Port Authority of New York & New Jersey

Options for Mass Transit Solutions to LGA

This report was prepared by experienced technical consultants from Bechtel, WSP, Nelson\Nygaard, FourSquare, and Ramboll in consultation with Port Authority and MTA personnel with input and guidance from the Expert Panel.

3-13-2023

EXECUTIVE SUMMARY

Introduction and Background

This report (the "Report"), undertaken at the request of Governor Kathy Hochul, presents a review of potential alternative mass transit options to LaGuardia Airport (LGA). These options include expanded subway service, fixed guideways with light rail, improved and expanded bus service, ferry service, and new or emerging technologies.

The review encompasses input from specialized technical and planning advisors to the Port Authority. These advisors include an Expert Panel of independent transportation professionals with regional, national, and international expertise, as well as the Metropolitan Transportation Authority (MTA) and other key partner agencies.

The Report focuses on identifying and describing the options, and on exploring the key issues with each through assessment and analysis.

Study Process

The process undertaken for this effort comprised multiple steps. It began with gathering input from various sources and engaging with partners, stakeholders, and the public. It then involved updating the list of mass transit options and developing evaluation factors by which these options could be analyzed. The product of this current study is a detailed description of the individual options, and an assessment against the established evaluation factors.

Assembly of a Team of Independent Study Consultants

To develop the Report, the Port Authority commissioned a multi-disciplinary team of well-recognized independent experts, including:

- Bechtel – Study Lead and Report Preparation
- WSP – Engineering and Estimating
- Nelson\Nygaard Consulting Associates – Bus Planning Technical Lead
- Foursquare ITP – Emerging Technology and Equity
- Ramboll – International Emerging Technology

Review of Prior Studies

Improving transit access to LGA has been studied for many years as the Airport has grown and access to it has become ever more challenging. Some of the studies conducted over the past 30 years include the following:

a. Airport Access Program Draft Environmental Impact Statement, Federal Aviation Administration (FAA), 1994.

b. LaGuardia Airport Subway Access Study, Metropolitan Transportation Authority, 1998 to 2001.
c. Citywide Ferry Study, New York City Economic Development Corporation, 2013.
d. LaGuardia Airport Access Alternatives Analysis, New York City Department of Transportation in collaboration with New York City Transit and the Port Authority of New York and New Jersey, 2011 to 2014.
e. LGA Airport Access Improvement Project Purpose and Objectives and Analysis of Alternatives Report, Port Authority of New York and New Jersey, 2018.
f. NYC Ferry Expansion Feasibility Study, New York City Economic Development Corporation, 2018 to 2019.
g. LaGuardia Airport Access Improvement Project Final Environmental Impact Statement, FAA, 2021.

This study has reviewed the mass transit options analyzed in these reports, which have informed the current inquiry and the search for solutions that are practical and realistic.

Coordination with Partner Agencies and Operators

As the primary operator of bus, subway, and railroad services in New York City, the MTA has been a key member of the study team and has been consulted on all aspects of the Report, with specific focus on the subway and bus options.

Additional agencies and operators consulted during the course of the study include:

a. Amtrak
b. Consolidated Edison (ConEd)
c. Federal Aviation Administration (FAA)
d. New York City Department of Environmental Protection (NYC DEP)
e. New York City Department of Transportation (NYC DOT)
f. New York City Department of Parks and Recreation (NYC Parks)
g. New York City Economic Development Corporation (NYC EDC)
h. New York State Department of Transportation (NYS DOT)
i. NY Waterways

Engagement with the Expert Panel

In November 2021, the Port Authority announced the appointment of three independent transportation experts with regional, domestic, and international experience to consult on and help guide the evaluation process:

- Mike Brown (former Commissioner of Transport for London and former Managing Director of Heathrow Airport)
- Janette Sadik-Khan (Principal at Bloomberg Associates and former Commissioner of the NYC Department of Transportation)
- Phillip A. Washington (CEO of Denver International Airport and former CEO of Los Angeles Metro)

The study team has engaged with the Expert Panel in regular briefings of individual panel members and meetings of the entire panel. The topics covered have included all modes (subways, light rail with fixed

guideway, buses, ferries, and emerging technologies) as well as key issues of constructability, cost, schedule, community impacts, stakeholder input, equity, travel time, and ridership.

Engagement with Stakeholders and the Public

The Port Authority reached out to key stakeholders in March 2022[1] for input on the evaluation of potential mass transit options to LGA. A questionnaire describing the options and proposed evaluation factors was sent to more than 70 key stakeholders, including elected officials and community organizations. Stakeholders were engaged by means of a formal invitation to comment upon a summary description of each of the options.

Also in March 2022, the Port Authority hosted two in-person public workshops on the options being evaluated. Graphical representations of each of the options, as well as information on the Expert Panel and the evaluation factors to be used, were displayed. Independent outside consultants were made available to answer questions from attendees regarding the information contained on the display boards, and attendees were able to record comments for consideration in the evaluation process. Interpretation services in Bengali, Mandarin, and Spanish were available at the workshops.

In addition, an independent outside consultant conducted 10 focus group sessions, 7 in-person and 3 virtual, with members of the public. Of the 7 in-person sessions, 5 were held with community groups: 2 with Spanish-speaking participants, 1 with Chinese/Mandarin-speaking participants, and 2 general sessions.

In general, comments received on the subway and bus options were largely supportive, whereas comments received on the fixed guideway with light rail options were split between support and opposed. For the ferry service, comments received were supportive if implemented as a supplementary transit option or if the ferry service included additional stops. Of the few comments received about emerging technologies, most were opposed, expressing concern that emerging technologies would not be feasible. Many comments also suggested advancing multiple options or combining one or more of the options presented (see Table ES-1):

TABLE ES-1: PUBLIC COMMENTS SUMMARY

Mode	Positive Comments	Negative Comments
Subways	78	29
Light Rail with Fixed Guideway	65	55
Buses	115	38
Ferries	61 (12–15 as a supplemental option)	24
Emerging Technology	6	12

Study Options

[1] Port Authority seeks input from key stakeholders on 14 potential mass transit options to LaGuardia Airport.

This section introduces the mass transit options to LGA studied and summarizes their evaluation.

