit network.

At MacArthur Airport

A light rail connecting a station within the terminal to Ronkonkoma Station and potentially points beyond. The vehicle would have level boarding and luggage racks. Through an on-airport alignment, the vehicle would dispense with overhanging wires, being powered by batteries.

[149] (DART, 2017)
[150] (DDOT, 2017)
[151] (Metropolitan Airports Commission, 2017)
[152] (St. Louis Lambert International Airport, 2017)

A train-to-plane LRT link could be the first branch of a wider light-rail network connecting other travel markets in Suffolk County. The train-to-plane streetcar would solve the airport ground connection to LIRR, and would bring technological know-how to the County, that could be leveraged to expand the system. Rail-based systems, such as LRTs, have shown potential to increase property values, and to unlock new opportunities for transit-oriented developments.

Assessment

Light rail has been used at a number of airports in the United States, as it often represents a compromise between speed from the city center to the airport and ridership demands.

The footprint for a light rail right-of-way, its stations, and ancillary facilities often allow a light rail station to be built directly into a terminal. Passengers, both airport and non-airport, tend to view light rail as a fast, predictable, and easy to use form of transit. Airports reviewed that featured LRT connections had a wide range of air passenger demand, from about 7 million to 30 million annual enplanements.[153] These LRT connections are part of a broader local and regional transit network, and serve as a primary mode of transport the airport rather than a connection.

The person capacity of LRT varies based on train configuration and operational requirements. It can theoretically reach up to 20,000 pphpd, but this is rarely achieved. Typical service falls in the range of about 2,500 to 12,000 ppdph.[154,155] For a simple airport connection at LI MacArthur operating using two trainsets, the person-capacity of an LRT line would range from approximately 630 ppdph (at twice hourly frequency with a 2-car train) to 1,900 ppdph (at frequencies of four trains per hour with a 3-car train).

When designed to connect important residential and commercial centers as part of overall transit network, LRT can serve as an impetus for development, as it represents a permanent investment in a particular corridor. LRT has long design and construction times, and high investment costs, and does not allow quick changes in its routes and services.

It is preferable that LRT has dedicated right-of-way in order to maintain fast and reliable service. The alignment must be determined through careful study, including land ownership and height restrictions related to runway proximity. This may include routing on public roads, through airfield property, or underground depending on regulatory requirements.

Delivery Time Frame

Five years or more.

[153] (Federal Aviation Administration, 2017)
[154] (Hook, Lotshaw, & Weinstock, 2013)
[155] (Transit Cooperative Research Program, 2013)

Planning Level Cost Estimate

Capital Expenditures: $2,500,000 - $3,500,000[156]

Annual Operating Costs: $1,500,000 - $5,500,000[157]

3.3 Feasibility Context

The feasibility of a transport link is associated with the balance of its costs against its benefits, estimated as a combination of ridership level and quality of experience. In the specific case or airport connectors, it is common to provide capacity that is in excess of demand, as noted by ACRP Report 4: "in virtually all cases under consideration, the capacity of bus, light rail, rapid transit, or commuter rail service is vastly higher than that required for airport related activity."[158] That is partially because those systems are often designed with focus on service quality features such as comfort, reliability and possible connection to other destinations.

Cost and quality of experience for the identified modes are discussed on section 3.2, and this section discusses the feasibility context of those modes in terms of potential ridership levels. Some modes are typically applied to serve primarily airport customers, while others usually provide ground access from and to major regional population and employment centers.

This assessment can be benchmarked by the number of enplanements or millions of annual passengers (MAP) at other airports offering similar ground transportation services, or by the airport demand and local land use context in the case of ground connectors designed to serve other regional travel markets as well.

Moving walkways and for-hire vehicle services (including taxis and Transportation Network Companies) are highly scalable, flexible technologies with wide application for ground transportation at airports. While they should be implemented at a scale that meets the needs of air passengers, operators, and the airport, their feasibility does not depend in particular on the size of the airport. Therefore, the demand considerations for these mode are discussed in general terms, rather than in comparison with other airports.

Point-to-point

Taxis and TNCs

Taxi service is available to and from nearly all airports regardless of size. Taxi service are already available to transport customers between the Ronkonkoma LIRR station and MacArthur Airport. TNCs have similar operating characteristics as taxis and they are grouped here together.

There is no demand ceiling for successful taxi operations, since the service can be easily shared across other taxi markets. The key consideration is to supply an appropriate number of to roughly match the

[156] (Federal Transit Administration, 2017)
[157] (Federal Transit Administration, 2016)
[158] (Airport Cooperative Research Program, 2008)

demand for taxi trips generated by airport activity. If too much service is provided, drivers must wait long periods between fares, leading to uneconomical service. Conversely, undersupply of taxis results in long waits and unreliable service for customers. While taxis are nearly always provided by private commercial enterprises, airports manage undersupply by requesting more service from companies, encouraging ride-sharing, or when possible, mandating minimum service levels when contractual power is available.[159]

Structured Centered on Airport

'Structured Centered on Airport' are transportation links typically deployed at airports with the focus of moving passengers from and to terminals to other facilities. These links are often operated with Shuttle Buses, Automated People Movers (APM), and Personal Rapid Transit (PRT), and the Genoa airport in Italy is planning to have a gondola-based system. Moving walkways are an architectural solution to a mobility problem that can also be grouped in this category. They connect terminals of the same airport, or airport terminals to key transportation facilities. They are designed solely to serve airport-related traffic.

Shuttle Bus

Buses are used at airports of all sizes to link terminals with parking areas. Shuttle connections to rail also exist at airports with a wide range of demand levels. At the higher end, Massport runs shuttle service at Boston Logan International (nearly 18 million annual enplanements) to connect a commuter rail station with the terminal.[160] At the lower end, a free shuttle is available to transport passengers between Milwaukee's General Mitchell International Airport (about 3 million annual enplanements) and the nearby Amtrak station.[161] Fixed-schedule shuttle service was previously available at LI MacArthur, but uncoordinated train and flight schedules made this scheme inefficient.[162]

APM

APMs are typically deployed at medium to large hub airports. ACRP Report 37 indicates that U.S. airports with APM systems generally fall in the range of 12 MAP to 30 MAP of total passengers. The demand for these systems depends in part on how many and which types of facilities the system serves (i.e. multiple terminals, parking lots, regional rail, and car rental locations).[163]

PRT

With just one major application, it is difficult to evaluate a general range of air-travel demand that might support a PRT system. One of the few operating examples is London Heathrow's Terminal 5 Ultra Pod system, which links the terminal with a car park. According to the manufacturer, the pods

[159] (Airport Cooperative Research Program, 2015)
[160] (Massport, 2017a)
[161] (GMIA, 2017)
[162] (Village Taxi, 2017)
[163] (Airport Cooperative Research Program, 2010)

carry about 800 passengers a day using a 21 vehicle system.[164] Recent studies of automated transit networks at airports reveal that the demand for these systems may be more sensitive to the system purpose and individual airports individual context than the sheer size of passenger volumes at the airport and that these systems can be scaled in order to meet lower levels of demand.[165] Recently, a feasibility study was conducted for the Norman Y. Mineta San Jose International airport in San Jose, which serves much lower air travel demand (5 million annual enplanements) than Heathrow. This study considered a conceptual six mile, 10 station system connecting multiple terminals, parking lots, and rail stations that would serve an estimated demand of 5,780 daily total trips.[166]

Gondola

With no direct precedent for an airport Gondola system outside of one proposed system in Italy, it is impossible to identify current supportive air-traffic demand levels. However, with a capacity and cost structure slightly lower than APM's, it can be inferred that they would be feasible for the similar range of airports.

Moving Walkways

Moving walkways are implemented because on the comfort and convenience they provide to pedestrians traveling through a facility, not a projected demand. However, when designing moving walkway enough walkway width (among all installed units) should be provided to ensure high levels of service for pedestrians using the system.

Structured Branched to Airport

Another possibility of connecting LI MacArthur to the Ronkonkoma LIRR Station is by creating a branch to a regional public transportation system, such as those delivered with Bus Rapid Transit (BRT), Light Rail Transit (LRT), and Streetcars. The new connector could become a new branch integrated to the planned Nicolls Road BRT, or it could be the seed of a new rail-based system. In this context, air travel is one of many activities that generate the demand justifying the investment in new or extended infrastructure.

While the vehicles themselves could theoretically be used to provide simple, shuttle-like service between LI MacArthur's terminal and the Ronkonkoma LIRR station, this application would be unusual, since most of the benefits of these robust systems come from their ability to handle higher demand, with a more complex road network serving multiple stops. The airport link could be the first step in an integrated transit plan that would connect to destinations beyond the airport and LIRR.

BRT

Little research is available regarding successful BRT applications for ground access at airports. Two relevant airport examples are LaGuardia International and Boston Logan, both mega-hub airports with

[164] (Ultra Global PRT, n.d.)
[165] (Furman, Fabian, Ellis, Muller, & Swenson, 2014)
[166] (Arup, 2012)

well over 14 million enplanements annually. Both these BRT lines carry several thousand daily passengers between the airport and major rapid stations in dense neighborhoods.[167]

Examples of BRT are limited to higher traffic airports in part because BRT service is mostly found in urban areas requiring higher-frequency, higher-capacity transit service with limited stops. However, even some smaller airports, such as Sarasota-Bradenton International (590,000 annual enplanements) offer relatively frequent bus service, as high as two to three buses per hour on some routes connecting to their downtown area[168].

Benchmarks in the literature indicate that BRT services are typical of communities with densities of 7 to 8 dwelling units per acre (4,400 to 5,100 units per square mile) in the with a quarter mile catchment area, or about 17 residents plus jobs per acre[169]. However, the land use supportive of bus service generally scales with the proposed frequency of service.

LRT

Since the early 1990s, many cities have rolled out LRT lines that connect to their airports. LRT lines in Dallas and Seattle serving the airport also serve major downtown destinations, connecting with other rail and bus transit lines.

Airports reviewed that have LRT connections featured air-travel levels ranging from about 6 million annual enplanements (St. Louis) to about 30 million (Dallas) annual enplanements. Demand for LRTs at airports is not necessarily proportional to the air traffic market, but depends in part of the transportation geography in which the transit lines are situated. Dallas's Orange Line DFW station served about 900 average weekday passengers in 2016, while Seattle's SeaTac/Airport Station had average weekday boardings of over 6,700 [170].

Benchmarks in the literature indicate a wide range of local densities supportive of LRT: 16 to 67 residents per gross acre (10,000 to 42,000 per square mile) in a half-mile catchment area, or access provided to clusters of 100,000-150,000 jobs.[171]

Streetcars

Streetcars provide service patterns similar to buses', and are typically deployed for circulation in roads without enough width to accommodate fully segregated transitways, such as commercial districts with recurring congestion patterns. Currently there are no examples of Streetcar service extended to airports. However, the supportive demand for an airport application may be reasonably assumed to be similar to LRT, provided trip times are similar.

[167] (Massachusetts Bay Transportation Authority, 2014)
[168] (Sarasota County, 2017)
[169] (Puget Sound Regional Council, 2015)
[170] (Dallas Area Rapid Transit, 2017)

Memorandum

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Appendix C.

Project Screening Criteria Memo

Memorandum

ARUP

To	Lou Bekofsky, Deputy Commissioner, SCEDP Ankita Rathi, Planner, SCDEDP	Date	January 24, 2018
Copies		Reference number	
From	Denis Mani, Arup Amy Leitch, Arup Andrew Kay, Arup	File reference	
Subject	Ronkonkoma Railroad Station / Long Island MacArthur Airport (ISP) Train-to-Plane Connectivity Study - Project Screening Criteria		

Task 5: Develop Screening Criteria Matrix

After the project team identified 10 transportation modes that could connect the LIRR Ronkonkoma Station and the LI MacArthur Airport passenger terminal, a Screening Criteria Matrix was developed to support in determining the four connection modes that should advance to Task 6, in which the project team will detail implementation plans for each selected mode. A preferred alternative for the airport connector will be defined in Task 9, when a combination of modes will be selected from the list of 4 modes detailed in task 6.

One of the results of this evaluation is a graphic tool, the screening matrix, displaying how each mode would perform as a train-to-plane connection to LI MacArthur Airport. From these results, four modes amongst those that demonstrate the strongest opportunities with regards to their performance against air traveler, community and delivery focused criteria will be carried forward for further investigation by the project team to inform the final recommendations of the Study.

The memo is structured in the following sections:

- Introduction
- Screening Criteria
- Mode Assessment
- Summary Matrix

1 Introduction

The 10 connection modes evaluated in this study are presented in detail in the Task 4 memo, which sets out the existing conditions and the connection modes for exploration. These 10 modes were grouped into three supply-demand classes:

- Point-to-point: Modes that may pickup and drop-off passengers at almost any location.

- Structured centered on airport: Modes focused on airport-bound demand, running along a fixed route with pre-determined pickup and drop-off points.
- Structured branched to airport: Modes with structured routes serving multiple travel markets in the wider community, extended to the airport with a spur to serve airport demand.

The connection modes were evaluated based on two scenarios, one considering the existing terminal at LI MacArthur Airport, and one with a potential north-side terminal, which would be located less than a quarter-mile to the LIRR Ronkonkoma Station. The combination of scenarios and modes evaluated is illustrated in Table 1.

Table 1: Modes and scoring scenarios

Mode Group	Mode	Scenario	
		Existing Terminal	North Side Terminal
Point to Point	Updated Taxi System	●	
	Transportation Network Companies (TNCs)	●	
Structured, Centered On Airport	Shuttle Bus	●	
	Automated People Mover (APM)	●	
	Personal Rapid Transit (PRT)	●	
	Gondola		●
	Moving Walkway		●
Structured, Branched To Airport	Bus Rapid Transit (BRT)	●	●
	Streetcars	●	●
	Light Rail Transit (LRT)	●	●

● *indicates mode is evaluated for this scenario*

The project team used a bespoke evaluation framework to identify the connection modes' strengths and weaknesses and to score them against project goals. The framework comprises 10 screening criteria that represent specific goals for the project. The framework is intended as a high-level decision-making tool to determine four connection modes from the long list of potential options.

The screening criteria were identified through a process that included a high-level desktop literature review and interview of project team members to assess:

- Project goals
- Project risks
- Best practices
- Opportunities for innovation
- Stakeholders

The best practices component included input from Arup's professional expertise, as well as a review of peer projects, such as the evaluation of options for the LaGuardia Airport redevelopment. It also included industry guidance, such as the US Department of Transportation's MAP-21 Performance Management goals, and operational goals, such as set out by the Long Island Rail Road, and the Metropolitan Transportation Authority.

Memorandum

Within best practices, the team also sought to include criteria that promote quality in design and resilience in communities, such as robustness, redundancy, flexibility, resourcefulness, reflection, inclusivity and integration.[1] The team also considered criteria to reflect the feasibility and deliverability of the connection modes, including assumptions on the potential time period for service delivery, increase in demand for use and potential for further development / deployment to service additional markets.

The project team synthesized this review to identify 10 screening criteria. The criteria focused on the impact of the identified mode in operation; thus, the community focused criteria do not consider any additional impacts on the area surrounding the airport that might be associated with construction activity. This distinction reflects the objective of the task to determine the top four options that best deliver project goals. The specific impacts of these top four options, including mitigation options for any negative impacts, will be investigated in further detail in later project stages.

The 10 screening criteria reflect three focus areas:

Table 2: Focus Areas for the Screening Criteria

Focus area	Description
Air Traveler Focused	Criteria focus on the experience of air travelers using the transit mode in terms of ease of connection between the train station and the airport, the reliability of service, and overall passenger experience.
Community Focused	Criteria focus on the impact of the mode on the community in terms of the built environment, the ability of the mode to serve other markets in the future, and the impact to the environment.
Delivery Focused	Criteria focus on the deliverability of the mode in terms of rollout phasing, ease of implementation, capital cost and operational cost.

The diagram below illustrates the three key steps of the mode assessment: 1) develop the screening criteria, 2) assess each of the 10 project modes against the criteria, and 3) identify the relative performance of each mode in delivering project goals (Figure 1).

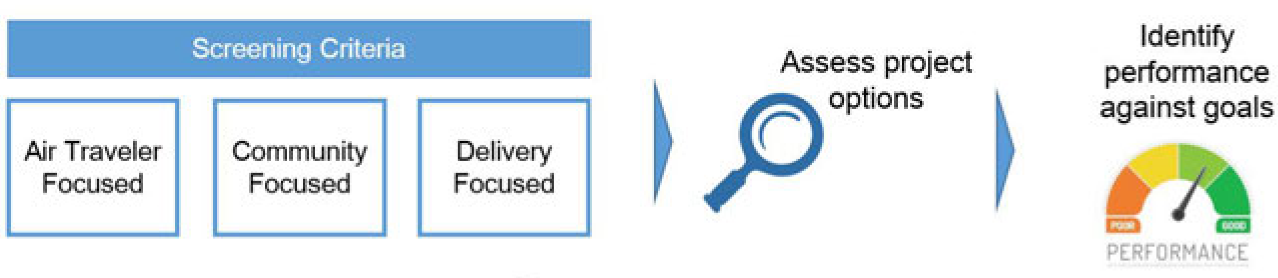


Figure 1: Screening Criteria Process

[1] Arup (2014). The City Resilience Index.

Each identified mode was evaluated against the screening criteria using an impact scale with three levels, and for summary scoring purposes, each level was scored according to the scale presented on Table 3.

Table 3: Key for score levels

Rating levels		Score
●	Good	10
◒	Fair	4
○	Poor	1

2 Screening Criteria

The screening criteria provide an unbiased grading system for the identified connection modes by overall potential to deliver the project goals. The screening criteria and evaluation methodology may also be further refined and used to inform a more detailed assessment as the project progresses towards final recommendations.

The 10 screening criteria used on Task 5 are defined in Table 4, along with the definitions for their three levels of impact.

At a workshop held on November 2017, the project stakeholders defined the subset of priority criteria. These prioritized criteria were weighted 50% higher, to tune the scoring process to the stakeholders' specific values and concerns. The six prioritized criteria are: ease of connection, reliability, passenger experience, rollout phasing, capital costs, and operating costs.

Table 4: Screening criteria definition and impact levels

Criteria		Definition
1	**Ease of connection** *Convenience of transferring into the connection vehicle, assessed by walking distance, level changes, wayfinding and baggage movement effort.*	• Good: Provision of clear and simple level transfer from train station to overpass into the connector's station. • Fair: Connector's station is at ground level and within 100ft of the elevator to the station overpass. Path from elevator to station has no steps or circuitous ramps to overcome grade changes, and offers protection from the weather. • Poor: Absence of covered path from train station to connector boarding area, walking distance from train station to boarding above 100ft or presence of steps along the way.

Criteria		Definition
2	**Reliability** *Frequency of delays on the connection travel, and of vehicle availability for pickup.*	• Good: Connector departures or vehicle availability are timed with train and airplane arrivals. Connection takes place over rail, or dedicated roadways without mixed traffic. • Fair: Connector departures or vehicle availability are timed with train and airplane arrivals. Connection takes place over public roadways, and thus are subject to interference of traffic. • Poor: Connector departures or vehicle availability are not timed to train and airplane arrivals.
3	**Passenger experience** *Quality and convenience of the train-to-plane journey, considering fare transaction, connector station quality, and in-vehicle comfort.*	• Good: Service is free of charge; a climate-controlled station displays information on connector estimated arrival time, and the status of flight departure; rides are smooth, predictable and have climate control. • Fair: Fare transaction is possible by mobile device, or physical means. Connector station has protection from weather; rides are smooth, predictable and have climate control. • Poor: Fare transaction does not enable payment by more than one method (i.e., either by cash/card only or by mobile phone only); boarding area has no protection from weather; rides take place over public roads, subject to variation in quality of pavement.
4	**Neighborhood integration** *Degree to which the travel mode complements or degrades the neighborhood and adjacent land uses, considering shading, obstructed views, and scale context.*	• Good: Connector station's (or boarding area's) scale is smaller than Ronkonkoma LIRR Station's and in line with surrounding land uses. Absence of elevated structures along public roads. • Fair: Connector station is at the scale of Ronkonkoma LIRR Station. Absence of elevated structures along public roads. • Poor: Need for elevated structures on public roads.

Criteria		Definition
5	**Ability to serve other markets** *Convenience of integrating the mode to the regional transit network, and ease of route extension to contribute to a 21st century transit network on other county travel markets.*	• Good: Route could easily be extended into other destinations to contribute to a 21st century transit network on other markets, or connector station has a seamless connection to planned BRT station at Ronkonkoma Station. • Fair: Route extension into other destinations would require intense planning and community engagement, and connector station does not seamlessly connect to the planned BRT stop at Ronkonkoma Station. • Poor: Route cannot be extended without substantial investment and long approval processes, and connector station does not seamlessly connect to the planned BRT station at Ronkonkoma, or mode is not part of a transit network.
6	**Environmental performance** *Efficiency of natural resources usage and magnitude of adverse effects on natural systems.*	• Good: Strong opportunity to decrease local emissions per passenger and little increase to noise and vibration levels. • Fair: Moderate to strong opportunity to decrease local emissions per passenger and little to moderate increase to noise and vibration levels. • Poor: Little opportunity to decrease local emissions per passenger or moderate to significant increase to noise and vibration levels.
7	**Rollout phasing** *Ability of project to be de-livered in incremental stages, in which capacity is built gradually over time and adjusted to observed demand.*	• High: Train-to-plane capacity can be expanded in small incremental steps, and a small portion of builtout capital expenses are incurred upfront. • Fair: Train-to-plane capacity can be expanded in small incremental steps, or only a small portion of builtout capital expenses are incurred upfront. • Poor: Train-to-plane capacity can be expanded only large in incremental steps and most of builtout capital expenses are incurred upfront.

Criteria		Definition
8	**Ease of implementation** *Complexity of project, construction delivery timeframes.*	• Good: Mode has precedents in the U.S. for airport ground access, and can be delivered under three years for design, approval and construction. • Fair: Mode has either precedents in the U.S. for airport ground access or can be delivered under three years for design, approval and construction. • Poor: Mode has no precedents in the U.S. for airport ground access, and cannot be delivered under three years for design, approval and construction.
9	**Capital Costs** *Amount of funds required for construction, vehicle purchase and systems procurement for start of operations.*	• Good: Existing terminal connections have average capex under $1 million. North terminal connections have average capex under $50 million. • Fair: Existing terminal connections have average capex under $100 million. North terminal connections have average capex higher than $50 million and lower than $100 million. • Poor: Existing terminal connections have average capex above $100 million. North terminal connections have average capex higher than $100 million.
10	**Operating Costs** *Amount of funds required for annual operations of the connection.*	• Good: Average opex under $500 thousand. • Fair: Average opex higher than $500 thousand and under $1 million. • Poor: Average opex above $1 million.

3 Mode Assessment

3.1 Point-to-Point Transportation

3.1.1 Updated Taxi System

A fleet of for-hire vehicles offers rides for individual passengers or small groups. Rides are summoned by hailing a taxi parked at a stand or driving by. The updated taxi system mode differs from the existing conditions baseline service by the provision of enhanced facilities and amenities for passengers such as dedicated mobile device application.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	◒	◒	●	◒	◒	●	●	●	●

Performance Narrative

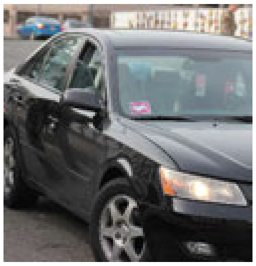
This option would retain many features from the current connection mode between the station and LI MacArthur Airport, with benefits through low implementation and operations cost, easy rollout and implementation, and minimal impact to the local neighborhood.

The updated system would deploy modern vehicles equipped with onboard digital amenities, and design favorable for stepping in and out, baggage movement and accommodation of persons with disabilities. The new fleet would allow passengers to pay by cash/card in addition to a new mobile device function, and to reserve a trip in advance through their smartphone.

This solution could be rolled out fast, and gradually expanded by addition of vehicles, because there are multiple companies offering software and cloud services for updating taxi fleets into a level of service similar to TNCs, and a next-generation taxi vehicle was recently developed by Nissan to serve New York City.

However, this option still provides low performance across ease of connection due to the sidewalk to asphalt transfer, need to move baggage and the distance from the train station to the taxi stand. Albeit reliability could be improved in relation to the no-action mode, with ride reservation apps, there is still possibility of capacity issues as a result of growing demand, and the need to travel through public roads, subject to traffic congestion.

3.1.2 Transportation Network Companies (TNCs)



Two variations of TNCs would suit the connection: ‘ride-hailing’ services, from companies like Uber and Lyft provide customers the ability to arrange a ride using a GPS-enabled mobile device; ‘microtransit’ services such as Chariot, Birdj and Via connect passengers to high-occupancy vehicles and shared rides.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	◒	○	●	●	○	◒	●	●	●

Performance Narrative

Like the Updated Taxi System mode, the Transportation Network Companies (TNC) option enhances the current transit service between LIRR and LI MacArthur airport by offering a wider range of mobility choices to travelers.

This option performs strongly in delivering cost, easy rollout and implementation, and minimal impact to the local neighborhood. Many airports across the U.S. have struck deals with TNCs to regulate their services within airport property, and public transit companies have made agreements with TNCs to offer minimum service in last-mile/first-mile links.

In terms of ease of connection, a pickup and drop-off station could be designed and constructed to offer a good quality of experience to riders, and the airport could negotiate with a microtransit service to guarantee service meeting every Ronkonkoma train.

Regarding passenger experience, TNCs present a challenge: they only allow for payment by smartphone and cannot accept cash/credit. TNCs rely on user accounts tied to their smartphone to offer rewards and penalties to users and drivers, and would therefore be opposed to a system in which users are not identified and negotiate via app. This restriction excludes from the system passengers who prefer to not use or do not own a smartphone, or even who do not have a TNC account

3.2 Structured, Centered on Airport

3.2.1 Shuttle

A dedicated bus service traveling along fixed routes at fixed schedules.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	●	●	●	○	◒	●	●	●	●

Performance Narrative

A dedicated shuttle bus service performs strongly in delivering cost, easy rollout and implementation, and minimal impact to the local neighborhood.

This mode represents a moderate improvement in traveler experience, with easy connection as transfer would be possible within 50ft of the elevator to the station overpass with no-step transfer and a covered walkway for protection from weather. The option makes provision for improved access to amenities, branding, and other ‘soft’ services. Buses would be clearly identified and provide a strong legibility / sense of place for ridership connection between the station and airport.

Shuttle buses also provide a moderate improvement in reliability of service, as shuttle availability can be scheduled to meet air and rail passengers. However, buses would still be subject to road congestion on public roads outside the airport.

The option performs strongly in terms of environment impact, with fully electric vehicles eliminating local carbon emissions and minimal impact to noise and vibration beyond existing conditions.

The option performs poorly in terms of ability to service other market, because it does not offer additional benefits to the existing service provided by Suffolk County Transit.

3.2.2 Automated People Mover (APM)

APM is a grade-separated mass transit system with full automated, driverless operations, featuring vehicles that travel on guideways with an exclusive right-of-way.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	●	●	●	◒	○	◒	○	◒	○	○

Performance Narrative

Automated People Mover (APM) service provides strong ease of connection and reliability, as the service can be designed to provide same-level connection from the station to the vehicles, and as the vehicles travel on a dedicated guideway segregated from traffic, they can provide timed service free of exposure to road congestion. APM also provide strong performance in passenger experience, as they provide fast, smooth service. APM is one of the only two modes assessed in this memo that received the highest score in all three air traveler focused criteria, a reflection of how it is the gold standard for mass movement of people for airport ground access.

While the operating costs of APM are mitigated as service can be automated, the technical and infrastructure requirements perform poorly across all other delivery-focused criteria. The guideway would be constructed at grade level through the airport, mitigating impact on the neighborhood.

The APM would perform fairly against environmental criteria as although APM can connect with a green power grid, and thus mitigate local carbon emissions from operation, the operation would generate adverse noise and vibration impacts (albeit, less than traditional rail-based modes).

In addition, the option also performs poorly in terms of ability to service other markets with limited opportunity to connect with local and regional service and the infrastructure requirements limit opportunity for rollout phasing.

Memorandum

3.2.3 Gondola

Cabins supported and propelled by overhead cables connecting stations. Used to cross landscapes where ground options are too costly or inconvenient.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
North Side Terminal	●	●	◒	◒	○	●	○	◒	◒	○

Performance Narrative

This option is only evaluated for a scenario in which the airport terminal is relocated to the north side of the airfield.

A gondola service provides strong ease of connection and reliability, as the service can be designed to provide same-level connection from the station to the gondola cabins, and as the cabins do not travel on the ground they can provide timed service free of exposure to road congestion. Passenger experience, however, suffers from lack of climate control in the cabin.

Gondolas require elevated structures that are not allowed within RPZs, and therefore would have to be set up on public roads, with an alignment that goes around the airport to connect Ronkonkoma Station to the Airport Terminal. While gondolas would require limited land development footprint, the tall support towers would be out of scale with the local neighborhood, causing issues such as overshadowing and obstruction of viewsheds. On the upside, Gondolas can also connect with a green power grid, mitigating carbon emissions from operation, and have very low noise and vibration impacts.

While the operating costs of a gondola system may be moderate, and capital costs best-in-class, in comparison to other long-term options, gondolas perform poorly across the other delivery focused criteria.

3.2.4 Personal Rapid Transit (PRT)

Small autonomous vehicles providing on-demand point-to-point service along a fixed guideway.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	●	●	●	◒	○	●	○	○	○	○

Performance Narrative

Like APM, Personal Rapid Transit (PRT) service provides strong ease of connection and reliability, as the service can be designed to provide same-level connection from the station to the vehicles with transit provided on a dedicated guideway segregated from traffic and free of exposure to road congestion. PRT also provide strong performance in passenger experience, as they provide fast, smooth service, and have strong recognition and positive perception by passengers. The gold standard for mass movement of passengers for airport ground access, PRT is one of the only two modes assessed in this memo that received the highest score in all three air traveler focused criteria.

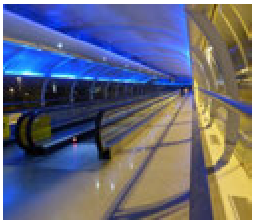
While the operating costs of PRT are mitigated as service can be automated, the technical and infrastructure requirements perform poorly across all other delivery-focused criteria. Like APM, the guideway would be constructed at grade level through the airport, mitigating impact on the neighborhood.

The PRT would perform fairly against environmental criteria as although PRT can connect with a green power grid, and thus mitigate local carbon emissions from operation, the operation would generate moderate adverse noise and vibration impacts.

In addition, the option also performs poorly in terms of ability to service other markets with limited opportunity to connect with local and regional service and the infrastructure requirements limit opportunity for rollout phasing.

Memorandum

3.2.5 Moving Walkway



A slow-moving conveyor mechanism that transports people across a horizontal or inclined plane over a short to medium distance.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
North Side Terminal	●	●	●	●	○	●	○	●	◒	●

Performance Narrative

A moving walkway option is evaluated only for a scenario in which the main terminal building is located to the north side of the airfield. Under that assumption, the walkway performs well in nearly all categories.

The connection would be possible within 50 ft. of the elevator and could be designed with no level change. A climate controlled corridor would take passengers directly from the train station to the terminal in comfort and without the need to wait for a connecting service vehicle, and presenting LIRR passengers with a strong sense of arriving at an airport facility. These features result in high scores for reliability, passenger experience, and neighborhood integration. Moving walkways are propelled using electric motors and have no local air emissions or noticeable noise impacts.

Once a decision has been reached to relocate the airport terminal, the moving walkway could easily be integrated into the plans, without large additional capital investments or operating costs.

The walkway however performs poorly on two criteria: ability to serve other markets and rollout phasing. The nature of the walkway is limited to connecting two, nearby facilities. In addition, once situated within a structure, implementing additional walkway capacity may not be possible.

Memorandum

3.3 Structured, Branched to Airport

3.3.1 Bus Rapid Transit (BRT)

Enhanced buses, traveling along dedicated lanes with signal priority, offer reliable, convenient, and fast transit. Systemic operational control ensures high levels of service.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	●	●	●	●	◒	●	◒	◒	◒
North Side Terminal	◒	●	●	●	●	◒	●	●	●	●

Performance Narrative

Bus Rapid Transit (BRT) performs well across all criteria, with no 'Low' score in any category.

BRT service provides an improvement in ease of connection as transfer would be possible within 50ft of the elevator to the station overpass with no-step transfer and a covered walkway for protection from weather. The option provides for improved access to amenities, branding, and other 'soft' services. Buses would be clearly identified and provide a strong legibility / sense of place for ridership connection between the station and airport.

BRT also provides more reliable service compared with other bus modes because they operate in dedicated right-of-way, and are not subject to local traffic impact. Bus availability can be optimized for air passengers, and through installation or protected service lanes, buses would not be subject to road congestion on public roads or within the airport.

The option performs strongly in terms of environmental impact, with fully electric vehicles eliminating local carbon emissions and minimal impact to noise and vibration beyond existing conditions.

The option also performs strongly in terms of blending into the local neighborhood, ability to service other markets with opportunity to connect with existing plans for local and regional BRT service to expand delivery beyond the station-airport connection. The fast delivery also supports strong rollout phasing opportunity, with the ability to provide enhanced service when needed to meet growing demand.

Ease of implementation is rated higher in the scenario of a relocated the terminal to the north side of the airfield. This new location would minimize the amount of route-miles required to serve the airport and provide more ready integration with other proposed BRT service in Suffolk County.

3.3.2 Streetcar

Streetcars are electric, rail vehicles, operating in mixed-traffic and on tracks embedded in the pavement. Station design is similar to a high quality bus stop.

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	●	●	●	●	○	◒	◒	○	○
North Side Terminal	◒	●	●	●	●	○	◒	●	◒	○

Performance Narrative

Streetcar service provides an improvement in ease of connection as the transfer would be possible within 100ft of the elevator to the station overpass with no-step transfer and a covered walkway for protection from weather. The option provides for improved access to amenities, branding, and other ‘soft’ services. Vehicles would be clearly identified and provide a strong legibility / sense of place for ridership connection between the station and airport.

Streetcars are capable of handling high ridership volume without major capital projects. The route alignment would go through the airport site, to provide for the dedicated right-of-way that would deliver high reliability in travel times. Because there can be no structures on the RPZ, the streetcar would require batteries that would be charged at the route termini or over the portions of the alignment outside the RPZ.

While this mode is electrified, and therefore has no local emissions and has the opportunity of being connected to the green power grid, there are other environmental issues. Rail modes in general have higher patterns of noise and vibration than rubber-tire based modes. Because noise and vibration are of primary environmental concern for airports, this mode scored low in the environmental performance criteria.

The option has moderate opportunity to serve other markets, should streetcar service be expand beyond the station-airport connection. The infrastructure need for rail, overhead wires and stations would also limit opportunity for rollout phasing.

Ease of implementation is rated higher in the scenario of a relocated the terminal to the north side of the airfield. This new location would minimize the amount of route-miles required to serve the airport.

3.3.3 Light Rail Transit (LRT)

Rail service running on dedicated right-of-way. Smaller vehicles and lower operating costs than traditional subways or commuter rail services.

Memorandum

Performance Summary

	Air Traveler Focused			Community Focused			Delivery Focused			
Scenario	Ease of connection	Reliability	Passenger experience	Neighborhood integration	Ability to serve other markets	Environmental performance	Rollout phasing	Ease of implementation	Capital costs	Operating costs
Existing Terminal	◒	●	●	◒	◒	○	○	○	○	○
North Side Terminal	◒	●	●	◒	◒	○	○	○	○	○

Performance Narrative

LRT service provides an improvement in ease of connection, as it would offer level boarding and a station would be set up by the elevator access to the Ronkonkoma station overpass. The service would be very reliable with departures timed to match air and rail schedule, and travel along exclusive right-of-way through the airport site. The option makes provision for improved access to amenities, branding, and other 'soft' services. Vehicles would be clearly identified and provide a strong legibility / sense of place for ridership connection between the station and airport.

The larger vehicles used in LRT compositions require heavier track and power distribution infrastructure, and these systems and construction needs are the biggest difference between LRT and Streetcar modes. With a larger set up, the LRT composition cannot share the right-of-way with other vehicles at no times, and consequently expansion of the system to other markets in Suffolk County would entail a long and demanding process of planning and approval seeking.

The extensive construction costs for track and power supply hurt the ability of the system to be rolled out in phases, and implementation would take more than five years due to stringent design standards and long lead times in delivery of rolling stock and system parts. The operating costs are the worst-performing across the long-term modes, but the capital expenses needed for system launch are on par with the group average.

Ease of implementation is rated higher in the scenario of a relocated the terminal to the north side of the airfield. This new location would minimize the amount of route-miles required to serve the airport.

4 Summary Matrix

Existing Terminal

For the existing terminal configuration, the four highest ranking options were: extending a BRT branch to the airport, updating the taxi system, shuttle buses, and TNCs. These options align with the majority of ground access solutions employed across the U.S. They all feature lower capital costs than the others and could be implemented as part of a combined strategy.

Figure 2: Existing Terminal Modes Screening Matrix

Memorandum

North Side Terminal

The BRT extension, and the moving walkway options scored higher than the others. The costs for relocating the airport terminal, which should be similar across all connection modes, are not considered in this portion of the analysis.