Options Overview

The options evaluated in this study fall into the following broad categories, or transit modes:

- **Subway Services**
  These options would be a branch or extension of the N and/or W Lines that currently terminate in Astoria.
- **Bus – New Dedicated Bus Rapid Transit (BRT) Routes**

  These options include new services running in dedicated bus lanes or other protected rights-of-way, transit signal priority, and other associated improvements.
- **Bus – Transit Improvements along Existing Routes**

  These options include enhanced services on existing routes, including transit improvements to reduce travel time, improve reliability, increase frequency, and enhance passenger comfort.
- **Fixed Guideways with Light Rail**

  These options consist of guideways, systems, and facilities that use steel-wheeled light rail or associated people-mover technologies, similar to the JFK AirTrain.
- **Ferry Services + Shuttle Bus**

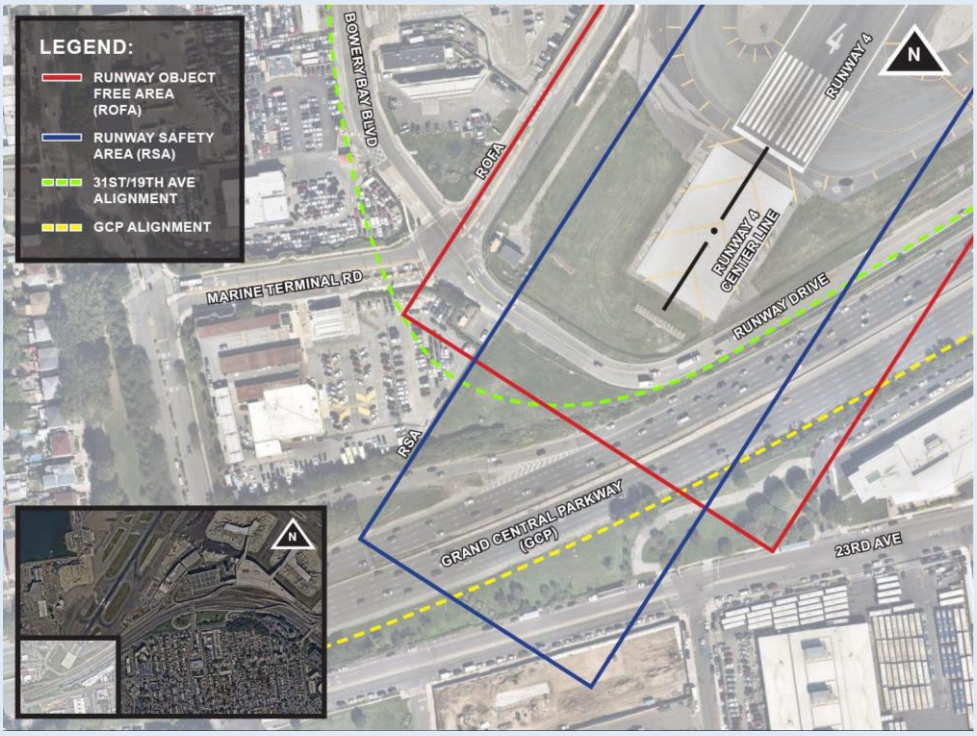
  These options would build on the City's current ferry system and provide access to the Airport from three waterfront locations in Manhattan. The ferry options would require shuttle bus connections from the ferry landings to the Airport passenger terminals.
- **Emerging Technologies**

  These options include various nascent technologies, including hyperloop, electric vehicles in narrow tunnels, and personal/group rapid transit pods.

Major Constructability Challenges for Options Approaching the Airport from the West and Southwest

The subway and other heavy infrastructure options that approach the Airport from the west and southwest face two main challenges.

First, FAA regulations prohibit any new permanent infrastructure at- or above-grade that intersects with the flight path and safety areas of airport runways. The FAA regulations in this area are collectively referred to as "Airport Design Standards" and are depicted, along with the impacted alignments, in the graphic below for LGA Airport Runway 04-22. Since this runway abuts Runway Drive and the Grand Central Parkway, any new at- or above-grade subway or other heavy infrastructure through this corridor would be prohibited based on current FAA Airport Design Standards.



Second, any new tunneled option (for a subway or other heavy infrastructure option) would conflict with major, underground utilities owned by the NYC Department of Environmental Protection, including two combined sewer and storm water structures that provide critical services to hundreds of thousands of Queens residents. These structures are 9–15 ft in diameter and were built over 90 years ago on wooden support piles.

As part of its preliminary engineering, the study team explored multiple approaches (e.g., going under or reconstructing the utilities); however, it was unable to identify a construction approach that it could conclude with confidence would practicably overcome these challenges (described further in Section 3.2.1.1.1 of the Report).

Nevertheless, given the intense public interest, the study team has carried out an evaluation of the heavy infrastructure options from the west and southwest for comparative purposes—even though, as presented, they do not successfully resolve the above challenges.

Description of Options and Summary of Findings

The study evaluated potential mass transit options to LGA within the five transit modes noted above. The description of each option is summarized below, together with a tabulated summary of the study team's findings against key evaluation factors. The data provided in the tables was produced using a common set of principles as a baseline for comparison between the options and sub-options.

Subway Services

The subway options offer the convenience of a single-seat ride from points in Midtown Manhattan directly to LGA, offering Airport passengers access to the established and frequent service of the MTA Subway network. This study focused on linking the existing N/W-Lines to LGA from their terminus in Astoria, the Subway lines closest to the Airport, primarily along an elevated track structure. As these options approach LGA from the west, they face the as yet unresolved challenge of complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, 15-ft-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report).

The subway options and sub-options evaluated (see Figure ES-1) are described below, followed by a comparison table (Table ES-2) of the options against selected key evaluation factors. A full summary of each option against all evaluation factors can be found in the relevant section of the Report.

FIGURE ES-1: SUBWAY OPTION ROUTES

S-1: W-Line Branch via Grand Central Parkway

Option S-1 would take advantage of the GCP transportation corridor between Astoria and LGA, creating a branch line south of the Astoria Blvd Station to divert W-Line trains directly to the Airport Terminals B and C. Locating the proposed subway within the GCP transportation corridor would minimize the direct impact of the subway on local communities. Two sub-options were assessed with either two on-Airport elevated stations (S-1A) or one off-Airport underground station (S-1B). The on-Airport sub-option offers Airport passengers the convenience of direct access to Airport Terminals B and C but with the complexity of constructing large subway stations within the confines of the Airport, including substantial infrastructure and buildings mandated by MTA requirements for terminus stations. The off-Airport sub-option (south of the GCP) would provide a new subway station closer to the East Elmhurst community but would also require construction of substantial infrastructure and buildings mandated by MTA requirements for terminus stations, and bring significant construction impacts closer to this community.

S-1A: W-Line GCP Branch with Two On-Airport Elevated Stations

This sub-option would require the construction of heavy infrastructure, including elevated and open-trench concrete guideway structures predominantly along the GCP transportation corridor. This sub-option would have to overcome the construction challenges of crossing the Hell Gate rail trestle (90–100 ft above the ground), complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), and traversing the constrained area north of St Michael's Cemetery. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an open trench south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

S-1B: W-Line GCP Branch with One Off-Airport Underground Station

This sub-option would require the construction of heavy infrastructure, including elevated and open-trench concrete guideway structures predominantly along the GCP transportation corridor. This sub-option would have to overcome the construction challenges of crossing the Hell Gate rail trestle (90–100 ft above the ground), complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), traversing the constrained area north of St Michael's Cemetery, and constructing one or more deep underground stations. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an open trench south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

S-2: N/W-Line Extension via 31st St/19th Ave

Option S-2 would provide a direct link to LGA Terminals B and C by extending the existing subway north from the terminus at Astoria-Ditmars Blvd Station, providing Airport access for all N and W trains.

This option would require the construction of heavy infrastructure, including elevated concrete guideway structures along predominantly city streets of residential and commercial properties, and elevated and below-grade structures on-Airport. This option would have to overcome the construction challenges of complying with FAA Airport Design Standards while negotiating the 90-year-old utilities running under the Airport at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report) and locating more substantial infrastructure and buildings mandated by MTA requirements for terminus stations. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of a cut-and-cover tunnel under Runway Dr despite this approach not being compliant with FAA Airport Design Standards.

TABLE ES-2 - SUMMARY OF KEY CHARACTERISTICS - SUBWAY OPTIONS S-1A, S-1B, AND S-2

Evaluation Factor	W-LINE GCP BRANCH WITH TWO ON-AIRPORT STATIONS (S-1A)	W-LINE GCP BRANCH WITH ONE OFF-AIRPORT STATION (S-1B)	N/W-LINE EXTENSION VIA 31ST/19TH AVE (S-2)
Constructability	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Tall (90+ ft) long-span (150–200 ft) structures spanning the Hell Gate rail trestle • Reconstruction of 82nd St Bridge • Total option route length: approx. 3 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Tall (90+ ft) long-span (150–200 ft) structures spanning the Hell Gate rail trestle • Reconstruction of 82nd St Bridge • Cut-and-cover tunnel under 102nd St and deep 600-ft station construction adjacent to major utilities • Total option route length: approx. 3 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Construction adjacent to residential city blocks along 31st St and 19th Ave • Total option route length: approx. 3 miles
Indicative Capital Cost (2022$)[2]	$5.9 billion[3] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$6.6 billion[3] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$5.4 billion[3] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)
Indicative Timeline/Schedule	12–13 Years	12–13 Years	12–13 Years
Travel Time[4]	31 mins (Times Square to Terminal B, then C; shuttle to Terminal A)	37 mins (Times Square to Terminal B, then C; shuttle to Terminal A)	32 mins (Times Square to Terminal B, then C; shuttle to Terminal A)
Transfer Experience	Single-seat ride on W-Line, no transfer necessary	Single-seat ride on W-Line, no transfer necessary	Single-seat ride on N- & W-Lines, no transfer necessary
Ridership[5]	Total annual projected ridership for option: 6.3 million Net increase in annual projected transit ridership: 3.7 million	Total annual projected ridership for option: 4.7 million Net increase in annual projected transit ridership: 2.4 million	Total annual projected ridership for option: 5.9 million Net increase in annual projected transit ridership: 3.4 million
Local Community Impacts	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 6.25 years <u>Proximity to communities:</u> • 35–50 ft from one city block of residential and commercial properties on 31st St • 50–135 ft from 12 city blocks of residential and commercial properties along the GCP • 35–50 ft from the north end of St Michael's Cemetery along Astoria Blvd South • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • Acquisition of up to 24 properties (private residential, private commercial, and industrial) • Structures over Columbus Sq Park, Planeview Park, Overlook Park, and to the north of St. Michael's Cemetery[6] • Loss of approx. 20 on-street public parking spaces along 31st St	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 6.75 years. <u>Proximity to communities:</u> • 35–50 ft from one city block of residential and commercial properties on 31st St • 50–125 ft from 12 city blocks of residential and commercial properties along the GCP • 35–50 ft from the north end of St Michael's Cemetery along Astoria Blvd South • 150–275 ft from 11 city blocks of residential and commercial properties along Ditmars Blvd to the south of the GCP <u>Permanent impacts:</u> • Acquisition of up to 28 properties (private residential, private commercial, and industrial) • Structures over Columbus Sq Park, Planeview Park, Overlook Park, and to the north of St. Michael's Cemetery[6] • Loss of approx. 20 on-street public parking spaces along 31st St	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 6 years <u>Proximity to communities:</u> • 30–50 ft from 4 city blocks of residential and commercial properties on 31st St • 25–40 ft from 15 city blocks of residential and commercial properties on 19th Ave, including along the boundary of land with community baseball fields • Over 500 ft across 8 lanes of the GCP from 7 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • Acquisition of up to 2 properties (industrial) • No impacts to NYC parklands or plazas • Loss of approx. 200 on-street public parking spaces on 31st St and 19th Ave

[2] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[3] Costs for heavy infrastructure options approaching LGA from the west/southwest are based on the open-trench construction concept past Runway 04-22 (over the existing 90-year-old utilities), to provide a baseline estimate of the cost of construction. Although this concept does not meet FAA Airport Design Standards, it provides a consistent approach for capital cost comparison purposes. Costs associated with tunnelling and/or relocating utilities would be substantially higher, potentially up to approx. $1–$3 billion.
[4] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[5] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.
[6] Municipal parkland cannot be converted to a non-park use (known as alienation) without State legislative permission. Thus, the acquisition of New York City Parkland for construction of a mass transit option would require legislation authorizing such alienation. Obtaining such legislation is a multi-step process requiring actions by the New York City Council, the Mayor of New York City, the New York State Legislature, and the Governor.

Bus – New Dedicated Bus Rapid Transit Routes

The Bus Rapid Transit (BRT) options would create new dedicated, non-stop bus shuttle services providing two-seat ride access to LGA from existing transit hubs within Queens. BRT options would use Transit Signal Prioritization, convert existing traffic lanes to BRT-only bus lanes, and/or build new separated busway structures to avoid traffic congestion and would introduce a new electric bus fleet. BRT options would offer travel time, reliability, and customer experience benefits over existing bus services. Heavy infrastructure bus options approaching LGA from the west and southwest face the as yet unresolved challenge of complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report).