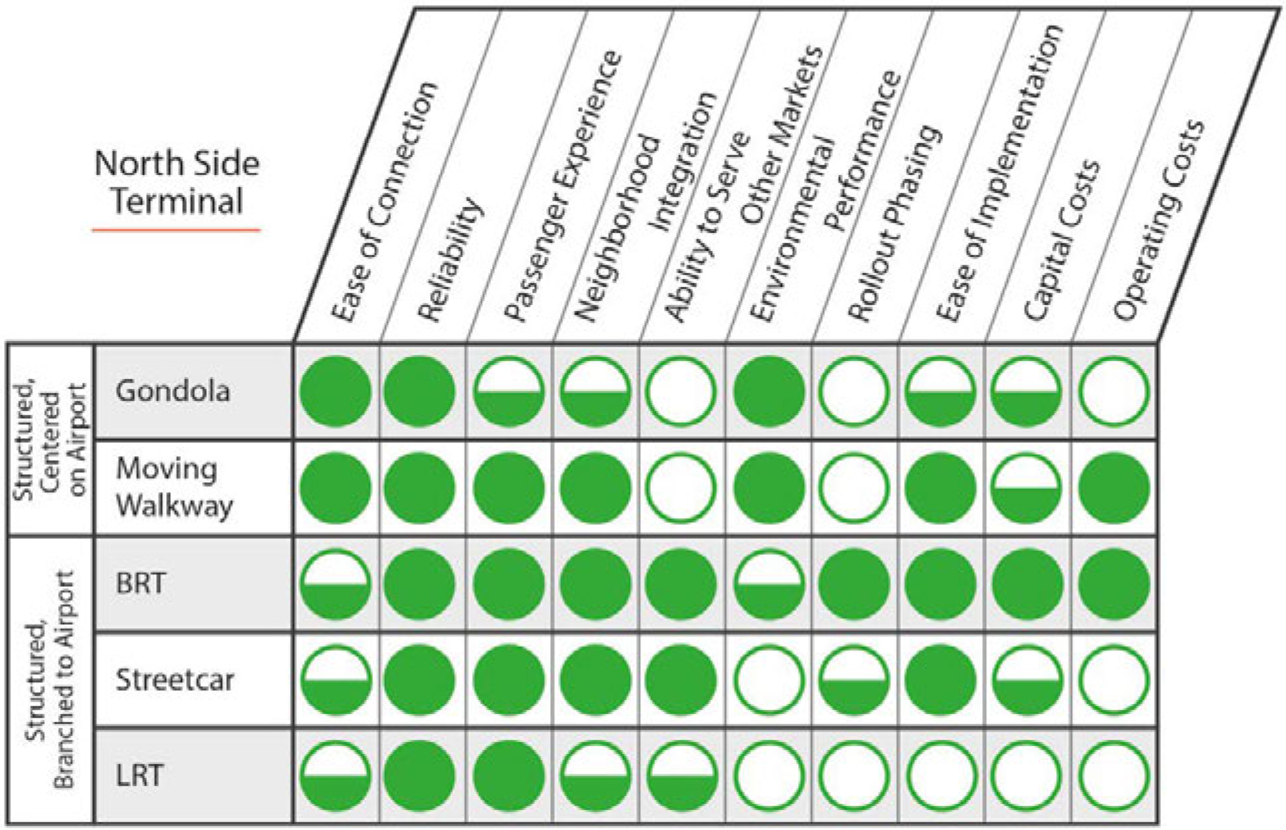


Figure 3: North Side Terminal Modes Screening Matrix

The aggregated score for each of the modes is indicated on Table 5 and Table 6.

Table 5: Existing Terminal Modes Score

Existing Terminal		Score
Point to Point	Updated Taxi System	7.0
	TNCs	6.2
Structured, Centered on Airport	Shuttle Bus	8.2
	APM	4.8
	PRT	5.0
Structured, Branched to Airport	BRT	7.0
	Streetcar	5.4
	LRT	3.9

Table 6: North Side Terminal Modes Score

North Side Terminal		Score
Structured, Centered on Airport	Gondola	4.9
	Moving Walkway	7.6
Structured, Branched to Airport	BRT	8.8
	Streetcar	6.2
	LRT	3.9

Appendix A– Screening Criteria Breakdown

A1.1 Ease of Connection

Updated Taxi System

Existing Terminal: Fair

- Current taxi stand is 200ft away from the overpass elevator, but a new boarding zone could be set up south of the tracks, less than 100ft from the overpass elevator.
- There is a step down from the sidewalk to the pavement and baggage needs to be lifted into the trunk
- An awning would extend over the taxi boarding area protecting passengers from rainfall.

TNCs

Existing Terminal: Fair

- TNC pickup area would be south of the tracks, within 100ft walking distance from the overpass access.
- There is a step down from the sidewalk to the pavement and baggage needs to be lifted into the trunk
- An awning would extend over part of the boarding zone, but some vehicles would still be exposed to the elements.

Shuttle Bus

Existing Terminal: Fair

- Connector station would be at south side, less than 100ft from the overpass access.
- Connector station would be at level with the shuttle bus.
- An awning would extend over the bus boarding area protecting passengers from rainfall.

APM

Existing Terminal: Good

- New station would be level transfer from overpass.

PRT

Existing Terminal: Good

- New station would be level transfer from overpass.

Gondola

North Side Terminal: Good

- New station would be level transfer from overpass.

Moving Walkway

North Side Terminal: Good

- Moving walkway entrance would be south of the tracks within 100ft walking distance from overpass access.
- Walkway would be in an enclosed or covered structured, protecting passengers from elements.

BRT

Existing & North Side Terminals: Fair

- Connector station would be at south side, less than 100ft from the overpass access.
- Connector station would be at level with the shuttle bus.
- An awning would extend over the BRT boarding area protecting passengers from rainfall.

Streetcar

Existing & North Side Terminals: Fair

- Connector station would be at south side, less than 100ft from the overpass access.
- Connector station would be at level with the shuttle bus.
- An awning would extend over the Streetcar boarding area protecting passengers from rainfall.

LRT

South & North Side Terminals: Fair

- Connector station would be at south side, less than 100ft from the overpass access.
- Connector station would be at level with the shuttle bus.

An awning would extend over the LRT boarding area protecting passengers from rainfall.

A1.2 Reliability

Updated Taxi System

Existing Terminal: Fair

- Taxis are available to meet every train connection.
- Trips are subject to traffic congestion on public roads.

TNCs

Existing Terminal: Fair

- TNCs should guarantee availability for each train connection.
- Trips subject to traffic congestion on public roads.

Shuttle Bus

Existing Terminal: Good

- Because Long Island MacArthur would plan, manage and control the service, shuttle departures would be timed to train and airplane arrivals.
- Trips would take place at a dedicated roadway through the airport site.

APM

Existing Terminal: Good

- Because Long Island MacArthur would plan, manage and control the service, APM departures would be timed to train and airplane arrivals.
- Service runs on a fully separated rail right-of-way.

PRT

Existing Terminal: Good

- PRT vehicles would be requested by passengers at terminal or train station. Enough vehicles would be supplied to ensure availability.
- Service would be provided on guideways separated from any public accessible right of way and would be constructed within the airport property.

Gondola

North Side Terminal: Good

- Because Long Island MacArthur would plan, manage and control the service, Gondola service would be optimized for air passengers.
- Service is provided on an aerial ropeway, and is not subject to local traffic congestion.

Moving Walkway

North Side Terminal: Good

- Moving walkway service would be available at all times air service is offered and does not require waiting for a vehicle.

BRT

Existing & North Side Terminals: Good

- Because Long Island MacArthur would plan, manage and control the service, BRT departures would be timed to train and airplane arrivals.
- Dedicated transit-way would be constructed on airport property, with transit priority at intersections with public roads.

Streetcar

Existing & North Side Terminals: Good

- Because Long Island MacArthur would plan, manage and control the service, Streetcar departures would be timed to train and airplane arrivals.
- Dedicated transit-way would be constructed on airport property, with transit priority at intersections with public roads.

LRT

Existing & North Side Terminals: Good

- Because Long Island MacArthur would plan, manage and control the service, Streetcar departures would be timed to train and airplane arrivals.
- Dedicated transit-way would be constructed on airport property, with transit priority at intersections with public roads.

A1.3 Passenger Experience

Updated Taxi System

Existing Terminal: Fair

- Fare transaction could be electronic or by cash/card.
- Passengers can wait for in climate-control environment, with no information over flight status.
- Ride comfort subject to pavement quality on public roads and on quality of vehicle, which are both out of airport's control.
- Vehicles may not ride with the AC on.

TNCs

Existing Terminal: Poor

- Fare transactions are accomplished through mobile devices only, requires an account and is difficult to split between passengers.
- Passengers would be picked up outdoors, with no information over flight status.
- Ride comfort subject to pavement quality on public roads and on quality of vehicle, which are both out of airport's control.

Shuttle Bus

Existing Terminal: Good

- No fare transaction necessary. Airport would cover costs.
- Waiting area would be minimally furnished with no information over flight status.
- Ride comfort subject to pavement quality on the airport, which would receive maintenance to ensure a smooth ride.

APM

Existing & North Side Terminals: Good

- No fare transaction necessary. Airport would cover costs.
- Fast, reliable and comfortable travel.
- APM creates the perception of arrival at the airport immediately upon boarding
- Smooth and comfortable ride quality in vehicles designed with air travelers in mind.

PRT

Existing & North Side Terminals: Good

- No fare transaction necessary. Airport would cover costs.
- Dedicated guideway provides a smooth and comfortable ride in vehicles designed with air travelers in mind.

Gondola

North Side Terminals: Fair

- No fare transaction necessary. Airport would cover costs.
- Cabins are not powered, only one international precedent where cabins have climate control.

Moving Walkway

North Side Terminal: Good

- No fare transaction necessary.
- Ideally located in a climate controlled corridor, in which information could be provided.

BRT

Existing & North Side Terminals: Good

- No fare transaction necessary. Airport would cover costs.
- Ride comfort subject to pavement quality on the airport, which would receive maintenance to ensure a smooth ride.
- Upgraded, high-quality amenities in vehicles and passenger information at stations.

Streetcar

Existing & North Side Terminals: Good

- No fare transaction necessary. Airport would cover costs.
- Upgraded, high-quality amenities in vehicles and passenger information at stations.
- Smooth, comfortable ride quality.

LRT

Existing & North Side Terminals: Good

- No fare transaction necessary. Airport would cover costs.
- Upgraded, high-quality amenities in vehicles and passenger information at upgraded stations.
- Smooth, comfortable ride quality.

A1.4 Neighborhood integration

Updated Taxi System

Existing Terminal: Good

- Existing facilities are small scale and in line with surrounding land uses.
- No elevated structures.

TNCs

Existing Terminal: Good

- Additional station facilities would be small scale, likely limited to a designated pick-up area.
- No elevated structures.

Shuttle Bus

Existing Terminal: Good

- Additional station facilities would be small scale, likely limited to a designated pick-up area.
- No elevated structures.

APM

Existing Terminal: Fair

- Additional facilities would be medium scale.
- Guideway at ground level.

PRT

Existing Terminal: Fair

- Additional facilities would be medium in scale.
- Guideway at ground level.

Gondola

North Side Terminal: Fair

- Additional station facilities scale would be on par with Ronkonkoma Station.
- Requires elevated ropeway structures, but visual impacts would be limited to parking areas and airport facilities.

Moving Walkway

North Side Terminal: Good

- Walkway structure would be small scale and not require elevated structures on public roads.

BRT

Existing and North Side Terminal: Good

- Additional station facilities would be small scale.
- No elevated structures.

Streetcar

Existing and North Side Terminal: Good

- Additional station facilities would be small scale.
- Vehicles could be powered by batteries over some segments, to reduce their impact to the neighborhood and interference with airport restrictions.

LRT

Existing Terminal: Fair

- Additional station facilities scale would be on par with Ronkonkoma Station.
-

North Side Terminal: Fair

- Additional station facilities scale would be on par with Ronkonkoma Station.

A1.5 Ability to Serve Other Markets

Updated Taxi System

Existing Side Terminal: Fair

- Taxis can easily be shifted to address demand imbalances and serve other markets.
- The adoption of mobile device payment and other web-based services could lead to increased adoption of taxis as a solution to first- and last-mile access to the regional transit network.
- While taxis are a public service, they are not a mass transportation alternative, and do not by themselves represent an expansion of transit in Suffolk County.

TNCs

Existing Terminal: Good

- TNCs can easily be shifted to address demand imbalances and serve other markets.
- Microtransit services can build on the success of an airport connector to expand service into the county.
- Suffolk County Transit, the Long Island Rail Road or the Nicolls Road BRT operator could partner with microtransit operators to provide access to first- and last-mile trips, and to extend transit to neighborhoods in a cost efficient manner.

Shuttle Bus

Existing Terminal: Poor

- Service would not be provided to non-airport markets.
- Would not contribute to wider transit network.

APM

Existing Terminal: Poor

- Service would not be provided to non-airport markets.

PRT

Existing Terminal: Poor

- Service would not be provided to non-airport markets.

Gondola

North Side Terminal: Poor

- Service would not be provided to non-airport markets.

Moving Walkway

North Side Terminal: Poor

- Service would not be provided to non-airport markets.

BRT

Existing & North Side Terminals: Good

- Route could easily be extended to serve non-airport markets, given current BRT planning already underway by County.
- Strong opportunity to contribute to wider transit network.
- Could share station facilities with planned BRT station at Ronkonkoma.

Streetcar

Existing& North Side Terminals: Good

- Route could easily be extended to serve non-airport markets, but would require intense alignment planning.
- Strong opportunity to contribute to wider transit network.
- Could potentially share facilities with proposed BRT station at Ronkonkoma.

LRT

Existing & North Side Terminals: Fair

- Route could easily be extended to serve non-airport markets, but would require intense alignment planning.
- Strong opportunity to contribute to wider transit network.

A1.6 Environmental Performance

Updated Taxi System

Existing Terminal: Fair

- Typical motor vehicle emissions with moderate impacts on air pollution, but with opportunities for lower impact vehicle technologies.
- Low noise and vibration impacts.

TNCs

Existing Terminal: Poor

- Typical motor vehicle emissions with moderate impacts on air pollution.
- Low noise and vibration impacts.

Shuttle Bus

Existing Terminal: Fair

- Electric buses would offer opportunity to connect to the green power grid.
- Electric buses would have low emission
- Vibration and noise would be higher than light vehicles.

APM

Existing Terminal: Fair

- Vehicles are powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- APMs are designed to have lower noise and vibration impacts than traditional rail modes, but are still higher than light vehicles.

PRT

Existing Terminal: Good

- Vehicles are powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- Low noise and vibration impacts.

Gondola

North Side Terminals: Good

- Ropeway is powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- Low noise and vibration impacts.

Moving Walkway

North Side Terminal: Good

- Walkway is powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- Low noise and vibration impacts.

BRT

Existing & North Side Terminals: Fair

- Electric buses would offer opportunity to connect to the green power grid.
- Electric buses would have low emission vibration and noise.
- Vibration and noise would be higher than light vehicles.

Streetcar

Existing & North Side Terminals: Poor

- Vehicles are powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- Higher vehicle noise and vibration impacts than buses.

LRT

Existing & North Side Terminals: Poor

- Vehicles are powered by electricity, producing no local emissions.
- Strong opportunity to purchase power through clean energy sources.
- Higher noise and vibration impacts than buses.

A1.7 Rollout Phasing

Updated Taxi System

Existing Terminal: Good

- Expanded service is incremental by vehicle.

TNCs

Existing Terminal: Fair

- Unproven / unknown delivery, reliant on external provider.

Shuttle Bus

Existing Terminal: Good

- Small upfront investment.
- Expanded service is incremental by vehicle.

APM

Existing Terminal: Poor

- Installation of track and power equipment requires moderate upfront investment.
- Because vehicles have high capacity, each new composition adds a major step to overall system capacity.
- Expanded service may require additional track and power work.

PRT

Existing Terminal: Poor

- Installation of guideway and system components require very high upfront investment.
- Some potential for expanded capacity by adding new vehicles.

Gondola

North Side Terminal: Poor

- Installation of ropeway and power equipment requires high upfront investment.
- Expanded service require additional ropeway and power work.

Moving Walkway

North Side Terminal: Poor

- Walkway would be housed in a structure. Once implementing, additional walkway capacity would be difficult to provide.

BRT

Existing & North Side Terminals: Good

- Small upfront investment.
- Capacity can be expanded with new vehicles.

Streetcar

Existing & North Side Terminals: Fair

- Installation of track and power equipment requires moderate upfront investment.
- Because vehicles have high capacity, each new composition adds a major step to overall system capacity.
- Expanded service may require additional track and power work.

LRT

Existing & North Side Terminals: Poor

- Installation of track and power equipment requires moderate upfront investment.
- Because vehicles have high capacity, each new composition adds a major step to overall system capacity.
- Expanded service may require additional track and power work.

A1.8 Ease of implementation

Updated Taxi System

Existing Terminal: Good

- Many precedents in the U.S. for airport ground access.
- Service can be delivered in under two years.

TNCs

Existing Terminal: Good

- Many precedents in the U.S. for airport ground access.
- Service can be delivered in under two years.

Shuttle Bus

Existing Terminal: Good

- Many precedents in the U.S. for airport ground access.
- Service can be delivered in under two years.

APM

Existing Terminal: Fair

- Many precedents in the US for airport ground access.
- Service cannot be delivered in under three years.

PRT

Existing Terminal: Poor

- No precedents in the U.S. for airport ground access.
- Service cannot be delivered in under three years.

Gondola

North Side Terminal: Fair

- No precedents in the U.S. for airport ground access.
- Alignment must be determined through careful study, including land ownership and height restrictions related to runway proximity.
- Reduced system length could reduce design and construction complexity, making it possible to deliver in three years.

Moving Walkway

North Side Terminal: Good

- Many precedents in the U.S. for airport ground access.

BRT

Existing Terminal: Fair

- Many precedents in the U.S. for airport ground access.
- Service can be delivered between two and five years, depending on complexity of design and construction and vehicle specification.

North Side Terminal: Good

- Reduced system length could potentially reduce design and construction complexity, and could likely be delivered in under three years.

Streetcar

Existing Terminal: Fair

- No precedents in U.S. for airport ground access, where the vehicle rolls powered by batteries for some extension.
- Service can be delivered between three and five years, depending on complexity of design and construction and vehicle specification.

North Side Terminal: Good

- Reduced system length could reduce design and construction complexity, and could likely be delivered in under three years.

LRT

Existing Terminal: Poor

- No precedents in U.S. for airport ground access, where the vehicle rolls powered by batteries for some extension.
- Service cannot be delivered in under three years.

North Side Terminal: Poor

- Reduced system length could reduce design and construction complexity, making it possible to deliver in three years, but still novel technology in the state.

A1.9 Capital costs[2]

Updated Taxi System

Existing Terminal: Good

- $200K − $1M

TNCs

Existing Terminal: Good

- $0

Shuttle

Existing Terminal: Good

- $500K - $1M

BRT

Existing Terminal: Fair

- $40 - $130M

North Side Terminal: Good

- $0 - $5M

Streetcar

Existing Terminal: Poor

- $150 - 250M

North Side Terminal: Fair

- $50 - $150M

LRT

Existing Terminal: Poor

- $250 - $350M

North Side Terminal: Poor

- $100 - $200M

Gondola

North Side Terminal: Fair

- $50 - $100M

APM

Existing Terminal: Poor

- $250 - 650M

PRT

Existing Terminal: Poor

- $150 - $450M

Walkway

North Side Terminal: Fair

- $25M - $100M

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[2] Sources:

Taxis: Individual vehicles source: NYC TLC, NY Times

Shuttle: Analysis – Arup; Data Sources: Bureau of Transportation Statistics

BRT, APM and Walkway: Data Source: ISP CBP Study

Streetcar, LRT: Analysis – Arup, Data Source: FTA Current Capital Investment Grant Projects

PRT: Data Source: University of Washington, Princeton University

Gondola: Analysis – Arup NY, Data Sources –Cable Car Confidential

Walkway: Analysis – Arup, Data Sources: ISP CBP Study

A1.10 Operating costs[3]

Updated Taxi System

Existing Terminal: Good

- $5 per passenger

TNCs

Existing Terminal: Good

- $10 per ride, depending on arrangement

Shuttle

Existing Terminal: Good

- $500 - $800K

BRT

Existing Terminal: Fair

- $500K - $1.5M

North Side Terminal: Good

- $250K - $750K

Streetcar

Existing Terminal: Poor

- $1 - 4M

North Side Terminal: Poor

- $500K - $2M

LRT

Existing Terminal: Poor

- $1.5 - $5.5M

North Side Terminal: Poor

- $750K - $3M

Gondola

North Side Terminal: Poor

- $750K - $2M

APM

Existing Terminal: Poor

- $1.5 - 3.5M

PRT

Existing Terminal: Poor

- $500K - $3M

Walkway

North Side Terminal: Good

- Negligible

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[3] Sources:

Taxis and TNCs: current prices for passengers.