The new BRT shuttle route options evaluated (see Figure ES-2) are described below, followed by comparison tables (Table ES-3 for heavy infrastructure BRT options and Table ES-4 for light infrastructure BRT options) of the options against selected key evaluation factors. A full summary of each option against all evaluation factors can be found in the relevant section of the Report.

FIGURE ES-2: BUS IMPROVEMENTS AND BUS RAPID TRANSIT OPTION ROUTES

BRT-1: BRT Shuttle to/from Astoria Blvd Station via Astoria Blvd/GCP

Option BRT-1 would create a new electric bus shuttle service to LGA Terminals B and C via a two-seat ride from the existing Astoria Blvd Subway station, providing transfer access to N- and W-Line Subway services. BRT bus stops would be located adjacent to the station on either side of Columbus Sq, and buses would use the Astoria Blvd/GCP transportation corridor to reach the Airport. All sub-

options would require the construction of a new bus depot on Airport property at Ingraham's Mountain.

The study team evaluated three sub-options of BRT-1:

- BRT-1A would use a combination of bus lanes on Astoria Blvd and a dedicated elevated busway onto the Airport to avoid possible congestion and traffic delays, improving travel time and reliability.
- BRT-1B would further improve these with a separated busway for the full route from Astoria Blvd Station to LGA.
- BRT-1C offers a more cost-efficient alternative to BRT-1A or BRT-1B, converting bus lanes on Astoria Blvd but avoiding heavy construction, realizing many of the travel time benefits while avoiding both the cost and community impacts of the heavy infrastructure required by the separated busway.

BRT-1A: Astoria Blvd Shuttle with Bus Lanes on Astoria Blvd and Busway Adjacent to the GCP

Sub-Option BRT-1A would offer bus travel time and reliability benefits through the conversion of travel lanes on Astoria Blvd North and South to bus-only lanes with traffic signals revised to prioritize the buses, and a new dedicated busway structure to new elevated bus stops on-Airport, allowing buses direct access to the Airport, bypassing other Airport traffic. This sub-option would offer improvements such as signage, wayfinding, and weather-protected bus stops to the passenger transfer connection at Astoria Blvd Subway station. However, MTA has advised that any new access improvements to platform level would be limited by the space available within the existing constrained station infrastructure.

This sub-option would require a mix of heavy infrastructure, including an at-grade busway structure along the GCP rising to elevated structure on-Airport along with light roadway work at other points (line painting, re-curbing, etc.) for the new bus lanes. The heavy infrastructure sections of this sub-option would have to overcome the construction challenges of complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report). For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an at-grade roadway south of Runway 04-22, despite this approach not being compliant with FAA Airport Design Standards.

BRT-1B: Astoria Blvd Shuttle with Full Busway on Astoria Blvd and Adjacent to the GCP

Sub-Option BRT-1B would offer bus travel time and reliability benefits through the construction of a new dedicated busway structure from the Subway station all the way to the Airport. This would consist of the conversion of one lane and construction of an additional lane along Astoria Blvd South (beneath the Hell Gate rail trestle) with traffic signals revised to prioritize the buses, and a new dedicated busway structure to new elevated bus stops on-Airport, allowing buses direct access to the Airport, bypassing other airport traffic. This sub-option would offer

improvements such as signage, wayfinding, and weather-protected bus stops to the passenger transfer connection at Astoria Blvd Subway station. However, MTA has advised that any new access improvements at the platform level would be limited by the space available within the existing constrained station infrastructure.

This sub-option would require the construction of heavy infrastructure, including at-grade and elevated concrete busway structures predominantly along the GCP transportation corridor. This sub-option would have to overcome the construction challenges of complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), extending Astoria Blvd South into the GCP embankment, and traversing the constrained area north of St Michael's Cemetery. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an at-grade roadway south of Runway 04-22, despite this approach not being compliant with FAA Airport Design Standards.

BRT-1C: Astoria Blvd Shuttle with Bus Lanes on Astoria Blvd Only

Sub-Option BRT-1C would offer bus travel time benefits through the adoption of cost-efficient light infrastructure construction through the conversion of travel lanes on Astoria Blvd North and South to bus-only lanes with traffic signals revised to prioritize the buses, and utilization of a new bus-only loop-road and at-grade bus stop at Terminal C, bypassing traffic at the current Terminal C stop. This sub-option would continue on limited-access roadways to the Terminal B at-grade bus stop and then continue to the existing Terminal A bus stop location using the existing on-Airport roadway network. This sub-option would offer improvements to the passenger transfer connection at Astoria Blvd Subway station such as signage, wayfinding, and weather-protected bus stops. However, MTA has advised that any new access improvements to platform level would be limited by the space available within the existing constrained station infrastructure.

This sub-option would require light roadway work (line painting, re-curbing, etc.) for the new bus lanes and new roadway construction on-Airport around Terminal C.

BRT-2: BRT Shuttle to/from Astoria-Ditmars Blvd Station via 31st St/19th Ave

Option BRT-2 would create a new electric bus shuttle service direct to LGA from the existing Astoria-Ditmars Blvd Subway station, providing two-seat ride transfer access to N- and W-Line Subway services to Manhattan at their terminus in Astoria.

BRT-2 would offer peak-hour bus travel time benefits through the conversion of existing travel/parking lanes on 31st St and 19th Ave to peak-hour bus-only lanes and with traffic signals revised to prioritize the buses. In addition, a new, bus-only roadway through ConEd property would create a direct link between 31st St and 19th Ave. Utilization of a new bus-only loop-road and at-grade bus stop at Terminal C would allow buses to bypass traffic at the current Terminal C stop. BRT-2 would construct new vertical circulation from the end of the subway platforms direct to street level and the BRT bus stops on 31st St, providing an LGA-branded customer transfer experience

directly to the N/W-Line subway terminus. Accessing LGA from 19th Ave would allow BRT-2 to serve Airport Terminal A on its way to Terminals B/C.

This option would require light roadway work (line painting, re-curbing, etc.) for the new bus lanes, new roadway construction to link 31st St and 19th Ave around the ConEd property, new roadway construction on-Airport around Terminal C, and the construction of a new bus depot on Airport property at Ingraham's Mountain.

BRT-3: BRT Shuttle to/from Northern Blvd Station via Northern Blvd/94th St

Option BRT-3 would create a new electric bus shuttle service direct to LGA Terminals B and C from the existing Northern Blvd Subway station, providing two-seat ride transfer access to M- and R-Line Subway services (E-Line services are overnight only). BRT bus stops would be provided near the station entrances on Northern Blvd. BRT-3 would provide bus travel time benefits through the conversion of existing travel lanes on Northern Blvd and 94th St to bus-only lanes with traffic signals revised to prioritize the buses, to avoid possible congestion and traffic delays along these roads. Utilization of a new bus-only loop-road and at-grade bus stop at Terminal C would allow buses to bypass traffic at the current Terminal C stop.