Shuttle: Analysis – Arup; Data Sources: Hoboken Shuttle

BRT, Streetcar, LRT: Analysis – Arup, Data Source: 2015 National Transit Database

Gondola: Analysis – Arup NY, Data Sources – MTA (for NY-region wages), Cable Car Confidential, Arup Bogota, Dopplemayr, NYSERDA (electricity costs).

PRT: Data Source: University of Washington, Princeton University

Walkway: Analysis – Arup with ACRP 117 tool, Data Sources: NYSERDA, Otis, ACRP.

Appendix D.

High-Level Implementation Plans Memo

Memorandum

ARUP

To	Lou Bekofsky, Deputy Commissioner, SCEDP Ankita Rathi, Planner, SCDEDP	Date	April 27, 2018
Copies		Reference number	
From	Arup	File reference	
Subject	Ronkonkoma Long Island Rail Road Station / Long Island MacArthur Airport (ISP) Train-to-Plane Connectivity Study – High-level implementation plans		

1 Upgraded Taxi Service

1.1 Mode Outline

The Upgraded Taxi Service connection option builds upon the existing connection between Ronkonkoma LIRR Station (the LIRR Station) and LI MacArthur Airport (the Airport), improving the customer experience with modern vehicles designed for airport-bound taxi passengers' needs and expectations, supported by mobile transactions for reservation and payment.

Both at Ronkonkoma LIRR Station and at the Airport terminal, passenger pick up and drop off will take place at pre-determined locations. At the LIRR Station, this area is in the parking lot north of the railway tracks. At the Airport, taxi riders are currently directed to the western edge of the terminal's front curbside; however, once the new Transportation Facility is completed, all taxi operations will be relocated to this new facility east of the terminal, where the Airport plans to direct all its commercial ground access vehicles. Taxis can choose their travel route between the airport and the train station, as there will be no pre-determined alignment. Free from a rule to follow specific roads for travel, drivers can choose the best travel route based on traffic conditions, as reported by a mobile application.

The upgraded fleet will offer more safety and comfort than the town cars currently in operation. A wide variety of vehicles are available to be integrated into the upgraded fleet, including sedans, SUVs, and minivans. Taxis based on modified small cargo vans – such as the Ford Transit and Nissan NV200 – have grown in popularity among operators. These vehicles offer good mix of passenger amenities and have been designed to maximize interior space on a small chassis. Desirable amenities for the new taxi fleet include:

- Capacity to seat a minimum of four passengers plus one driver comfortably;
- Sliding doors, interior grab-handles, and swing out-steps to maximize ease of entry and exit;
- Flat vehicle floors which provide additional comfort and space for small luggage;
- Independent rear climate control;
- Spacious rear luggage compartment;
- Wipe-clean interior surfaces;
- Reading lights and floor lighting; and
- Universal Accessibility features.

In addition to upgraded vehicles, introduction of an electronic reservation, dispatching, and payment system is proposed. This system will allow users to request rides in advance of arriving at the taxi area using a mobile device. After the user requests a ride through the mobile app, an available driver receives the order and prepares to welcome the upcoming passenger. Drivers and passengers identify one another using profile information (e.g., driver name, vehicle model, license plate number) shared by the application. If they choose to do so, passengers can pay for the ride with the app, in a cashless transaction.

There are many vendors capable of offering this electronic hailing and dispatch service, with either custom or off-the-shelf systems. Cloud-based services are preferred to avoid procurement, setup and maintenance of network servers. Still, to ensure service reliability and provide service options for passengers, the ability to request a taxi in person and pay in cash or a physical credit card should be preserved alongside introduction of new digital technology.

To promote the connector upgrade and to disseminate a consistent message of the its values, a new branding strategy will accompany the system launch. A distinctive, recognizable and strong brand will ensure that the public gets a positive and accurate impression of the system from the onset, raising the social profile of existing customers, and increasing the potential of attracting new users. To achieve visual cohesiveness, the strategy will define the system’s standard typeface and color palette, and update its logo. The combination of these elements defines a visual identity which will be systematically deployed every time the system sends visual cues to riders: on signage at the Airport and LIRR Station, at drivers’ uniforms, on vehicles liveries, at the mobile application and at the connection’s webpage. This visual identity will be distinguished from the taxi operator’s, to guarantee consistency in the event of a future change of operator, but it may reference the LIRR’s and the Airport’s brands, to increase its association with them.

Ancillary improvements associated with the upgraded taxi system include:

- Improved wayfinding signage at Ronkonkoma LIRR Station to guide passengers to the taxi curb; and
- Installation of video screens near the taxi station, providing up-to-date flight information.

1.2 Rollout Plan

The next steps for rolling out the upgraded taxi fleet are depicted in Figure 1. Some steps may require more complex decisions or additional design work that must be completed as part of the implementation process. These are discussed in Section 1.3 as key considerations.

The initial steps involve investigating vehicles, contractual requirements, and systems. Suffolk County should choose a specific vehicle, or mix of vehicles, that will be used in provision of the taxi service. Ultimately, these vehicles may be owned by the taxi operator, or owned by a public agency and leased to the operator under a service agreement. Both cases will require changes to existing contractual agreements. Simultaneously, Suffolk County should begin the process of refined scoping and vendor identification for the mobile hailing and dispatching service.

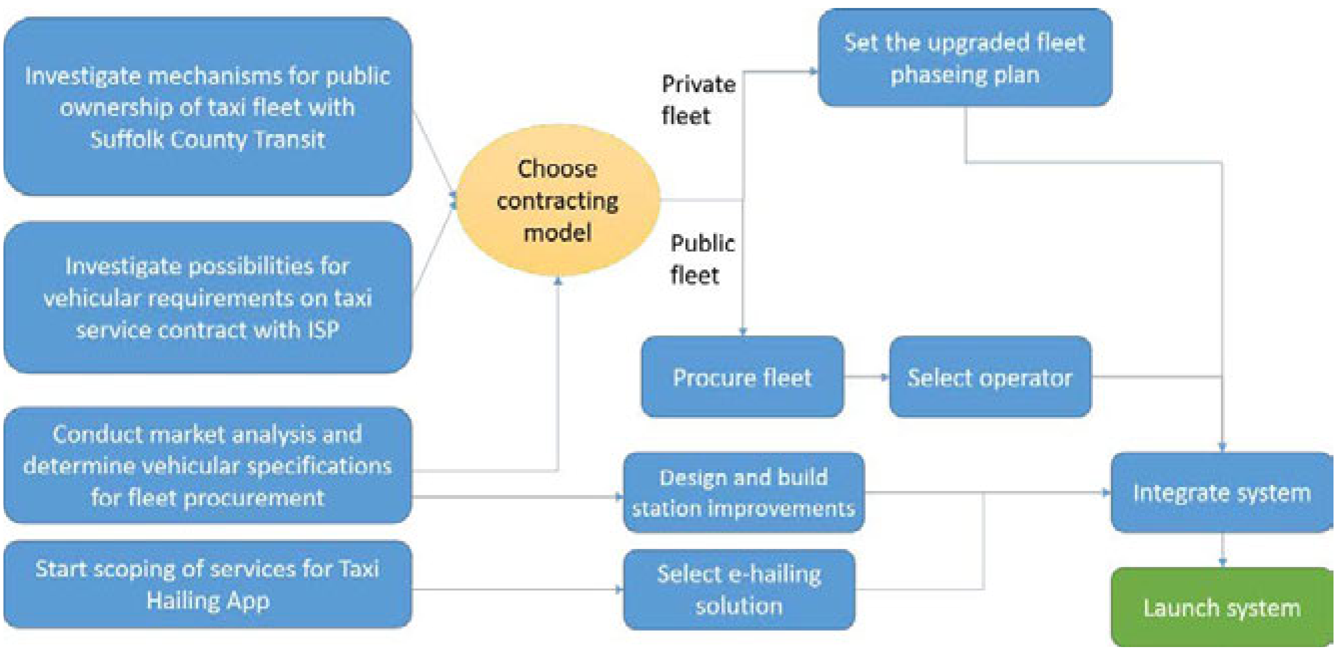

Figure 1: Rollout Plan, Upgraded Taxis

Once the contractual model is chosen, and a preferred vendor for the electronic hailing solution identified, the procurement process can proceed. If the preferred model involves private ownership of the upgraded fleet, the operator must agree to a plan specifying the vehicle performance requirements and timeline for phasing in the new vehicles. Under a public ownership model, a specified government entity will directly procure the vehicles. The taxi service provider only needs to operate and maintain the vehicles. The final design and construction of ancillary improvements may take place on a similar timeframe.

Once the vehicles and electronic hailing solution are in place, the digital infrastructure and systems can be integrated. The process entails the testing of the services to determine operational readiness and subsequently, launching the service to the public.

1.3 Key Considerations

The key considerations for the upgraded taxi service are:

Fleet ownership and operation model – There are two options available for ownership of the upgraded taxi fleet. The fleet may be procured and owned by a public entity such as Suffolk County or Suffolk County Transit, and then leased to a private taxi operator. This private operator would provide service and maintain the vehicles under the terms of lease and a service agreement. This model decreases financial risk to the operator associated with capital investment in new vehicles. Direct procurement also eliminates potential negotiation with the operator regarding vehicle specifications and costs, enabling straightforward delivery of the fleet.

Alternatively, the upgraded fleet could be procured directly by the private operator, after an update of the taxi service provision contract that include higher standards of quality. The company would own, maintain and operate the fleet under contract to a public entity. This arrangement may require more gradual introduction of the new fleet, as the taxi operator manages risk and capital investments in their vehicles.

Vehicle specifications – A final vehicle specification – or mix of vehicles specifications – must also be selected to provide the service. This process may involve choosing amongst available vehicles based on performance. If a hybrid vehicle is selected, chargers will have to be procured and installed in at least one of the waiting areas for the taxis, and in that case the Ronkonkoma LIRR Station should be prioritized, as it is the location where the taxis dwell, even when they are not returning from a trip to airport. A summary of taxi fleet vehicles is provided in Appendix A1 for informational purposes.

Electronic hailing platform – Either the private operator or a public entity could serve as the contracting entity. If the private operator is chosen, a list of minimal requirements should be specified. As discussed above, a variety of vendors can provide applications using solutions ranging from off-the-shelf, semi-customized, to fully customized. These systems are likely to include an upfront cost for set up and development as well as ongoing subscription or transaction-based fees A desktop review of several systems is provided in Appendix A2 for informational purposes.

1.4 Cost

The total expected capital expenditures associated with an upgraded taxi fleet including 10 vehicles is $1.1 million. It is that the expected cost for new taxis will be $40,000 per vehicle.

No estimate of operating costs is provided for this mode, as operating costs will depend largely on the contractual arrangement with the taxi operator. In addition, the operating costs will include ongoing costs associated with the electronic hailing application; however, not enough public information is available to inform a reliable estimate.

2 Upgraded Shuttle to Airport Terminal on Public Roads

2.1 Mode Outline

Currently, Village Taxi operates a shuttle service to transport passengers between the LIRR Ronkonkoma Station and LI MacArthur Airport terminal. The upgraded shuttle plan involves changes and improvements to the current system infrastructure and operations to enhance the customers' sense of connectivity when using transit to access the airport. Most changes to the system center on adoption of high-standard vehicles, introduction of frequent service, and improvements to the passenger experience at the train station and at the boarding and drop-off zones.

There are two options for siting the shuttle at the Ronkonkoma LIRR station: the loop north of the tracks, or south of the tracks. The shuttle would proceed along a route on public roadways, following Smithtown Avenue, Lakeland Avenue, and Veterans Memorial Highway before accessing the airport via Schaeffer Road.

Generally, shuttles would be scheduled to depart from the train station and airport terminal approximately every twenty minutes during peak activity hours, with adjustments to meet every train arrival. Service should be provided during all hours during which the airport is active – approximately 4:00am to 1:00am.

The service should operate with new buses. Two vehicles plus one spare should be sufficient to operate the service. These vehicles are usually 40-feet in length, with a capacity to seat 40 persons and hold a similar number of standing passengers. However, to improve the experience for air-travelers, the final fit-out should include a seating arrangement that accommodates luggage racks and better in-vehicle circulation. To reduce emissions, the fleet could be comprised of new, battery electric buses. While such buses are more expensive to purchase and require installation of new charging infrastructure, they have lower lifetime costs due to lower fuel and maintenance expenses. Buses should be equipped with an automatic vehicle location system that can be used to track the location of the vehicles in transit and provide real time passenger information (RTPI) on shuttle arrival times for passengers waiting at the train station or airport. Vehicle livery should be designed with a unique brand to reinforce the new connectivity provided by the service.

Several ancillary improvements are associated with the new shuttle system:

- An enclosed bus shelter at Ronkonkoma LIRR Station would provide a comfortable waiting area for passengers at the train station. The station should feature amenities such as seating, heating and cooling, information displays, and check-in kiosks. To ensure that the shelter can comfortably accommodate travelers with luggage, a minimum of 10 square feet per passenger, net of furnishings, is recommended for shelter sizing.[1] MTA should be consulted on providing wayfinding around the station area to help guide passengers to the pick-up area. Stations should feature branding elements consistent with the vehicles.
- To provide space for a new shelter, capital improvements (extending curblines and building new concrete sidewalks) are needed adjacent to the train station area.
- A small depot is required to provide the buses with light maintenance, cleaning, storage and charging (should the vehicles be electric).
- A layover area for driver breaks is also required on airport property. Stakeholders have indicated that the new Transportation Facility located at 150 Arrival Avenue should be suitable upon completion.
- Video screens for passenger information should be set up at the train station bus shelter, and at the airport terminal. At the train station, these screens should display information on departing flights as well as the time of the next departing shuttle. At the airport, arriving passengers should be provided with real time arrival and departure information for the LIRR as well as the time of the next departing shuttle.

2.2 Rollout Plan

The initial steps for implementing the upgraded shuttle service involve siting the new infrastructure required. First, the location of shuttle stops must be finalized. The existing options at the LIRR station are either north or south of the tracks. At the airport, the route may be configured for shuttles to stop curbside at the terminal or at a new location near the transportation facility. Preliminary engineering of the stations and shelters may be required to inform this process. Suitable locations and size must also be determined for parking at the driver layover area and for the bus depot capable of supporting light-maintenance, cleaning, and vehicle charging.

At a future conceptual design phase, Suffolk County should further explore options for contractual means and business models for operations. This involves identifying the appropriate public and/or private entities to purchase the vehicles and to provide drivers and administrative staff for operations. The service could be operated by Suffolk County Transit, or a private contractor. In the latter case, the vehicles and technology may be owned by a public entity and operated and

[1] Based on the minimum threshold for a Level of Service “B” rating for queuing areas.

maintained under a service agreement. Alternatively, a private entity willing to purchase and own the vehicles could be sought.

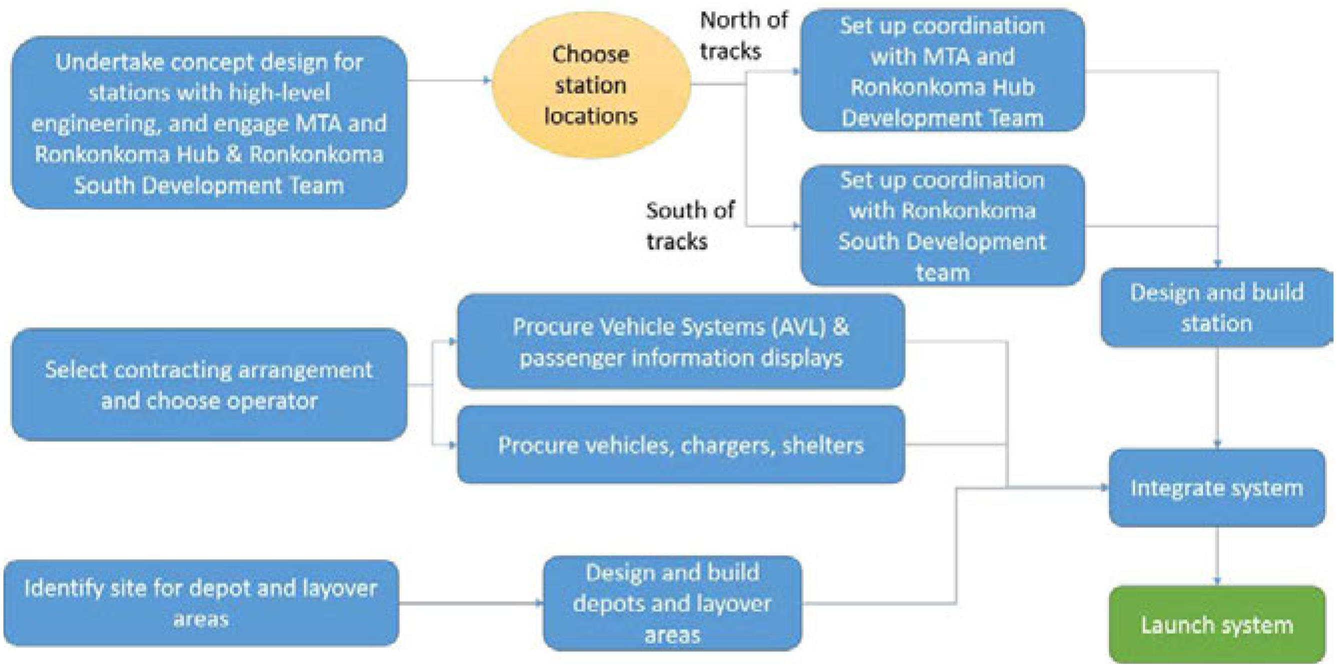

Figure 2: Rollout Plan, Upgraded Shuttles on Public Roadways

The next steps are begin acquiring and constructing the elements needed to run the service. At this stage, vehicles, shelters, AVL and real-time passenger information systems will be procured from a vendor. Final design and construction for the bus depot and transportation center improvements will begin. Final designs for the shuttle station at the LIRR should be coordinated with the MTA and/or property developers of Ronkonkoma Hub and Ronkonkoma South, and then constructed.

In the final step, the operator defines the service plan (scheduling trips and assigning shifts to drivers). It also requires integrating the technology components so that real time information on flights, trains, and shuttles are communicated and displayed appropriately to customers. Subsequently, the service can be launched to the public.

2.3 Key Considerations

The key considerations for the upgraded shuttle service are related to contractual model and siting of various elements.

Contractual models – Key considerations on the contractual model focuses on two key questions: who will operate the bus service and who will purchase the vehicles? Duties of the operator will include providing staff for driving, cleaning and conducting light maintenance for vehicles, and periodically updating the service plan as train and flight schedules change. A selected public entity, such as Suffolk County Transit, would procure and own the buses, in-vehicle technology, and charging infrastructure. If the operator is a private company, the private contractor would operate and maintain the publicly-owned fleet under a service agreement. A private ownership model would involve accepting proposals to identify a company that would be willing to purchase vehicles and technology meeting Suffolk County's standards in addition to operating the bus service. The public procurement model is likely to be more successful, as the capital investment in new high-standard vehicles poses a large financial risk to the operators.

Infrastructure siting – There are two potential locations for siting the shuttle station at the LIRR Ronkonkoma station: on the north side of Railroad Avenue, just south of the square planned in the Ronkonkoma Hub development; or south of the station; as shown in Figure 3. While the northern station alignment (Location A) avoids potential delay resulting from heavy park-and-ride activity during the morning and evening peak hours, the routing is more circuitous and must stop at the signalized intersections located just east and west of Smithtown Avenue on Railroad Avenue. The southern alignment (Location B) may suffer delays from conflicts with parking vehicles, but avoids potentially recurring stops at the traffic lights.

Because the sidewalks adjacent to the train station are narrow, installation of the proposed shelters requires additional capital work at either location. At Location A, the new shelter and bus dwelling areas would have to be integrated into the local design for the Ronkonkoma Hub Development. At Location B, the curb would be extended southward into the existing drop off area to allow for installation of the shelter and a clear path on the north side of Easton Street. In addition, the plan for Location A would require coordination with the long-term development of Ronkonkoma Hub, while the Location B plan for south side operations would require coordination with the eventual development of the Ronkonkoma South Site.

Memorandum

Figure 3: Shuttle Stop and Routing Options at Ronkonkoma

In addition to stations, a convenient layover area where driver may park vehicles during breaks is required. It is desirable to place parking near the new transportation facility at the airport terminal, as this location has been identified as a suitable location for administrative functions and to house bathrooms, breakrooms, and other amenities for drivers.

Bus depot – This facility should be designed to support bus storage, light maintenance, and regular cleaning of the shuttle buses. Electric vehicle charging infrastructure should also be located at the depot (only if the vehicular fleet is electric or hybrid). Ideally, this location would be close to the new transportation facility, to consolidate the operational infrastructure (parking, break rooms, and administrative functions) within the airport. To provide a sense of scale, Figure 4 presents a diagram showing two possible locations for a 100-by-100-foot bus depot.

Figure 4: Potential Size and Location of Bus Depots

2.4 Costs

The total expected capital expenditures associated with an upgraded shuttle service amount to $8.5 million. This includes a fleet of three new, battery electric buses along with charging infrastructure and ancillary structures.

The annual operating costs could amount to approximately $2.2 million, but this would vary with specific operating plans and contractual arrangements.

3 AV Shuttle to Airport Terminal on Private Roads

3.1 Mode Outline

The upgraded shuttle on private roads will operate with similar elements and service to the upgraded shuttle on public roads. The service will accept passengers at the Ronkonkoma LIRR Station shortly after arriving LIRR trains from a sheltered station, bringing them to a station located at the airport terminal and vice versa.

Memorandum

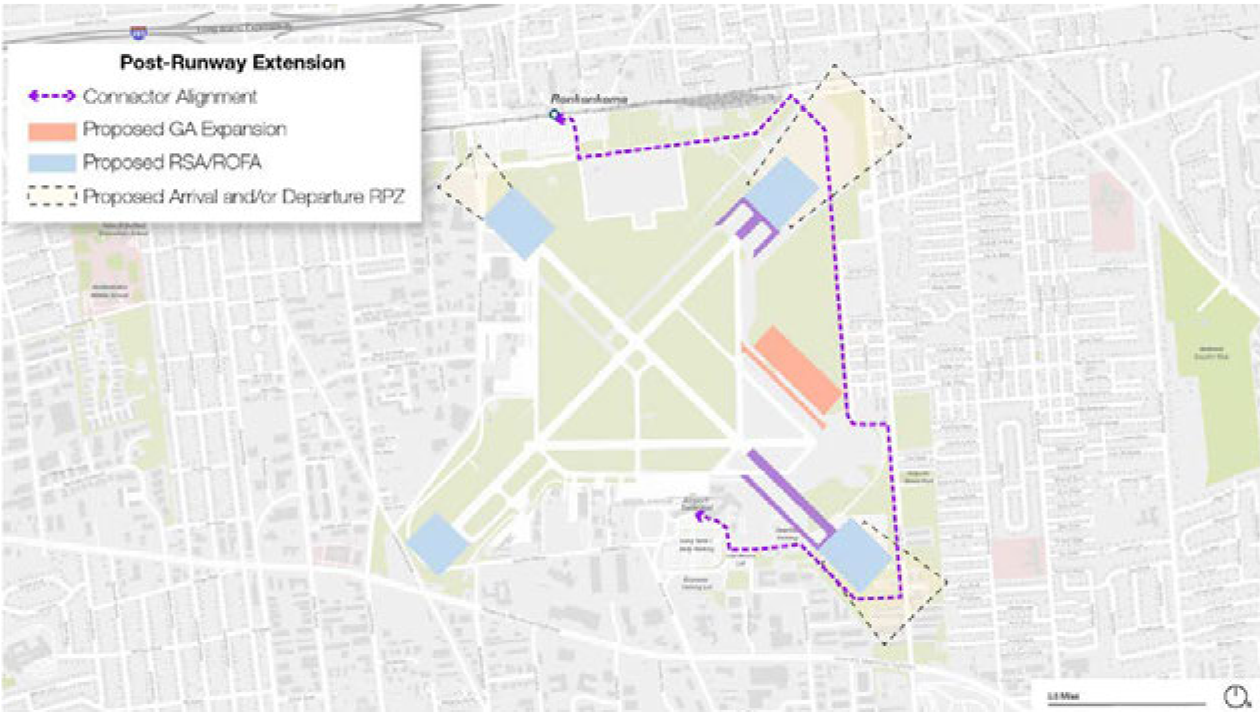

Figure 5: AV shuttle on private roads route alignment

The major difference between the two shuttle options is the routing. Shuttles will travel mostly on exclusive right-of-way, entirely within airport property. The shuttle will travel along a portion of Railroad Avenue south of the LIRR tracks, entering the airport property at a secure gate located north-north-east of the airfield. Shuttles would then travel toward the terminal along a new roadway within the airport, approximately 3.5 miles in length. An Airport Operation Area (AOA) fence will be required on both sides of the roadway until the roadway exits the airport secured area and enters public area.

To avoid conflict with the Runway Protection Zones (RPZ) and other FAA protected surfaces for runways 6/24 and 15R/33L, the airport shuttle roadway would traverse underneath the two RPZs and other surfaces in tunnels to be constructed as part of the system implementation. Based on soil data from the USDA, the ground underneath the runway and taxi lane area consists of cut and fill land (CuB) and the area surrounding the runway (including the runway safety zone and RPZ) consists mostly of sandy loam (RdA).

Figure 6: LI MacArthur Airport Soils Map (USDA)

Preliminary geotechnical observations suggest that a culvert box tunnel would be most cost efficient and viable. A cut and cover method shall be considered as the preferred construction technique for the tunnel. The proposed bus route will be passing through approximately 2,000 feet in northeast of runway 6/24 RPZ area and 2,000 feet southeast of runway 15L/33R RPZ area. Since the tunnel with 2-way lane is too large for pre-cast box culvert, the construction of the tunnel will require a support wall system, excavation, built-in covert box, and cover. Assuming normal construction period and weather-permitting condition, it would require a range of 6 to 12 months to complete 2,000 feet of tunnel. Use of precast box culverts could reduce construction time, but a second box would be required to support two-way traffic.

Memorandum

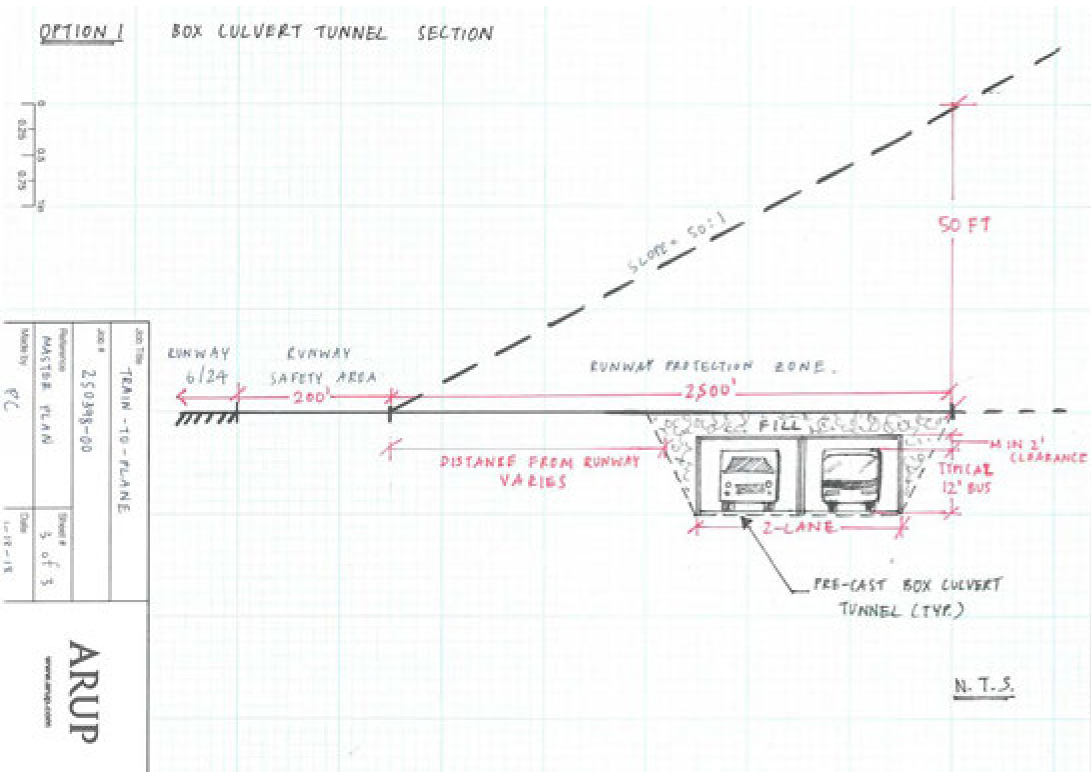

Figure 7: Aircraft Landing Clearance Sketch with Box Culvert

As the shuttle roadway approaches each RPZ, it would slope down and enter the box-culvert tunnel, exiting the tunnel once clear of the RPZ.

Due to the tunnel and roadway construction, this option is viable only in the medium- to long-term option. Because of this time-frame, and the exclusive right-of-way, it may be possible to offer the shuttle service using autonomous vehicles (AVs). In the context of the train-to-plane connection, an AV would arrive at the designated shuttle station south of the train station, transporting passengers to the airport. At the airport, the passenger pick-up and drop-off area would be located at the end of the shuttle route, near the new transportation facility, and not curbside in front of the terminal.

To avoid railway crossings, the shuttle station should be located south of the LIRR tracks. The AV's operational plan should be similar to the conventional shuttle's, with vehicle headways of approximately 20 minutes, with some flexibility to meet arriving trains and aircraft on peak activity periods.

Ancillary improvements associated with an autonomous shuttle operating using new roadways on airport property include:

- Security gates at the entrance to the airport property, as well as fencing alongside the shuttle route. The fence will be a typical chain link fence, with at least 8 feet om height with 3 strands of barbed wire, totaling approximately 1.3 miles in length (2.6 miles if required on both sides of the roadway. The security fence will require AOA access gate to provide access to service vehicles, and a Perimeter Intrusion Detection System (PID) may be required.

- New utilities will be required along the proposed roadway. New fixtures are needed to provide lights, and electric conduit, wires, and pull boxes are required to supply these light poles. A water line may also be required if the proposed roadway and tunnel needs fire protection. Assuming all on-airport utility lines are active, the proposed utility shall be connected to the existing airport system.
- A stormwater system is required for the proposed roadway. Impervious area generated from proposed roadway is approximately 731,200 sf (17 acre). Using the NYS standard stormwater management guideline and NOAA rainfall intensity of Long Island for a duration of 15 minutes using 10-year design storm runoff, the roadway could accumulate more than 70,000 cubic foot of water (524,000 gallons of water) per rainfall event. Stormwater runoff is required to be treated to a certain quality before release into the municipal system. By using stormwater management system such as underground detention tanks, bioswales, and a traditional storm sewer system, stormwater runoff could be treated, the flow reduced, and then connected to the existing airport storm sewer. The existing storm sewer may need to be increased in size to manage additional runoff from new roadways. Additional information would be required to evaluate this.
- Enclosed, climate controlled shelters for shuttle passengers at the train station and airport.
- Small depot for light maintenance, cleaning, and parking of AV shuttles. If a traditional shuttle bus depot has already been constructed – this may only require a few simple upgrades.

3.2 Rollout Plan

The initial step is to coordinate with key stakeholders to determine the feasibility of the autonomous shuttle operations. NYSDOT will likely need to issue regulatory approval for the AV program as the regulator. Consulting with AV vendors is necessary to determine the available vehicle specifications and the operating requirements of these vehicles. Depending on regulatory and technological changes in the future, an AV shuttle may require that some right-of-way *outside* the airport also be converted to exclusive AV routes. It important to coordinate with the developers of Ronkonkoma Hub and Ronkonkoma South to understand any impacts to nearby land uses of changes to the road network and siting of the shuttle station.

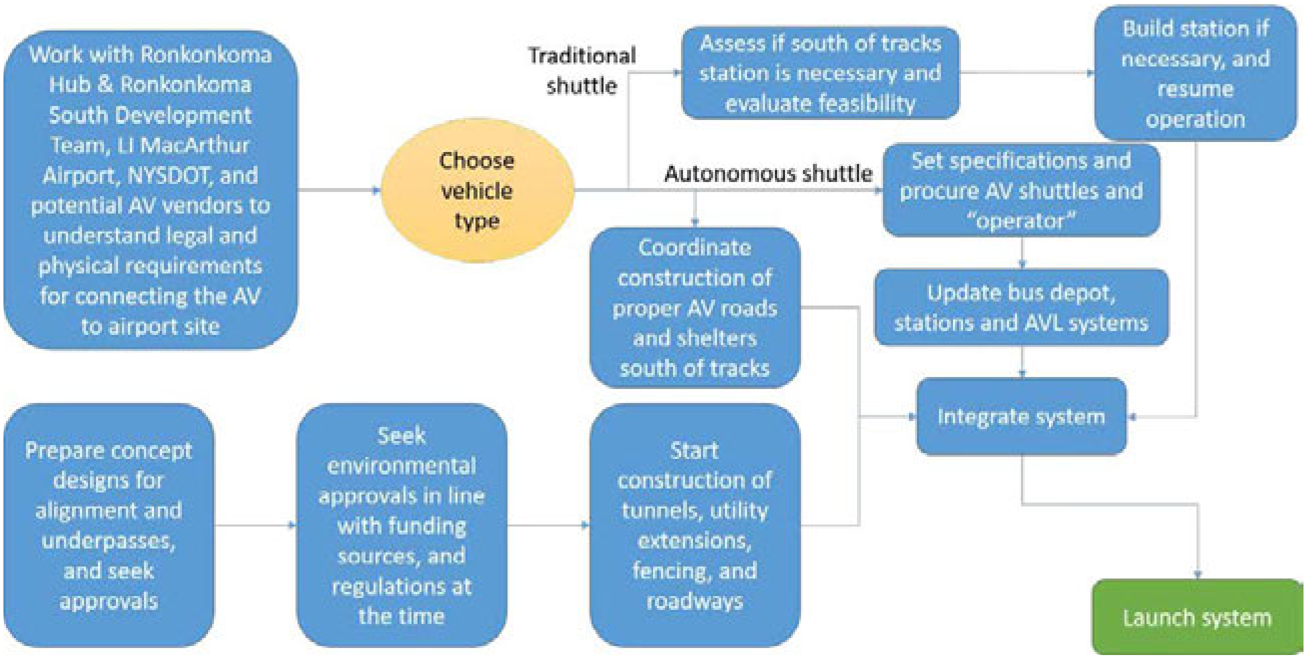

Figure 8: Rollout Plan, AV Shuttles on Private Roadways

If autonomous vehicles are deemed feasible, the next steps are to set forth vehicle specifications (capacity, features, number of vehicles required) and to begin the procurement process. At this stage, a new or updated bus depot and all roadway improvements needed to run the AV shuttle should be constructed. Updates to the AVL and real-time passenger information systems will proceed around this time.

If conventional vehicles are selected to operate on the airport, the airport may already be operating service with suitable vehicles. (If no service is in operation at that time, vehicles should be procured and an operator selected, per the previous section). However, if a sheltered shuttle station been placed north of the LIRR, it may need to be relocated to the south side of the tracks to efficiently access the airport via Railroad Avenue. A final determination should be made whether this is necessary and feasible.

Regardless of the vehicle technology used, conceptual designs for the roadway alignment and tunnel underpasses should also be completed in an independent, parallel timeline. This initial design phase is necessary to apply for and obtain approvals by the FAA for Obstruction Evaluation/Airport Airspace Analysis (OE/AAA), by the New York State Department of Environmental Conservation (NYS DEC) for the State Environmental Quality Review (SEQR), and the United States Environmental Protection Agency (EPA) for the National Environmental Policy Act (NEPA) process (the last only if the project is funded at least in part from federal sources). Once approvals are received, final design and construction for the new roadway, tunnels, bus shelters, and associated infrastructure improvements can move forward.

Once infrastructure improvements are made and the passenger information systems have been upgraded, the service may be launched to the public.

3.3 Key Considerations

The key considerations for an upgraded shuttle traveling on private roadways to the airport terminal are the vehicle technology, the regulatory environment, and complexity of construction.

Vehicle technology – The concept of a shuttle service on airport roads does not depend on use of any vehicle technology. The service could be provided using conventional buses, in which case similar considerations to the shuttle operating on public roads concept would apply. Alternatively, a shuttle service could potentially be provided using autonomous shuttle vehicles. The implementation requirements will depend on the best-available technology at the time of deployment.

Currently, pilot projects in the U.S., Europe, and Japan are underway using low-capacity (9-12 person) autonomous shuttles.[2] These vehicles generally meet the criteria for "high automation," meaning the vehicle is "capable…of all driving functions under *certain* conditions" (emphasis added).[6,3,4,5] These vehicles are not yet capable of navigating busy public roads with mixed-traffic, but circulate in private areas or very limited sections of public roads. While the individual vehicles do not require drivers, the system is managed remotely by operators capable of handling exceptions and issues.

The technology to enable "full automation" – which allows vehicles to perform "all driving functions under *all* conditions" – is advancing rapidly (emphasis added).[6] Full automation would allow the autonomous shuttle to operate in mixed traffic safely and reliably.