This option would require light roadway work (line painting, re-curbing, etc.) for the new bus lanes, new roadway construction on-Airport around Terminal C, and construction of the bus depot on Airport property at Ingraham's Mountain.

TABLE ES-3 – SUMMARY OF KEY CHARACTERISTICS –NEW HEAVY INFRASTRUCTURE BRT OPTIONS BRT-1A AND BRT-1B

Evaluation Factor	ASTORIA BLVD SHUTTLE WITH BUS LANES ON ASTORIA BLVD AND HEAVY INFRASTRUCTURE BUSWAY ADJACENT TO THE GCP (BRT-1A)	ASTORIA BLVD SHUTTLE WITH FULL HEAVY INFRASTRUCTURE BUSWAY ON ASTORIA BLVD AND ADJACENT TO THE GCP (BRT-1B)
Constructability	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Reconstruction of 82nd St Bridge • Total option route length: approx. 3 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Construction of lane extension in GCP embankment and under Hell Gate rail trestle • Reconstruction of 82nd St Bridge • Total option route length: approx. 3 miles
Indicative Capital Cost (2022$)[7]	$1.3 billion[8] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$1.9 billion[8] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)
Indicative Timeline/Schedule	9–10 Years	9–10 Years
Travel Time[9]	Via N/W-Lines: 38–39 mins (6–7 mins on bus) (Times Square to Terminal B then C; shuttle to Terminal A)	Via N/W-Lines: 37–38 mins (5–6 mins on bus) (Times Square to Terminal B then C; shuttle to Terminal A)
Transfer Experience	• Transfer to the bus stop at Astoria Blvd Subway station would involve two vertical moves via existing stairs or existing elevator from platform to grade, and a short walk, in open air, to the covered bus stop • Circulation space at the mezzanine level of Astoria Blvd Station is constrained • Serves Terminals B and C only; shuttle to Terminal A	• Transfer to the bus stop at Astoria Blvd Subway station would involve two vertical moves via existing stairs or existing elevator from platform to grade, and a short walk, in open air, to the covered bus stop • Circulation space at the mezzanine level of Astoria Blvd Station is constrained • Serves Terminals B and C only; shuttle to Terminal A
Ridership[10]	Total annual projected ridership for option: 3.7 million Net increase in annual projected transit ridership: 2.1 million	Total annual projected ridership for option: 3.8 million Net increase in annual projected transit ridership: 2.2 million
Local Community Impacts	<u>Construction:</u> • Mix of heavy civil construction and light roadway work for approx. 4.25 years <u>Proximity to communities:</u> • Heavy civil construction over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals • Bus Depot construction 200–300 ft from 4 city blocks of commercial properties near Ingraham's Mountain • Light roadway modification 35–50 ft from 26 city blocks of residential and commercial properties along Astoria Blvd North and South <u>Permanent impacts:</u> • No permanent private property acquisition • Structures over or adjacent to Planeview Park and Overlook Park[11] • Loss of approx. 110 on-street public parking spaces near Astoria Blvd bus stop and along Astoria Blvd North <u>Operations:</u> • Operated with a quiet, zero-emissions all-electric bus fleet • Bus depot on airport property, 200–300 ft from commercial areas	<u>Construction:</u> • Heavy civil construction of elevated and at-grade structures for approx. 4.25 years <u>Proximity to communities:</u> • 35–50 ft from 14 city blocks of residential and commercial properties along Astoria Blvd South • 35–50 ft from the north end of St Michael's Cemetery along Astoria Blvd South • 200–300 ft from 4 city blocks of commercial properties near Ingraham's Mountain • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • No permanent private property acquisition • Construction and permanent structures over or adjacent to Planeview Park and Overlook Park[11] • Permanent loss of approx. 40 on-street public parking spaces near Astoria Blvd bus stop and along Ditmars Blvd <u>Operations:</u> • Operated with a quiet, zero-emissions all-electric bus fleet • Bus depot on airport property, 200–300 ft from commercial areas

[7] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[8] Costs for heavy infrastructure options approaching LGA from the west/southwest are based on the open-trench construction concept past Runway 04-22 (over the existing 90-year-old utilities), to provide a baseline estimate of the cost of construction. Although this concept does not meet FAA Airport Design Standards, it provides a consistent approach for capital cost comparison purposes. Costs associated with tunnelling and/or relocating utilities would be substantially higher, potentially up to approx. $1–$3 billion.
[9] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[10] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.
[11] Municipal parkland cannot be converted to a non-park use (known as alienation) without State legislative permission. Thus, the acquisition of New York City Parkland for construction of a mass transit option would require legislation authorizing such alienation. Obtaining such legislation is a multi-step process requiring actions by the New York City Council, the Mayor of New York City, the New York State Legislature, and the Governor.