If the "high automation" level represents the best available technology at the time of deploying the train-to-plane connection system, portions of the road network south of the train station may need to be closed to private traffic to operate the autonomous shuttle safely. Physically separated automated vehicle lanes could also be required on portions of Railroad Avenue used by shuttles to access the on-airport roadways. However, if "full automation" technology is commercially available, the shuttle vehicles could likely operate independently in mixed traffic under any scenario, generally without supervision from a remote operator.

Regulatory environment – As AV technology evolves over the next decade, so too will regulations. To provide this service, the final operator of the autonomous shuttle system (whether a

[2] https://www.prnewswire.com/news-releases/aaa-and-keolis-launch-nations-first-public-self-driving-shuttle-in-downtown-las-vegas-300551187.html;
[3] http://www.easymile.com/portfolio-page/sohjoa-project-finland/;
[4] https://futurism.com/japan-is-testing-driverless-buses-to-help-the-elderly-get-around/
[5] https://navya.tech/en/inauguration-of-the-autonomous-shuttles-service-at-la-defense-in-paris-2/;
[6] https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

public entity or a private contractor) will need to seek approval from NYSDOT to provide commercial service using unmanned vehicles. Currently, NYSDOT does not have a specific policy that would cover the train-to-plane connection. The agency may develop such a policy in the future or require an approval as the primary regulatory for commercial transportation in the State of New York.

The extensive construction in the airport will trigger the need to seek additional approvals. The roadways and tunnels under the RPZ would likely require an update to some or all of LI MacArthur Airport's Airport Layout Plan (ALP). The airport will need to coordinate with the FAA's New York Airports District Office to determine the scope of changes to the ALP. In addition, the capital works will trigger environmental reviews by State and Federal agencies (depending on the project's funding sources), and airspace reviews by the FAA.

3.4 Cost

Capital expenditures for this option are expected to be in the rough-order-of-magnitude of $41 million. This figure includes construction of the new roadways and tunnels.

Not enough public information is available to inform an estimate of the capital and annual operating costs of procuring and operating AV shuttles. However, the initial investment in vehicles is likely to be small in comparison to the costs of providing the roadway and tunnel infrastructure.

4 Moving Walkway to Relocated Terminal

4.1 Mode Outline

Under a scenario of relocating the LI MacArthur Airport terminal to the north side of the airfield, the new terminal would be located much closer to Ronkonkoma LIRR Station and a vehicular transportation system would likely be unnecessary. Instead, a moving walkway could bridge transit-riders' final leg from the train station building to the north-side terminal facility. It would consist of two parallel conveyor systems to aid passengers' travel in both the direction of the train station and the airport. The walkways would provide universal access – without vertical steps – and allow passengers to walk or ride at faster-than-walking speed. Because the system would run continuously, customers will simply walk between the two facilities, with no need to wait. The walkway system enhances this journey by making it faster and more comfortable. Such a system would easily be able to meet current and likely future demand for LI MacArthur Airport access.

The alignment of the walkway would be determined to provide the shortest, most direct connection between the train station and terminal and would be housed within a climate-controlled structure, with entry/exit points located directly at the train station and terminal buildings. Depending the ultimate on future development of the airport and adjacent properties, the walkway could be constructed at ground level, elevated, or potentially underground.

Various moving walkway systems and technologies exist, with slightly varying speeds and lengths. It is likely that the moving walkway systems for LI MacArthur Airport would be long, with travel times in the range of 3.5 to 6 minutes. Trip times would be minimized by using a variable speed walkways. Such walkways have two-speeds: typical walkway speeds towards the access and egress points, and faster “cruise” speeds towards the middle.

For maximum user comfort, the supporting structure for the system should include sufficient access to views and daylight, and be safely lit during times of darkness. This structure should also include enclosure walls, external railing, guards, closures, shutters, ventilation and smoke barriers as required. Adequate areas should be provided for passengers to queue before entry and to re-adjust any baggage, attend to children, etc. upon exit, with further detail defined in ASME A17.1 (Section 6.2.3.8.4).

4.2 Rollout Plan

Because of the transit oriented development goals for Ronkonkoma Station, the physical environment around the train station is likely to change in the medium-to-long term. The moving walkway and additional development should complement and not preclude each other. Thus, the first stage in developing the moving walkway system plan is to coordinate conceptual designs between the terminal development team and the developers of Ronkonkoma Hub and Ronkonkoma South sites. The location and mass of structures and future roadway alignments will influence the final alignment of the walkway system and help determine whether an at-grade or elevated walkway structure is preferable.

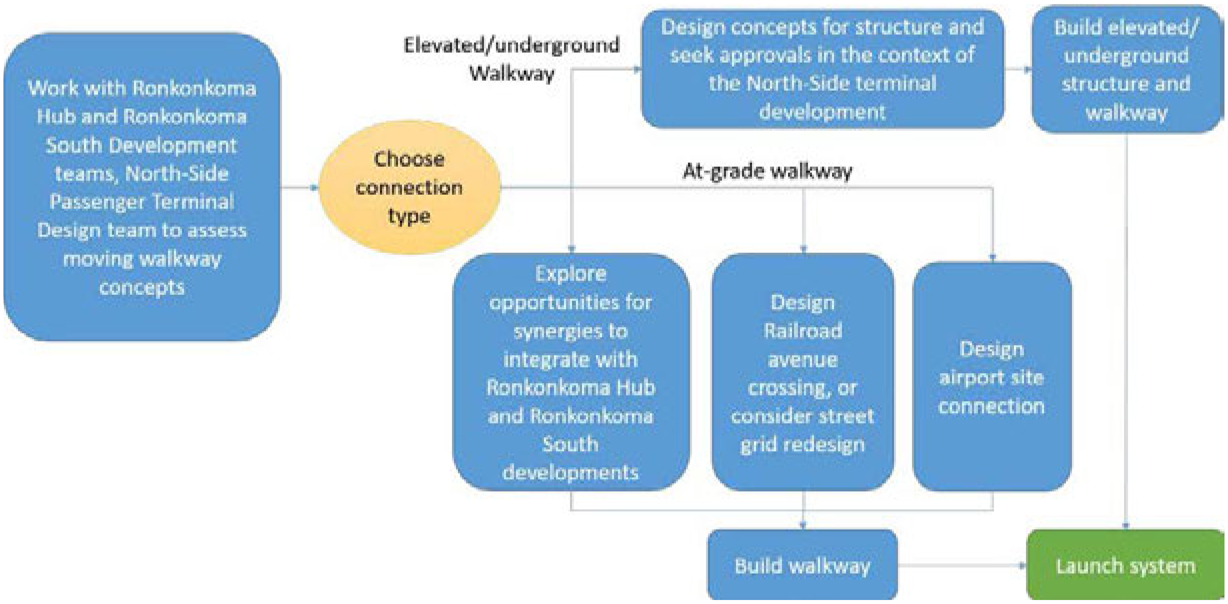

Figure 9: Rollout Plan, Moving Walkway

If the walkway is at-grade (at street level) several opportunities should be explored. First, there may be potential for providing additional access points to new development sites. In addition, reconfiguration of the street grid south of the train station may be required to provide the at-grade walkway system to avoid conflicts with circulating traffic on the street level.

Once the final elevation is determined, the access points and structures – including mechanical integration of the walkway – will be designed. During this period, the airport may begin the process of procuring the walkway components from a manufacturer. The next phase is to construct the moving walkway, meeting the construction timeline of the new terminal – with the new facilities opening to the public at the same time.

4.3 Key Considerations

The key considerations for the moving walkway center on the timeframe, future development, and the supporting structure.

Timeframe – The moving walkway system is not feasible without relocation of the LI MacArthur Airport passenger terminal to the north side of the airfield, near the Ronkonkoma LIRR station. Redevelopment of the airport is a major undertaking, placing the potential for a walkway connection firmly on a long term (20+ years) planning horizon. Any required environmental review related to the walkway would be folded into the larger assessment of the airport redevelopment.

Future development –The system would be constructed concurrent to the development of the proposed North-Side Terminal, and should be integrated into the design of any proposed new build that occurs between Ronkonkoma Station and LI MacArthur Airport – the Ronkonkoma Hub South project. For example, the Moving Walkway could be integrated into new development proposed for the existing surface parking lot, providing an opportunity for users to exit the walkway for retail opportunity or comfort stations and re-enter to continue their journey.

Supporting structure – The supporting structure for the Moving Walkway could be constructed at ground level or as an elevated skyway. Ground-level construction would require less structural support, greater flexibility for adjacent walkways, and reduced complexity for integration with the Station and the North-Side Terminal. However, a ground-level structure would obstruct roadways, requiring re-routing of surface transit, or under/overpass construction. An elevated structure would require greater technical and infrastructure considerations, and is thus costlier. However, it would preserve the flexibility of surface-level mobility with a minimal footprint. As discussed above, the plans for the moving walkway – as well as the terminal relocation – will need to be closely coordinated with land use developments adjacent to the train station, the Ronkonkoma South, which should redevelop the existing park-and-ride lots south of the tracks.

4.4 Costs

The total capital expenditures the moving walkway equipment are expected to reach approximately $15 million. This figure includes the purchase and installation of walkway equipment. This figure does not include the costs of relocating the terminal itself. Due to the high level of uncertainty regarding the range of construction options, it also excludes any elevated structures, tunnels, or other features required for integration with the new terminal.

The annual operating costs for the walkway may reach approximately $150,000. This cost includes the energy requirements of the walkway as well as maintenance and cleaning.

5 Cost-Effectiveness Review

The cost estimate is classified as a Class 5 rough order of magnitude estimate according to Arup's estimate classification matrix (Level 5), which was developed from the Association for the Advancement of Cost Engineering (AACE) best practices.

The accuracy range of this estimate has been determined to be -25% and +50%. The accuracy range is a gauge of likely bid prices if the project was issued to tender at this current stage.

These estimates are based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other works not covered in the drawings and programs as stated in this document. The unit rates reflected herein have been obtained from experience of projects of this nature.

General cost assumptions:

- The values are from the fourth quarter of the year 2017
- Material costs are calculated from data bases such as RS Means, similar project costs and vendors
- Labor rates, fringes and taxes are calculated based on the Bureau of Labor Statistics from the United States Department of Labor
- A New York location factor is applied to the labor and material costs, this factor is obtained from the portal RS Means
- The Operational Cost estimate is not a Life Cycle Cost, meaning that there might be other costs involved to operate the facilities
- ARUP has no control over the cost of labor and materials, general contractor's or any subcontractor's method of determining prices, or competitive bidding and market conditions. This opinion of probable cost of construction is made based on the experience, qualifications, and best judgment of the professional consultant familiar with the construction industry. ARUP cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from this or subsequent cost estimates.
- ARUP recommends that the Owner carefully review this document, including line item descriptions, unit prices, clarifications, exclusions, inclusions and assumptions, contingencies, escalation and markups. If the project is over budget, or if there are unresolved budgeting issues, alternate systems schemes should be evaluated before proceeding into the construction phase.

Some items that may affect the cost estimate:

- Modifications to the scope of work included in this estimate.
- Special phasing requirements.
- Restrictive technical specifications or excessive contract conditions.
- Any other non-competitive bid situations.
- Bids delayed beyond the projected schedule.
- Loss of labor productivity.
- Future market conditions.

The cost estimates reflect standard project conditions, and the best information available, and therefore exclude items that have substantial variation or that require design details available only at a future date. These items are listed at Table 1.

Table 1: Items excluded from the cost estimate

Items excluded from the cost estimate
The costs or impacts of latent environmental issues that result in litigations or development delays
Owners contingency
Planning and enquiry costs, including legal expenses and fees
Local planning obligations and agreements
Site investigation
Local taxes and duties
Right-of-way and or land acquisition costs
Risk-based contingency analysis
Tests and inspections performed by others, apart from that listed in the estimate
Program management and construction management costs
Compensatory costs to other interested parties
Cost benefits and impacts associated with improvements in construction technology, more severe regulatory requirements, and future construction that may impact the work contemplated under this project
Removal and disposal of hazardous materials, unless otherwise stated in the cost estimate
Integration to the building management or communication systems otherwise stated
Structural, civil and architectural costs otherwise stated
Consultant fees
Owners Costs
Preliminary Engineering costs
Detailed Engineering costs
Escalation allowance

5.1 Capital Expenditures

Pricing shown reflects probable construction costs obtainable for replacement works on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors, that is to mean 4 to 5 bids. If fewer bids are received, bid results can be expected to be higher.

Assumptions regarding other costs:

- An allowance of 20% from direct cost is considered as general requirements, which covers costs related to general staff wages and fringes, site conditions and temporary power.
- Allowed a project reserve of 15% from total direct cost due to the project's uncertainty.

- Allowed contractor's overhead and profit of 15% from the total cost.
- Allowed contractor's bonds and insurances of 2.5% from the total cost.
- Escalation allowance is excluded in this estimate.
- The Total Unit Cost is compound by material, crew and sub-contractor overhead and profit.
- Crews are integrated of labor and equipment and are defined based on similar project costs and RS Means portal.

Table 2: Upgraded Taxis Capital Cost Estimate

CAPITAL COST ESTIMATE		
Alternative 1 - Upgraded Taxis	**QUANTITY**	**Total Cost [$]**
Direct costs		
Charging Station		**$ 590,000**
Taxi charging station	10	$ 520,000
Installation civil works and connections	10	$ 70,000
Total Direct Costs		**$ 405,000**
Indirect Costs		
General Requirements (staff, site conditions, temporary power)	20.00%	$ 81,000
Construction Contingency	15.00%	$ 60,800
Total Cost (Direct + Indirect)		**$ 546,800**
Contractor's Costs		
Overhead and Profit	15.00%	$ 82,000
Bond & Insurances	2.50%	$ 13,700
Total Contractor's Cost		**$ 100,000**
Vehicles		**$ 405,000**
Nissan NV200	10	$ 305,000
Taxi special accomodations	10	$ 100,000
Total Price (Total Cost + Contractor's Cost)		**$ 1,051,800**
Total Price (Low)	**-25%**	**$ 789,000**
Total Price (Likely)		**$ 1,051,800**
Total Price (High)	**35%**	**$ 1,420,000**

Assumptions:

- Assumed 10 Nissan NV200 plus taxi special accommodations
- Assumed 10 charging stations
- An allowance of $8.5k per charging station for installation and minor civil works

- No civil works considered otherwise stated
- Depot or maintenance facility excluded

Table 3: Shuttle on Public Roads Capital Cost Estimate

CAPITAL COST ESTIMATE				
Alternative 2 - Shuttle system on public roads	**QUANTITY**	**UNIT**		**Total Cost [$]**
Direct costs				
Bus Platform / Station	**2**	**EA**	**$**	**906,000**
Shelter to accommodate 30 passengers	1,500	SF	$	375,000
HVAC system (heating/AC)	1,500	SF	$	34,500
Vending machines	1	EA	$	8,100
Displays and installation	1	EA	$	12,400
Real time passenger information system (RTPI)	1	EA	$	23,000
Bus depot	**1**	**EA**	**$**	**3,104,000**
Storage and maintenance depot, 10000 SF	10,000	SF	$	1,980,000
Additional Depot items	10,000	SF	$	860,000
Bus charging station	4	EA	$	264,000
Total Direct Costs			**$**	**4,010,000**
Indirect Costs				
General Requirements (staff, site conditions, temporary power)	20.00%		$	802,000
Construction Contingency	15.00%		$	602,000
Total Cost (Direct + Indirect)			**$**	**5,414,000**
Contractor's Costs				
Overhead and Profit	15.00%		$	812,000
Bond & Insurances	2.50%		$	135,000
Total Contractor's Cost			**$**	**950,000**
Shuttle Bus				
BYD K9 electric bus	3	EA	$	2,166,000
Total Price (Total Cost + Contractor's Cost)			**$**	**8,530,000**
Total Price (Low)	**-25%**		**$**	**6,398,000**
Total Price (Likely)			**$**	**8,530,000**
Total Price (High)	**35%**		**$**	**11,516,000**

Assumptions:

- Two 1500 SF stations considered

- A 10000 SF bus depot / maintenance facility considered

Roadway and tunnels under the RPZ					
	DESCRIPTION	**QTY**	**UNIT**	**UNIT PR**	**AMOUNT**
1	2-Lane Road with shoulder (6" base, 6" stone, 3" top)	680,000	SF	12	8,160,000
2	Street Strippinng	20,000	LF	15	300,000
3	Demolition of existing roadway	20,000	SF	10	200,000
4	Cut and fill roadway profile	31,481	CY	15	472,222
5	AOA fence	20,000	LF	170	3,400,000
6	Water	20,000	LF	60	1,200,000
7	Lighting fixtures	20	EACH	6,000	120,000
8	Electrical	20,000	LF	50	1,000,000
9	Storm	20,000	LF	70	1,400,000
10	12' x 6' Pre-cast box culvert tunnel	4,000	FT	3,665	14,660,000
11	Cut and Cover	118,519	CY	15	1,777,778
	TOTAL				32,690,000
	CONTINGENCIES	25%			**40,862,500**

Assumptions:

- Roadway length = 20,000 ft
  - Width = 34 ft
  - Depth = 1.25 ft
- Tunnel length = 4,000 ft
  - Width = 40 ft
  - Depth = 20 ft

Table 4: Moving Walkway Capital Cost Estimate

CAPITAL COST ESTIMATE			
Alternative 4 - Moving Walkway	QUANTITY	UNIT	Total Cost [$]
Direct costs			
Moving Walkway	2	EA	**$ 9,520,000**
Moving Walk, 48" tread width	1,400	LF	$ 4,760,000
Infraestructure			**$ -**
			$ -
Total Direct Costs			**$ 9,520,000**
Indirect Costs			
General Requirements (staff, site conditions, temporary power)	20.00%		$ 1,904,000
Construction Contingency	15.00%		$ 1,428,000
Total Cost (Direct + Indirect)			$ 12,852,000
Contractor's Costs			
Overhead and Profit	15.00%		$ 1,928,000
Bond & Insurances	2.50%		$ 321,000
Total Contractor's Cost			$ 2,250,000
Total Price (Total Cost + Contractor's Cost)			**$ 15,102,000**
Total Price (Low)	**-25%**		**$ 11,327,000**
Total Price (Likely)			**$ 15,102,000**
Total Price (High)	**35%**		**$ 20,388,000**

Assumptions:

- A 1400 Linear Feet 48" tread width moving walkway considered
- Moving walkway installation allowance considered
- No civil works considered otherwise stated

5.2 Operating Expenditures

Assumptions regarding other costs:

- Allowed a project reserve of 15% from the total operational cost due to the project's uncertainty.

- The operational costs are calculated for a year of operations, which is equivalent to 365 days.

- The frequency of each activity is considered based on similar projects and conversations with operators.
- A crew formed by labor and equipment is considered for each activity.
- A cost of $ 0.2 kwh for energy is considered.

Table 5: Shuttle on Public Roads Operating Cost Estimate

	Quantity	Units		total cost per year
Operations costs				
Bus Platform / Station	**2**	**EA**	**$**	**108,000**
Energy Consumption (HVAC, lights, AC, etc)	12.5	KWH	$	18,250
Cleaning allowance	1	MO	$	35,561
Bus depot	**1**	**EA**	**$**	**825,000**
Facility Technical Staff	4	MO	$	491,021
Facility Manager Staff	1	MO	$	197,561
Office consumables	1	MO	$	12,000
Energy Consumption (HVAC, lights, AC, etc)	50	KWH	$	30,000
Cleaning allowance	1	MO	$	94,830
Shuttle Bus	**2**	**EA**	**$**	**1,021,214**
Electric power / fuel	1	EA	$	11,340
Bus Drivers	3	MO	$	499,267
Total Operational Cost			**$**	**1,954,000**
Reserve	15%		$	293,100
Total Price (Total Operational Cost + Operator's Cost)			**$**	**2,247,000**
Total Price (Low)			**$**	**1,685,000**
Total Price (Likely)			**$**	**2,247,000**
Total Price (High)			**$**	**3,033,000**

Table 6: Moving Walkway Operating Cost Estimate

	Quantity	Units		total cost per year
Operations costs				
Moving Walkay				
Maintenance for Moving Walk, 48" tread width	1400	FT	$	52,015
Electric power / fuel	1400	FT	$	26,205
Cleaning allowance	1	MO	$	47,415
Total Operational Cost			**$**	**126,000**
Reserve	15%		$	18,900
Total Price (Total Operational Cost + Operator's Cost)			**$**	**144,900**
Total Price (Low)			**$**	**109,000**
Total Price (Likely)			**$**	**144,900**
Total Price (High)			**$**	**196,000**

5.2.1 Cost Summary

The summary of the capital and operating costs for the connector options, to the extent that is possible to estimate them (as outlined by the assumption in the previous sections), is presented at Table 7.

Table 7: Cost Summary

	Short-Term: Upgraded Taxis
Capex	$ 1,100,000
Opex	TBD
	Estimate based on the cost of 10 vehicles and 10 chargers. Capex and opex of E-hailing app are not indicated, since there are not enough public records to inform an estimate. Opex also influenced by contracting arrangements with taxi operator.

	Medium-Term: Bus Shuttles
Capex	$ 8,530,000
Opex	$ 2,247,000
	Estimate based on the cost of 3 vehicles and ancillary structures. Opex wil vary according operational plans and contracting arrangements.

	Long-Term Current Terminal: AVs Through Airport
Capex	$ 41,000,000.00
Opex	TBD
	Capex cover new roadway and tunnels. Capex and opex of AVs are not indicated, since there are not enough public records to inform an estimate.

	Long-Term North Terminal: Walkway
Capex	$ 15,000,000
Opex	$ 144,900
	Capex considers purchase and setup of walway; does not include construction costs of elevated structure, tunnels and other festures required for integration with the terminal.

5.3 Revenue Sources

There may be some small opportunities for generating revenue from the upgrading of train-to-plane services at the airport. The table below splits out ticket and advertising revenue potential for each alternative. Any generation of ticket revenue needs to be balanced against the cost of collecting the revenue and the impact on passenger experience and appetite for using the new service. Upgrading train-to-plane access might also create new advertising opportunities, which are worth considering but will not bring in significant revenue.

Who owns and operates the proposed alternatives and the contractual relationship between involved parties will also dictate the amount of revenue the airport will collect, compared to revenue for the taxi or shuttle operators (if they are not the airport).

Table 8: Potential revenue sources for the operator

Alternatives	User charges (ticket revenue)	Advertising revenue
Upgraded Taxi Service	**Potential small revenue opportunity** Train-to-plane taxi services currently charge $5 per person and that revenue goes to the taxi operator. The taxi operator then pays an annual fixed fee to the airport for monopoly rights to provide this service. Upgrading the taxi service might justify increasing the $5 charge, but this needs to be considered in the wider context of potential competition from the shuttle bus, and impacts to the attractiveness of the offer. Depending on the future contractual relationship and ownership of the upgraded taxi service there may be opportunities for the airport to capture more of the revenue from taxis rides, instead of a flat fee regardless of usage.	**Potential very small revenue opportunity** Taxis can have exterior and interior advertising which could be a source of revenue for the operator.
Upgraded Shuttle to Airport Terminal on Public Roads AV Shuttle to Airport Terminal on Private Roads	**Potential small revenue opportunity** An Airport shuttle could be free or be available at a small fee for usage. Typically, shuttles owned by an airport are free for passengers and almost always free for airport staff. However, a user charge could be applied. Any user charge would need to be small to be competitive with Taxis, which currently charge $5 per person.	**Potential very small revenue opportunity** Depending on the contractual arrangement with the shuttle owner/operator there may be some opportunities for modest advertising inside or outside of the shuttle.
Moving Walkway to North-Side Terminal	**No potential revenue opportunity.** In theory, users could be charged for usage of the walkway, but there are no examples of this in practice and consumer expectation is that moving walkways are free at the point of use.	**Very small revenue opportunity** Depending on the design of the walkway there may be some opportunities for modest advertising.

5.4 Effectiveness

Each proposed alternative brings different benefits for passengers and the airport. In addition to the benefits tabled below, enhancements to train-to-plane access may also encourage more people to choose Long Island MacArthur Airport over alternative airports. The degree to which ground transportation improvements may stimulate additional air passengers has not been calculated in this report but studies indicate that improvements to the quality, reliability, and travel time to and from the airport can induce noticeable shifts in air travel demand at an airport[7].

[7] Transport Research Board - Understanding Airline and Passenger Choice in Multi-Airport Regions. https://doi.org/10.17226/22443.

Table 9: Potential benefits of each alternative

Alternatives	Benefits
Upgraded Taxi Service	**Improved passenger experience:** The updated system would deploy modern vehicles equipped with onboard digital amenities, and design favorable for stepping in and out, baggage movement and accommodation of persons with disabilities. The new fleet would allow passengers to pay by cash/card in addition to a new mobile device function, and to reserve a trip in advance through their smartphone. **Ease of operation:** Like today, by outsourcing train-to-place operations to a third-party taxi operator the airport has lower operational costs and fewer management responsibilities.
Upgraded Shuttle to South Terminal on Public Roads	**More environmentally friendly:** Having a full shuttle bus of passengers is more environmental friendly than multiple taxis or cars transporting passengers to and from the airport. Reducing the number of vehicle trips around the airport will improve local air quality and reduce carbon emissions. This could be further enhanced with a low or zero-emission shuttle buses. **More affordable options for passengers:** Assuming the shuttle would be free, or at least cheaper than a taxi, this alternative would provide users with more choice and less expensive options.
Upgraded Shuttle to South Terminal on Private Roads	**More reliable and resilient service** By using a dedicated private airport road, the shuttle service will be more reliable. Although traffic congestion is not a major issue on the public roads near the airport, by taking the shuttle off public roads it protects the service from un-expected delays that might occur, for example from congestion related to crashes or police activity. **Faster journey times** A dedicated private road would have a marginally more direct route and fewer junctions, meaning that journey times to the airport from the station may be marginally faster than a shuttle bus or taxi on public roads. **More environmentally friendly:** Having a full shuttle bus of passengers is more environmental friendly than multiple taxis or cars transporting passengers to and from the airport. Reducing the number of vehicle trips around the airport will improve local air quality and reduce carbon emissions. This could be further enhanced with a low or zero-emission shuttle buses. **More affordable options for passengers:** Assuming the shuttle would be free, or at least cheaper than a taxi, this alternative would provide users with more choice and less expensive options.

Alternatives	Benefits
Moving Walkway to North-Side Terminal	**Shorter journey:** A moving walkway between the train station and a new northern terminal would significantly reduce the time it takes to transfer from train to airport. The shorter the transfer time the more attractive ISP will be for passengers. With a shuttle or taxi, a passenger might have to wait a few minutes for service but with a moving walkway there is zero waiting time, it is always available when the passenger needs it. **Simpler journey:** Travelling on a moving walkway is easier than using a taxi or shuttle bus. Firstly, you do not need to lift your baggage into a taxi or shuttle. Secondly, most passengers do not perceive a moving walkway as a mode of transport and therefore in the eyes of the consumer moving between the train station and the airport would not require a 'transfer'. **Weather protection:** Depending on the design of the walkway, passengers could move from the train station to the airport under cover. If the walkway is fully enclosed, passengers could benefit from a more comfortable transfer. **Easy to operate:** Once constructed, a moving walkway have very low operating costs and does not require staff to operate.

6 Environmental Review Effort Assessment

This review estimates the effort required to undertake an environmental assessment for each connection option. This assessment is aimed at assisting decision-making that could impact the development of the train-to-plane connection, and it includes a summary of key regulatory and policy considerations with illustrative assessment durations and potential costs. The schedule and cost estimates reflect rough order-of-magnitude approximations based on information currently available.

This is not an exhaustive evaluation of the options, and a detailed environmental assessment in compliance with all relevant local, state and federal regulations should be undertaken to inform subsequent project stages.

Illustrative time and cost considerations are not provided for the moving walkway, as the environmental assessment for this option would need to be undertaken in conjunction with the development of the proposed North Side Terminal.

A list of references that informed the review are provided at the end of this section.

6.1 Upgraded Taxi Service

Estimated timeline for assessment: 2 – 3 months

Estimated cost of assessment: $25,000 - $50,000

It is assumed that no Federal funding will be used for the development of this option and therefore no National Environmental Policy Act (NEPA) review will be required by the U.S. Environmental Protection Agency.

The project is an unlisted action under the New York State Environmental Quality Review (SEQR). The environmental review will require the preparation of an Environmental Assessment Form (EAF) followed by a Negative Declaration as per SEQR requirements. No public hearings would be required as part of this SEQR review.

A SEQR Lead Agency will need to be identified, and it is anticipated that the EAF will include multiple Involved Agencies, so a coordinated review will be necessary.

The only element of the development of this option anticipated to require environmental analysis would be the construction of electric vehicle (EV) charging stations. Per current development plans, the proposed locations for EV charging stations are on paved and/or previously disturbed surfaces which have been maintained as developed sites. From preliminary review, no trees or other natural vegetation will need to be cleared. It is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. There are no surface waters or wetlands in the vicinity. The project is in a Sole Source Aquifer area; however, no detailed analysis is anticipated. It is anticipated that there are no cultural resources in the vicinity that could be impacted.

6.2 Upgraded Shuttle Bus on Public Roads

Estimated assessment duration: 3 – 5 months

Estimated assessment cost: $40,000 - $80,000

Even if the project is not funded through the AIP program, grant assurances require the airport to conduct a NEPA review. Because the only new building in the airport would be the bus depot, the FAA would require the airport to complete a Categorical Exclusion (CATEX) or short form EA. Federal funds may also be applied towards this project through FTA’s Urbanized Area Formula Grants (5307).

The project is an unlisted action under the New York State Environmental Quality Review (SEQR). The environmental review will require the preparation of an Environmental Assessment Form (EAF) followed by a Negative Declaration as per SEQR requirements. No public hearings would be required as part of this SEQR review.

A SEQR Lead Agency will need to be identified, and it is anticipated that the EAF will include multiple Involved Agencies, so a coordinated review will be necessary.

Per current development plans, the proposed locations for the shuttle stations and bus depot are on either paved and/or previously disturbed surfaces that have been maintained as developed sites. Based on existing information, it is anticipated that a Phase 1 Environmental Site Assessment (ESA) will be required. It is assumed that no potential hazardous waste issues will be identified.

From preliminary review, no trees or other natural vegetation will need to be cleared. It is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. There are no surface waters or wetlands in the vicinity. The project is in a Sole Source Aquifer area; however, no detailed analysis is anticipated. It is anticipated that there are no cultural resources in the vicinity that could be impacted.

6.3 AV Shuttle on Private Roads

Estimated assessment duration: 18 – 24 months

Estimated assessment cost: $500,000 - $1,000,000

It is assumed that the development of a new roadway and tunnel will involve Federal funding, from sources other than the AIP, which currently cannot be committed for the project. A NEPA review would be required, and a Federal Lead Agency would need to be identified to determine NEPA documentation format. A detailed Design Report and Environmental Assessment (DR/EA) would be required, and, depending on its findings, an Environmental Impact Statement (EIS) will have to be prepared.

The DR/EA may also serve as the SEQR document. It is anticipated that there would be multiple SEQR Involved Agencies, so a coordinated review will be necessary. The DR/EA will be subject to a Public Hearing, and depending on the requirements of the eventual Federal NEPA Lead Agency, public information meetings may also be required.

Per current development plans, it is anticipated that that trees or other natural vegetation would need to be cleared. Depending on the season of clearing, surveys for the Northern Long-eared Bat (NLEB) may be required. Other than the NLEB, it is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. Preliminary review indicates a Federally regulated wetland may be present on the airport property that will need to be avoided. Under federal wetland regulations, there is no regulatory boundary beyond the limits of the wetland. There are no surface waters or State regulated wetlands in the vicinity.

The project is within in a Sole Source Aquifer Area. If any new pavement is proposed, a groundwater analysis will be required. A State Pollutant Discharge Elimination System (SPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) will be required if the clearing equals or exceeds one (1) acre.

It is anticipated that there are no cultural resources in the vicinity that could be impacted.

6.4 Moving Walkway

Estimated assessment duration: not estimated

Estimated assessment cost: not estimated

Regulations will not permit an environmental review of this option to be segmented apart from the proposed development of the future North Side passenger terminal. Environmental review procedures are anticipated to evolve during the 20-year time frame anticipated to plan, design, fund and construct this facility. The summary below sets out environmental review considerations in line with current regulations.

It is assumed that this project will only take place with Federal funding, from different agencies, as well as other sources at different levels of government. A NEPA review would be required, and a Federal Lead Agency would need to be identified to determine NEPA documentation format. A detailed Design Report and Environmental Assessment (DR/EA) would be required.

The DR/EA may also serve as the SEQR document. It is anticipated that there would be multiple SEQR Involved Agencies, so a coordinated review will be necessary. The DR/EA will be subject to a Public Hearing, and depending on the requirements of the eventual Federal NEPA Lead Agency, public information meetings may also be required.

Per current development plans, it is anticipated that that trees or other natural vegetation would need to be cleared. Depending on the season of clearing, surveys for the Northern Long-eared Bat (NLEB) may be required. Other than the NLEB, it is anticipated that there are no federal or state listed endangered, threatened special concern species, significant natural communities or rare plants that will need to be addressed.

The project is not in the designated Coastal Zone. Preliminary review indicates a federally regulated wetland may be present on the airport property that will need to be avoided. Under federal wetland regulations, there is no regulatory boundary beyond the limits of the wetland. There are no surface waters or State regulated wetlands in the vicinity.

The project is within in a Sole Source Aquifer Area. If any new pavement is proposed, a groundwater analysis will be required. A State Pollutant Discharge Elimination System (SPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) will be required if the clearing equals or exceeds one (1) acre.

It is anticipated that there are no cultural resources in the vicinity that could be impacted.

6.5 Summary Table

Table 10: Considerations for environmental assessment for each option

Environmental Screening Criteria	**Upgraded Taxi Service**	**Upgraded Shuttle Bus, public roads**	**AV Shuttle, private roads**	**Moving Walkway**
NEPA: National Environmental Policy Act				
Detailed Design Report and Environmental Assessment (DR/EA) anticipated?	No	Yes	Yes	Yes
Environmental Impact Statement (EIS) anticipated?	No	No	Yes	No
SEQR: New York State Environmental Quality Review				
Requires Environmental Assessment Form followed by a Negative Declaration?	No	No	No	No
Requires public hearing?	No	No	Yes	Yes
Requires public information meeting?	No	No	Yes	Yes
Requires identification of SEQR Lead Agency?	Yes	Yes	Yes	Yes
Requires coordinated review (with Multiple Agencies)?	Yes	Yes	Yes	Yes
Scope of environmental analysis				
Requires clearing of trees or other natural vegetation?	No	No	Yes	Yes
Requires development of previously undeveloped or undisturbed land?	No	No	No	No
Phase 1 Environmental Site Assessment (ESA) anticipated?	No	Yes	No	No
Presence anticipated of Federal or State listed endangered, threatened special concern species, significant natural communities, or rare plants within site boundary?	No	No	Yes	Yes
Located within a Coastal Zone?	No	No	No	No
Presence anticipated of regulated surface waters or wetland within site boundary?	No	No	Yes	Yes
Detailed Sole Source Aquifer Area analysis anticipated?	No	No	Yes	Yes
State Pollution Discharge Elimination System (SPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) anticipated?	No	No	Yes	Yes
Presence anticipated of cultural resources within site boundary?	No	No	No	No

N.B. Moving Walkway: Environmental regulations will not permit the moving walkway option to be segmented apart from the future passenger terminal. It is assumed that this option will only take place with federal funding. Environmental review procedures are anticipated to evolve during the 20-year time frame anticipated to plan, design, fund and construct this facility. The assessment presented here is based on current environmental regulations.

Appendix

A1 Upgraded Taxi Vehicle Features

Vehicles should feature passenger amenities that maximize comfort and convenience. Desirable amenities for new taxi purchases include:

- Sliding doors, interior grab-handles, and swing out-steps to maximize ease of entry and exit;
- Facilitated boarding;
- Flat vehicle floors which provide additional comfort and space for small luggage;
- Independent rear climate control;
- A spacious, rear luggage compartment;
- Wipe-clean interior surfaces; and
- Reading lights and floor lighting.

Not all the desired features listed above will be readily available in a single vehicle model, and therefore procurement should be based on a model of "should-have" rather than "must-have" for the performance features.

Taxi-versions of a variety of vehicles are available. Cargo van based taxis offer a good mix of passenger amenities, and have been designed to maximize interior space on a small chassis. This results in an easy to board vehicle with a good amount of space for luggage and comfortable middle sit on the rear bench. Mini vans offer some of the same features, but on a larger vehicle frame. Their overall comfort and capacity depends on the configuration of benches. Some minivans may be equipped with either rear-loading or side-loading wheelchair ramps, making them the most accessible.

SUVs may offer slightly more luggage capacity than sedans, but overall provide a similar experience. However, these vehicle types are the most commonly available in hybrid, plug-in hybrid, or fully electric models. Taxi operators around the world – including New York City, Montreal, and several European cities – continue to experiment with integrating electric vehicles – including Nissan Leaf, Kia Soul, and even the more expensive Tesla Model S – into their fleets.

Table 11: List of Potential Taxi Vehicles[8]

Vehicle Type	Example Vehicles	Passenger Capacity	Luggage Capacity	Fuels	Other Comfort Factors	Wheelchair Accessibility
Small Cargo Van	Nissan NV-200 Ford Transit Connect	Rear: 3 (comfortably) Front: 1	Best	Prototype Electric/Hybrids only. Transit can be configured as CNG	Easy boarding with spacious interior	Medium (rear-loading)
Mini Van	Toyota Sienna Dodge Grand Caravan	Rear: 2 per bench (comfortably), up to 3 per bench Front: 1	Best	Limited Hybrid options may be available.	Multiple benches make entry/exit difficult.	Best (side-loading options may be available)
SUV	Toyota Highlander Toyota Rav4 Ford Escape	Rear: 2 (comfortably), up to 3 Front: 1	Medium	Hybrid options widely available.	May have higher boarding than a sedan, making entry/exit difficult.	Worst (none)
Sedan	Toyota Prius/Prius V Toyota Camry Nissan Leaf (EV)	Rear: 2 (comfortably), up to 3 Front: 1	Worst	Hybrid options widely available. Potential for electric vehicles.[9]	Typical taxi vehicle experience.	Worst (none)

8 http://www.nyc.gov/html/tlc/html/industry/taxicab_vehicles_in_use.shtml
9 https://electrek.co/2017/05/30/nissan-leaf-all-electric-taxi/

A2 Taxi E-Hailing App Vendors

The electronic hailing and dispatching system is the primary new technological system associated with upgrading the taxi fleet. A variety of software systems have been developed to shift dispatching operation. The below case studies provide an overview of features available10.