TABLE ES-4 – SUMMARY OF KEY CHARACTERISTICS – NEW LIGHT INFRASTRUCTURE BRT OPTIONS BRT-1C, BRT-2, AND BRT-3

Evaluation Factor	ASTORIA BLVD SHUTTLE WITH BUS LANES ON ASTORIA BLVD (BRT-1C)	BRT SHUTTLE TO/FROM ASTORIA-DITMARS BLVD STATION VIA 31ST ST/19TH AVE (BRT-2)	BRT SHUTTLE TO/FROM NORTHERN BLVD STATION VIA NORTHERN BLVD/94TH ST (BRT-3)
Constructability	• Construction of bus turnaround /layover adjacent to existing Astoria Blvd Station and Columbus Sq Park • Total option route length: approx. 3 miles	• Construction of ADA-compliant passenger access at Astoria-Ditmars Blvd Station • Construction of a bus-only road from 31st St to 19th Ave via ConEd property • Total option route length: approx. 3 miles	• Construction of new bus stops and turnarounds at Northern Blvd and 55th St • Total option route length: approx. 3.5 miles
Indicative Capital Cost (2022$)[12]	$220 million[13]	$340 million[13]	$200 million[13]
Indicative Timeline/Schedule	4–5 Years	4–5 Years	4–5 Years
Travel Time[14]	Via N/W-Lines: 41–46 mins (9–14 mins on bus) (Times Square to Terminal C; serves Terminal C, B, then A)	Via N/W-Lines: 41–44 mins (7–10 mins on bus) (Times Square to Terminal A) Via N/W-Lines: 49–52 mins (15–18 mins on bus) (Times Square to Terminal B then C)	Via M-Line: 49–52 mins (14–17 mins on bus) (Herald Square to Terminal C then B; shuttle to Terminal A)
Transfer Experience	• Transfer to the bus stop at Astoria Blvd Subway station would involve two vertical moves via existing stairs or existing elevator from platform to grade, and a short walk, in open air, to the covered bus stop • Circulation space at the mezzanine level of Astoria Blvd Station is constrained • Serves Terminals A, B and C	• End of line Subway stop: boarding/alighting easier for passengers (usually a train waiting) • Transfer to the bus stop would involve one vertical move to grade from platform level and a short, covered walk to the covered bus stop • Serves Terminals A, B, and C	• Transfer to the bus stop from the Subway station would involve a vertical move via existing stairs to grade • The walk to the covered bus stop would be approx. 500 ft and involve crossing of streets • Serves Terminals B and C only
Ridership[15]	Total annual projected ridership for option: 3.4 million Net increase in annual projected transit ridership: 1.9 million	Total annual projected ridership for option: 3.0 million Net increase in annual projected transit ridership: 1.6 million	Total annual projected ridership for option: 2.0 million Net increase in annual projected transit ridership: 1.1 million
Local Community Impacts	<u>Construction:</u> • Light roadway (e.g., restriping, curb replacements, bypass lanes) for approx. 2 years <u>Proximity to communities:</u> • 35–50 ft from 26 city blocks of residential and commercial properties along Astoria Blvd North and South • 200–300 ft from 4 city blocks of commercial properties near Ingraham's Mountain <u>Permanent impacts:</u> • No permanent private property acquisitions • No impacts to NYC parklands or plazas • Permanent loss of approx. 110 on-street public parking spaces near Astoria Blvd bus stop and along Astoria Blvd North <u>Operations:</u> • Operated with a quiet, zero-emissions all-electric bus fleet • Bus depot on airport property, 200–300 ft from commercial areas	<u>Construction:</u> • Light roadway (e.g., restriping, curb replacements, bypass lanes) for approx. 1.5 years <u>Proximity to communities:</u> • 35–50 ft from 15 city blocks of residential and commercial properties along 31st St and 19th Ave • 200–300 ft from 4 city blocks of commercial properties near Ingraham's Mountain <u>Permanent impacts:</u> • Permanent acquisition up to 6 properties (private commercial and industrial) – Access agreements may be possible rather than acquisition • No impacts to NYC parklands or plazas • Permanent loss of approx. 200 public on-street parking spaces along 31st St and 19th Ave (potentially only during peak-hours) • Increased bus traffic on 31st St and 19th Ave (albeit electric vehicles) <u>Operations:</u> • Operated with a quiet, zero-emissions all-electric bus fleet • Bus depot on airport property, 200–300 ft from commercial areas	<u>Construction:</u> • Light roadway (e.g., restriping, curb replacements, bypass lanes) for approx. 1.5 years <u>Proximity to communities:</u> • 35–50 ft from 40 city blocks of residential and commercial properties along Northern Blvd & 94th St • 200–300 ft from 4 city blocks of commercial properties near Ingraham's Mountain <u>Permanent impacts:</u> • Acquisition up to 3 properties (private commercial) • Operations 200–250 ft from 78th St Plaza • No impacts to NYC parklands or plazas • Loss of approx. 280 on-street public parking spaces along Northern Blvd and 94th St <u>Operations:</u> • Operated with a quiet, zero-emissions all-electric bus fleet • Bus depot on airport property, 200–300 ft from commercial areas

[12] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[13] Cost would exclude circulation improvements around Terminal C if the Q-70 Light Improvement Option proceeds, as then such improvements would be implemented regardless of whether this option was selected to proceed.
[14] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[15] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.

Bus – Transit Improvements along Existing Routes

The evaluated bus improvement options would provide improved two-seat ride access to LGA from Manhattan by offering improvements to the current LaGuardia Link Q70 Select Bus Service (Q70-SBS) and/or M60 Select Bus Service (M60-SBS) MTA-operated bus services. The improvements would be intended to reduce current travel times, improve the reliability of bus service, increase service frequency, and increase passenger convenience compared to current operations.

The evaluation considered several potential options for improvements to existing bus services (see Figure ES-3), followed by a comparison table (Table ES-5) of the options against selected key evaluation factors. A full summary of each option against all evaluation factors can be found in the relevant section of the Report.

FIGURE ES-3: BUS IMPROVEMENTS AND BUS RAPID TRANSIT OPTION ROUTES

B-1: LaGuardia Link Q70-SBS Route Improvements

Option B-1 would offer improvements to the existing Q70-SBS bus route operated by the MTA. The Q70-SBS currently provides a two-seat ride link to LGA Terminals B and C, via the BQE and GCP transportation corridors, from the existing Jackson Hts-Roosevelt Av/74 St-Broadway stations (at Jackson Heights), and the existing LIRR Woodside and NYCT 61 St-Woodside stations (at Woodside). These provide transfer access to the E, F, M, R, and 7-Line Subway services at Jackson Heights and the LIRR Main Line (including the Port Washington Branch) and 7-Line Subway services at Woodside, as well as connections to other MTA bus services. Jackson Heights is also the locale for a proposed terminal station for the planned MTA-led Interborough Express (IBX) project.

Three levels of intervention were evaluated for the Q-70 SBS service:

- B-1A, with spot improvements to the Q70-SBS;
- B-1B, with new, heavy construction bus-only infrastructure to avoid peak-hour congestion on the GCP; and
- B-1C, a middle, more cost-efficient option (than B-1B) to improve bus services but with less community impact.

B-1A: Q70-SBS Route with Spot Improvements

Sub-Option B-1A would offer improvements to the existing Q-70 SBS service to improve customer experience and bus travel times. These would include improved wayfinding and signage at existing stops and the introduction of a new "queue jump" at the BQE off-ramp to Broadway and traffic signals revised to prioritize the buses. The service would continue to be operated by the MTA using the current bus fleet and timetable, which MTA can adjust to suit increased demand levels.

This sub-option would require light roadway work (line painting, re-curbing, etc.) for the bus queue jump and stop improvements.

B-1B: Q70-SBS Route with Heavier Infrastructure Improvements

Sub-Option B-1B would offer bus travel time improvements over the existing Q70-SBS service through the introduction of new bus-only heavy infrastructure. In addition to the queue jump and transit signal improvements of B-1A, Sub-Option B-1B would convert the northbound BQE shoulder to a bus-only lane and construct a new dedicated busway structure from the BQE to new elevated bus stops on-Airport, allowing buses to completely bypass traffic on the GCP.

This sub-option would require a mix of light roadway work (line painting, re-curbing, etc.) and heavy infrastructure, including an at-grade busway structure along the GCP rising to elevated structures on-Airport. This sub-option would have to overcome the construction challenges of complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report) and would require coordination with NY State/FHWA to gain approval to convert the BQE shoulder to a bus-only lane (which has been done on other projects involving expedited bus services). For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of a new at-grade roadway south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

B-1C: Q70-SBS Route with Lighter Infrastructure Improvements

Sub-Option B-1C would offer bus travel time improvements over the existing Q70-SBS service through the introduction of new bus-only light infrastructure. In addition to the queue jump and transit signal improvements of B-1A, Sub-Option B-1C would convert the northbound BQE shoulder to a bus-only lane and construct a new bus-only loop-road and at-grade bus stop at Terminal C, bypassing traffic at the current Terminal C stop. The service would continue to be

operated by the MTA using the current bus fleet and timetable, which MTA can adjust to suit future demand levels.

This sub-option would require light roadway work (line painting, re-curbing, etc.) and new roadway construction on-Airport around Terminal C. It would avoid the constructability challenge posed by heavy construction at the end of Runway 04-22. This sub-option would require coordination with NY State/FHWA to gain approval to convert the BQE shoulder to a bus-only lane (which has been done on other projects involving expedited bus services).

B-2: M60-SBS Route with Spot Improvements

Option B-2 would offer improvements to the existing M60-SBS bus route operated by MTA, which originates from Manhattan (providing access to Metro North services to locations in New York and Connecticut), and links LGA with the existing Astoria Blvd Subway station in Queens, providing two-seat ride access to the N and W Subway services. The current M60-SBS uses the GCP/Astoria Blvd transportation corridor to access all three LGA terminals. As the M60-SBS has already benefited from transit signal improvements, the proposed improvements would be limited to improved wayfinding and signage at existing stops. The service would continue to be operated by the MTA using the current bus fleet and timetable, which MTA can adjust to suit future demand levels.

This option would require light roadway work (line painting, re-curbing, etc.) for the stop improvements.

TABLE ES-5 – SUMMARY OF KEY CHARACTERISTICS – EXISITING BUS SERVICE IMPROVEMENT OPTIONS B-1A, B-1B, B-1C, AND B-2

Evaluation Factor	Q70-SBS ROUTE WITH SPOT IMPROVEMENTS (B-1A)	Q70-SBS ROUTE WITH HEAVIER INFRASTRUCTURE IMPROVEMENTS (B-1B)	Q70-SBS ROUTE WITH LIGHTER INFRASTRUCTURE IMPROVEMENTS (B-1C)	M60-SBS ROUTE WITH SPOT IMPROVEMENTS (B-2)
Constructability	• Total option route length: approx. 4 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Repurpose a 1-mile section of the eastbound BQE connector right shoulder to bus-only lane subject to federal, state, and local approval • Reconstruction of 82nd St Bridge • Total option route length: approx. 4 miles	• Repurpose a 1-mile section of the eastbound BQE connector right shoulder to bus-only lane subject to federal, state, and local approval • Total option route length: approx. 4 miles	• Total option route length: approx. 4.2 miles (considering only the Queens to LGA portion)
Indicative Capital Cost (2022$)[16]	$20 million	$1,200 million[17] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$100 million[18]	$5 million
Indicative Timeline/Schedule	1-2 Years	9–10 Years	2–3 Years	1–2 Years
Travel Time[19]	LIRR via Woodside: 42–51 mins (18–27 mins on bus, up to 5% quicker than current Q70-SBS[20]) (Penn Station to Terminal C then B; shuttle to Terminal A) Subway E-Line via Jackson Heights: 45–53 mins (14–22 mins on bus, up to 7% quicker than current Q70-SBS[20]) (Penn Station to Terminal C then B; shuttle to Terminal A)	LIRR via Woodside: 35–38 mins (11–14 mins on bus, up to 42% quicker than current Q70-SBS[20]) (Penn Station to Terminal B then C; shuttle to Terminal A) Subway E-Line via Jackson Heights: 39–40 mins (8–9 mins on bus, up to 47% quicker than current Q70-SBS[20]) (Penn Station to Terminal B then C; shuttle to Terminal A)	LIRR via Woodside: 39–44 mins (15–20 mins on bus, up to 21% quicker than current Q70-SBS[20]) (Penn Station to Terminal C then B; shuttle to Terminal A) Subway E-Line via Jackson Heights: 42–47 mins (11–16 mins on bus, up to 27% quicker than current Q70-SBS[20]) (Penn Station to Terminal C then B; shuttle to Terminal A)	Via N/W-Lines: 48–57 mins (16–25 mins on bus, up to 6% quicker than current M60-SBS[20]) (Times Square to Terminal C; serves Terminals C, B, then A)
Transfer Experience	• Transfer from Woodside LIRR station to the bus stop would involve two vertical moves via existing stairs and elevators • Transfer from Jackson Heights E, F, M, and R-Lines to the bus stop would involve vertical moves to the subway mezzanine via existing stairs and elevators (3 elevator rides to reach grade) • Transfer from Jackson Heights 7-Line to bus stop would involve vertical moves via existing stairs/elevators from platform to grade • All involve a short walk, in open air, to the covered bus stop • Jackson Heights is a complicated station with 5 Subway lines; improved wayfinding would be provided as part of the option	• Transfer from Woodside LIRR station to the bus stop would involve two vertical moves via existing stairs and elevators • Transfer from Jackson Heights E, F, M, and R-Lines to the bus stop would involve vertical moves to the subway mezzanine via existing stairs and elevators (3 elevator rides to reach grade) • Transfer from Jackson Heights 7-Line to bus stop would involve vertical moves via existing stairs/elevators from platform to grade • All involve a short walk, in open air, to the covered bus stop • Jackson Heights is a complicated station with 5 Subway lines; improved wayfinding would be provided as part of the option	• Transfer from Woodside LIRR station to the bus stop would involve two vertical moves via existing stairs and elevators • Transfer from Jackson Heights E, F, M, and R-Lines to the bus stop would involve vertical moves to the subway mezzanine via existing stairs and elevators (3 elevator rides to reach grade) • Transfer from Jackson Heights 7-Line to bus stop would involve vertical moves via existing stairs/elevators from platform to grade • All involve a short walk, in open air, to the covered bus stop • Jackson Heights is a complicated station with 5 Subway lines; improved wayfinding would be provided as part of the option	• Transfer to the bus stop at Astoria Blvd Subway station would involve two vertical moves via existing stairs or existing elevator from platform to grade, and a short walk, in open air, to the covered bus stop • Circulation space at the mezzanine level of Astoria Blvd Station is constrained
Ridership[21]	Based on 2019 Q70-SBS Ridership, total projected ridership: 2.6 M Net increase in annual projected Q70-SBS ridership: 0.7 million	Based on 2019 Q70-SBS Ridership, total projected ridership: 3.8 M Net increase in annual projected Q70-SBS ridership: 1.9 million	Based on 2019 Q70-SBS Ridership, total projected ridership: 3.5 M Net increase in annual projected Q70-SBS ridership: 1.6 million	Net increase in annual projected M60-SBS ridership: 0.4 million
Local Community Impacts	<u>Construction:</u> • Light roadway work (e.g., restriping, curb replacements, bypass lanes) for approx. 0.5 year <u>Proximity to communities:</u> • No change from existing Q70-SBS service <u>Permanent impacts:</u> • No permanent private property acquisitions • No impacts to NYC parklands or plazas • Minimal, if any permanent loss of on-street public parking spaces	<u>Construction:</u> • Mix of heavy civil construction/light roadway work for approx. 4.25 years <u>Proximity to communities:</u> • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • No permanent private property acquisition • Structures over or adjacent to Planeview Park and Overlook Park[22] • Loss of approx. 30 public on-street parking spaces on 56th St, Broadway, and Boody St	<u>Construction:</u> • Light roadway (e.g., restriping, curb replacements, bypass lanes) for approx. 1 year <u>Proximity to communities:</u> • No change from existing Q70-SBS service <u>Permanent impacts:</u> • No permanent private property acquisitions • No impacts to NYC parklands or plazas • Permanent loss of approx. 20 on-street public parking spaces along Broadway and Boody St	<u>Construction:</u> • Light roadway (e.g., restriping, curb replacements, bypass lanes) for approx. 0.5 year <u>Proximity to communities:</u> • No change from existing M60-SBS service <u>Permanent impacts:</u> • No permanent private property acquisitions • No impacts to NYC parklands or plazas • Minimal, if any permanent loss of on-street public parking spaces