- **Flywheel** is a San Francisco software company that has developed a solution called TaxiOS, which provides both driver, fleet management, and passenger applications for both iOS and Android. This solution includes cloud-based dispatching, meaning it runs on a remote server, obviating the need for new, back-end IT infrastructure. It also replaces all in-vehicle hardware: the taximeter, radio, navigation, and credit card processing systems are integrated into a mobile phone application. The dispatching system runs on a remote server, and can display fleet information in a web browser. The company offers some support for continued voice dispatching. Advanced features include carpooling, advance trip booking, and limited vehicle selection (i.e. ability to select a car, SUV, or accessible ride). Customers can pay using a stored credit card and tip drivers. The application also supports payout transactions between the driver and fleet manager.[11]
- **TaxiStartup** advertises full service solutions for fleet management. It offers a dispatch panel with telephone integration as well as automated dispatch via the driver app, which provides route directions to the customer's location. The dispatching software is cloud-based, running on a remote server, and does not require new back-end IT infrastructure. The application also supports zone based fares and multiple vehicle types. A queue algorithm allows drivers at a near a single pick up point to be assigned to trips one by one. The passenger app – available for both iOS and Android phones – can be configured to support both credit card and cash payments. In addition, a "Webdesk" product allows for a kiosk-like set up by allowing a taxi agent to instantly summon a vehicle to a permanent point-of-interest. The application also supports payout transactions between the driver and fleet manager using a managed account, and allows for integrated brand identity.[12]
- **ARRO** is a free-download web-based application that connects passengers with professional licensed drivers, like Uber or Lyft. ARRO works with locally regulated vehicle and drivers (such as taxis or private drivers), and where available, offers Wheelchair Accessible Vehicles or other types of vehicles such as minivans. The ARRO app works on both iOS and Android devices and passengers can register with their Facebook account or email address. Users can see the estimated cost of a ride before requesting, request a ride to book service immediately or in the future, and pay for rides. Customers are also able to directly dial drivers such as for confirmation

[10] This research is intended to provide information on system functionality, and should not be considered an endorsement of any product.
[11] http://www.flywheel.com/
[12] https://taxistartup.com/product/#features

or to find each other upon arrival. In New York City, ARRO has developed a service that enables passengers to ‘pair’ their smartphone with the Taxi TV to access a payment code and complete payment. Drivers can use either an ARRO app on their smartphone or use a mobile data terminal (MDT) for dispatching and payment. E-hails are only sent to drivers if near to the requesting customer, however the ARRO website does not provide information on what dispatching technologies they are able to offer or link to. [13]

- **Curb** is a product from Verifone Taxi Systems to help taxi operators compete with Transportation Network Companies, such as Uber. Curb provides both driver and passenger applications for iOS and Android smartphones, but will only allow licensed and insured taxi drivers to use their service. It supports multiple credit-card payment processing methods, including PayPal, and has support for ride-sharing. In addition to using the smartphone application, Curb supports customer booking by sending their pickup address via SMS. The Curb website, however, does not provide information on what dispatching technologies they are able to provide.[14]

[13] https://www.ridearro.com/about/
[14] https://gocurb.com/fleets/

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Appendix E.
Public Information Session Materials

STUDY PROCESS

Kick-Off Meeting 6.30.17

Existing Conditions Analysis

Long Island MacArthur Airport (accessibility, demand & catchment area, planned improvements)

Ronkonkoma LIRR Station (state of existing infrastructure, planned improvements)

Purpose and Need Statement

Defined broad purpose of the study

Identified project needs - System Linkage, Transportation Demand and Economic Growth

Identified Project Impacts

Connectivity Modes Assessment

Identified 10 modes which can be implemented as an train-to-plane linkage

High level technology assessment and feasibility context was established based on their applications at other locations

Ranking of Connectivity Modes

Developed Screening Criteria under three focus areas – Air Traveler, Community, and Delivery

Modes were scored for the existing terminal location as well a potential north-side terminal

Implementation Plans

Developed four high-level Implementation Plans: Short Term - Updated Taxi System, Mid Term - Shuttle, Long Term Option 1 - Automated Vehicle Shuttle, Long Term Option 2 - Moving Walkway to a new North-side Terminal

Cost & Environmental Review Assessments

Planning level estimates of capital and operating costs for each of the four Implementation Plan options

Estimation of level of effort necessary for the required environmental reviews

Final Report

Public Session 4.11.18

OPPORTUNITY FOR A TRAIN-TO-PLANE CONNECTION

Long Island MacArthur Airport's Passenger Growth Potential

- Frontier service started end of August 2017 and will keep growing into 2018
- NYC area airports are constrained- JFK, Newark and LaGuardia have highest % of flight delays in U.S.
- Potential runway extensions could open possibilities of new markets
- Greater Catchment Area - Planned Transit Oriented Developments and regional transportation improvements

Ronkonkoma LIRR Station's Potential

- Ronkonkoma is in the Phase 2 of MTA Capital Program - Enhanced Stations Initiative. Enhancements include new waiting areas, station renovations, Wi Fi, charging stations, and improved signage.
- 15 minute drive from LI MacArthur Airport and adjacent to Ronkonkoma Hub Development
- 78 minutes away from Penn Station, on average at weekday peak period

TYPE OF CONNECTION MODES EVALUATED IN THE STUDY

CATEGORY	DESCRIPTION	MODES INCLUDED
POINT TO POINT	• Pickup and drop off passengers at nearly any location • No major investment in stations, tracks, rolling stock	• Taxis • TNCs
STRUCTURED, BRANCHED TO AIRPORT	• Used as part of a regional transit network, with an extension for a train-to-plane connection • New investment in stations, transit-ways, and rolling stock	• Bus Rapid Transit • Streetcar • Light Rail Transit
STRUCTURED, CENTERED ON AIRPORT	• Mostly used for a train-to-plane connection • Focused on airport generated demand • New investment in stations, transit-ways, and rolling stock	• Shuttle • Gondola • Automated People Mover • Personal Rapid Transit • Moving Walkways

POINT-TO-POINT MODES

Upgraded Taxi System

A fleet of for-hire vehicles offering rides for individual passengers or small groups.
Enhancements - New orientation signage, Upgraded vehicle fleet, Availability of e-Hailing and mobile payment, Updated LIRR ticket vending machines and app.

Transportation Network Companies (TNCs)

Customers use a GPS-enabled mobile phone to request a ride from a 3rd party driver.
Enhancements- Negotiated service and fare with TNC, Designated pick-up areas

STRUCTURED, BRANCHED TO AIRPORT MODES

Bus Rapid Transit (BRT)

Branched from Nicolls Road Corridor; Enhanced buses, traveling along dedicated lanes with signal priority, offer reliable, convenient, and fast transit.

Streetcar

Electric rail vehicles operating in mixed-traffic and on tracks embedded in the pavement.

Light Rail Transit (LRT)

A light rail service operating in either mixed traffic or dedicated right-of-way; Smaller vehicles and lower operating costs than traditional subways or commuter rail services.

STRUCTURED, CENTERED ON AIRPORT MODES

Shuttle Buses

Dedicated bus service along fixed routes timed with Ronkonkoma LIRR train arrivals and with amenities catering to air travelers.

Automated People Mover (APM)

Grade-separated mass transit system with full automated, driverless operations, featuring vehicles that travel on guide ways with an exclusive right-of-way.

Personal Rapid Transit (PRT)

Small autonomous vehicles providing on-demand point-to-point service along a fixed guide way.

Moving Walkways

A covered, climate-controlled, moving walkway to connect the potential north-side terminal with Ronkonkoma LIRR Station.

Gondola

Cabins supported and propelled by overhead cables connecting the Station track overpass with the potential north-side terminal.

MODE EVALUATION - SCREENING CRITERIA

A Screening Criteria Matrix, comprised of ten screening criteria, was developed to evaluate the modes for their suitability as a potential train-to-plane connection and support in determining the four connection modes that should advance to 'Development of Implementation Plans' stage.

Air Traveler Focused

- Ease of Connection
- Reliability
- Passenger experience

Community Focused

- Neighborhood Integration
- Ability to serve other markets
- Environmental performance

Delivery Focused

- Rollout Phasing
- Ease of Implementation
- Capital Costs
- Operating Costs

MODE EVALUATION – SCREENING MATRIX

Existing Terminal

		Ease of Connection	Reliability	Passenger Experience	Neighborhood Integration	Ability to Serve Other Markets	Environmental Performance	Rollout Phasing	Ease of Implementation	Capital Costs	Operating Costs	
Point to Point	Updated Taxi System	◒	◒	◒	●	◒	◒	●	●	●	●	7.0
	TNCs	◒	◒	○	●	●	○	◒	●	●	●	6.2
Structured, Centered on Airport	Shuttle Bus	◒	●	●	●	○	◒	●	●	●	●	8.2
	APM	●	●	●	◒	○	◒	○	◒	○	○	4.8
	PRT	●	●	●	◒	○	●	○	○	○	○	5.0
Structured, Branched to Airport	BRT	◒	●	●	●	●	◒	●	◒	◒	◒	7.0
	Streetcar	◒	●	●	●	●	○	◒	◒	○	○	5.4
	LRT	◒	●	●	◒	◒	○	○	○	○	○	3.9

North Side Terminal

		Ease of Connection	Reliability	Passenger Experience	Neighborhood Integration	Ability to Serve Other Markets	Environmental Performance	Rollout Phasing	Ease of Implementation	Capital Costs	Operating Costs	
Structured, Centered on Airport	Gondola	●	●	◒	◒	○	●	○	◒	◒	○	4.9
	Moving Walkway	●	●	●	●	○	●	○	●	◒	●	7.6
Structured, Branched to Airport	BRT	◒	●	●	●	●	◒	●	●	●	●	8.8
	Streetcar	◒	●	●	●	●	○	◒	●	◒	○	6.2
	LRT	◒	●	●	◒	◒	○	○	○	○	○	3.9

●	Good
◒	Fair
○	Poor

Modes selected for Implementation Plans:

- Short Term (1-2 Years) - Updated Taxi System
- Mid Term (5-7 Years) - Shuttle Bus System on Public Roads
- Long Term (20+ Years) - Option 1: AV (Autonomous Vehicle) Shuttle on Airport Roads
- Long Term (20+ Years) - Option 2: Moving Walkway to the potential North Side Terminal

SHORT TERM - UPDATED TAXI SYSTEM (1-2 YEARS)

Salient Features

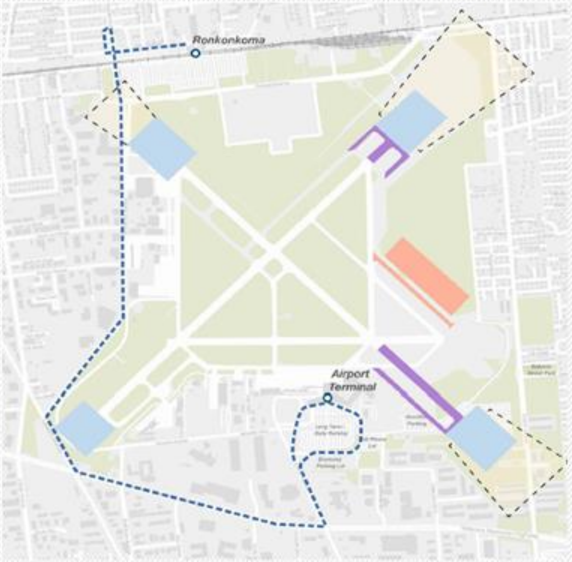
- Fleet of for-hire vehicles for point-to-point travel
- Ride hailing and payment enhanced by mobile device application
- Vehicle fleet designed for airport-bound passengers, potential features include:
  - Easy boarding
  - Larger trunks
  - Universal accessibility
  - Individualized climate control
  - Higher standard of design and comfort
- Cloud-based taxi dispatching system with performance monitoring

Planning Level Cost Estimates

- Capital Costs - $1.1 Million
- Operating Costs - depends on the contractual arrangement with the taxi operator and app specifications

Example: Ford Transit Connect

Route Alignment
- Around Airport, on Public Roads



Distance - 3.6 miles

MID TERM – SHUTTLE BUS SYSTEM (5-7 YEARS)

Salient Features

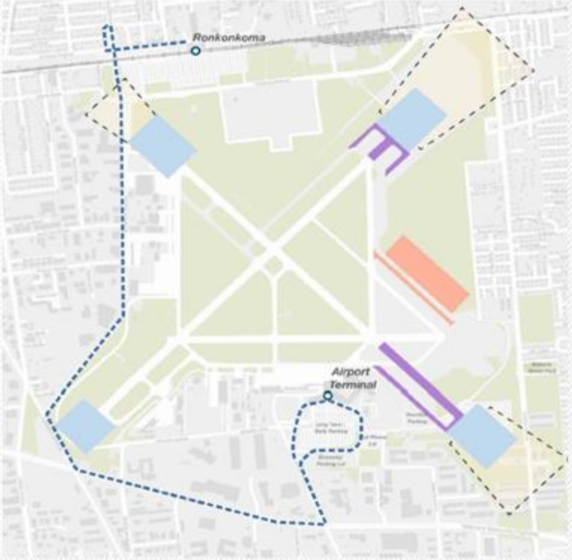
- Upgraded shuttle fleet continues to operate along public roadways- 40 foot battery electric transit buses
- Scheduled departures approximately every 20 minutes – meeting train and plane arrivals
- Regular service, improved vehicles, and real time information
- Station Locations:
  - New enclosed shelter with amenities proposed at LIRR station, with Airport Shuttle branding
  - At future transportation facility adjacent to the passenger terminal at LI MacArthur Airport
- Buses would be equipped with AVL to monitor schedule and provide real-time passenger information at the Airport and LIRR Passenger Information Displays

Planning Level Cost Estimates

- Capital Costs - $8.5 Million (3 buses + ancillary structures)
- Annual Operating Costs - $2.2 Million

Example: Proterra Catalyst Zero-Emission Bus

Route Alignment
- Around Airport, on Public Roads



Distance - 3.6 miles

LONG TERM – AV (AUTONOMOUS VEHICLE) SHUTTLE (20+ YRS)

Salient Features

- The vehicle would be an automated electric vehicle with capacity to carry 6 – 10 passengers
- Alignment through airport, on dedicated private roads, with underpasses to cross the two RPZs
- Through-airport road will have two lanes and shoulders, fences and security control on both entrance points
- Underpasses would be built with cut-and-cover, with temporary construction on the RPZs for the extended (future) runways. Construction of tunnels may take from 6 to 12 months
- Utilities need to be extended to power lighting poles and fire hydrants

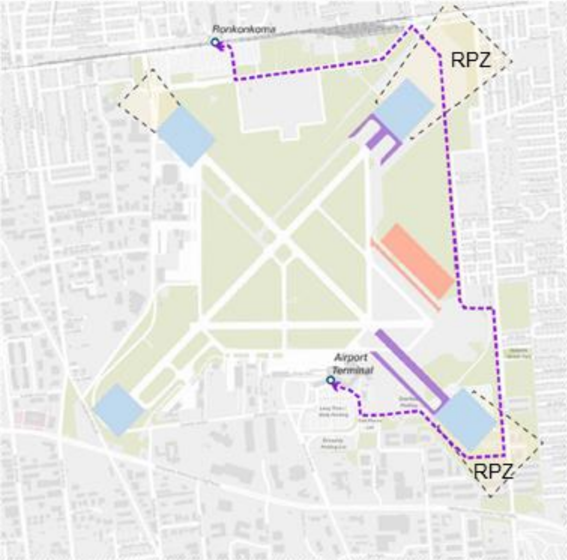
Planning Level Cost Estimates

- Capital Costs - $41 Million (for construction of roadways and tunnels)
- Annual Operating Costs – N.A.

Example: Navya Autonomous Shuttle

Example: Box Culvert Tunnel

Route Alignment - Through Airport, on dedicated right-of-way



Distance - 3.5 miles

LONG TERM – MOVING WALKWAY – NORTH TERMINAL (20+ YRS)

Salient Features

- Conditional to the development of a new passenger terminal on the north side of the existing runways
- Conveyor mechanism provides continuous service between the Ronkonkoma LIRR Station and potential North-Side Terminal
- No-step access, passengers can walk or ride at faster-than-walking speed within a climate-conditioned space
- Adjacent walking lane accommodates passenger-assist vehicles, provides redundancy
- Constructed at ground level, underground or elevated
- Travel times on the walkway would be in 3.5 – 6 minutes range, depending on design specifications.
- Walkway has two speed zones : slower speeds on the access and egress, and "cruise" speeds in the middle

Planning Level Cost Estimates

- Capital Costs - $15 Million (for moving walkway)
- Annual Operating Costs – $150,000

Example: ACCEL variable speed moving walkway

Route Alignment - Through Railroad Avenue & Airport

Distance < 0.25 miles

Appendix F.
Cost Estimate Classification and General Assumptions

The level of cost estimating performed for this study is classified as a Class 5 rough order of magnitude estimate according to Arup's estimate classification matrix (Level 5), which was developed from the Association for the Advancement of Cost Engineering (AACE) best practices.

The accuracy range of this estimate has been determined to be -25% and +50%. The accuracy range is a gauge of likely bid prices if the project was issued to tender at this current stage. These estimates are based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other works not covered in the drawings and programs as stated in this document. The unit rates reflected herein have been obtained from experience of projects of this nature.

General cost assumptions:

- The values are from the fourth quarter of the year 2017
- Material costs are calculated from data bases such as RS Means, similar project costs and vendors
- Labor rates, fringes and taxes are calculated based on the Bureau of Labor Statistics from the United States Department of Labor
- A New York location factor is applied to the labor and material costs, this factor is obtained from the portal RS Means
- The Operational Cost estimate is not a Life Cycle Cost, meaning that there might be other costs involved to operate the facilities
- ARUP has no control over the cost of labor and materials, general contractor's or any subcontractor's method of determining prices, or competitive bidding and market conditions. This opinion of probable cost of construction is made based on the experience, qualifications, and best judgment of the professional consultant familiar with the construction industry. ARUP cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from this or subsequent cost estimates.
- ARUP recommends that the Owner carefully review this document, including line item descriptions, unit prices, clarifications, exclusions, inclusions and assumptions, contingencies, escalation and markups. If the project is over budget, or if there are unresolved budgeting issues, alternate systems schemes should be evaluated before proceeding into the construction phase.

Some items that may affect the cost estimate:

- Modifications to the scope of work included in this estimate.
- Special phasing requirements.
- Restrictive technical specifications or excessive contract conditions.
- Any other non-competitive bid situations.
- Bids delayed beyond the projected schedule.
- Loss of labor productivity.
- Future market conditions.

The cost estimates reflect standard project conditions, and the best information available, and therefore exclude items that have substantial variation or that require design details available only at a future date. Additional cost estimate details can be found in Appendix D.

Appendix G.
Key Reference Documents

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Appendix H.
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