[16] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[17] Costs for heavy infrastructure options approaching LGA from the west/southwest are based on the open-trench construction concept past Runway 04-22 (over the existing 90-year-old utilities), to provide a baseline estimate of the cost of construction. Although this concept does not meet FAA Airport Design Standards, it provides a consistent approach for capital cost comparison purposes. Costs associated with tunnelling and/or relocating utilities would be substantially higher, potentially up to approx. $1–$3 billion.
[18] Cost includes potential early enabling work, including road circulation improvements around Terminal C by relocating bus drop-off and pick-up closer to the Terminal C garage.
[19] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[20] Based on MTA data for actual bus run times.
[21] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.
[22] Municipal parkland cannot be converted to a non-park use (known as alienation) without State legislative permission. Thus, the acquisition of New York City Parkland for construction of a mass transit option would require legislation authorizing such alienation. Obtaining such legislation is a multi-step process requiring actions by the New York City Council, the Mayor of New York City, the New York State Legislature, and the Governor.

Fixed Guideway with Light Rail

The evaluated light rail options would provide a two-seat ride to the Airport from Manhattan with a dedicated, LGA-branded transit link to LGA from existing transit hubs within Queens. Predominantly using elevated fixed guideways, light rail options could offer a relatively simpler, but still substantial, infrastructure construction solution than the equivalent MTA Subway structure. Light rail services would be operated as dedicated Airport connections, offering the opportunity to extend the Airport customer experience to the light rail transfer points, but all would require Airport passengers to transfer from the Subway or LIRR to a separate light rail segment to access the Airport. Light rail options approaching LGA from the west and southwest face the as yet unresolved challenge of complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report).

The light rail options evaluated (see Figure ES-4) are described below, followed by comparison tables (Table ES-6 for light rail options from the west and Table ES-7 for light rail options from the east) of the options against selected key evaluation factors. A full summary of each option against all evaluation factors can be found in the relevant section of the Report.

FIGURE ES-4: LIGHT RAIL OPTION ROUTES

LR-1: Light Rail to/from Woodside

Option LR-1 would provide a two-seat ride to LGA via a 4-minute light rail ride to/from the existing LIRR Woodside and 61 St-Woodside Subway stations, providing transfer access to both LIRR Main Line (including the Port Washington Branch) and 7-Line Subway services. A new dedicated light rail station would be located adjacent to both existing stations, providing ADA-compliant passenger access between them. The guideway would run above city streets to the BQE and GCP transportation corridors, on to LGA, avoiding city traffic.

This option would require the construction of heavy infrastructure, including elevated concrete guideway structures along predominantly city streets (for approximately 1.5 miles), open-trench concrete structures within the GCP transportation corridor (for approximately 1 mile), and elevated structures on-Airport (for approximately 0.5 mile). This option would have to overcome the construction challenges of constructing within the Amtrak and LIRR rail embankments between Woodside Station and 31st Ave, complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), and constructing a cut-and-cover tunnel at the BQE/GCP intersection. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an open trench south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

LR-2: Light Rail to/from Mets-Willets Point

Option LR-2 would provide a two-seat ride to LGA via a 4-minute light rail ride to/from the existing LIRR (Port Washington Branch) station, and the existing 7-Line Subway station located in Willets Point. A new dedicated light rail station would be located adjacent to both existing stations, providing ADA-compliant passenger access between them.

The guideway would run along the existing GCP transportation corridor to LGA from the east, avoiding the construction complexities and community impacts associated with options approaching the Airport terminals from the west.

This option would require the construction of heavy infrastructure, including elevated concrete guideway structures completely within the GCP transportation corridor and within the CitiField parking lots. This option would have to overcome the construction challenges of crossing over the 7-Line at Roosevelt Ave and constructing along the southern edge of Malcom X Promenade and within the GCP ROW. This option is the shortest evaluated at 2 miles in length.

This option was the subject of the 2021 Final Environmental Impact Statement (FEIS) for the LGA Access Improvement Project (LAIP) (Mets-Willets AirTrain, currently on pause).

LR-3: Light Rail to/from Jamaica

Option LR-3 would provide a two-seat ride to LGA via a 9-minute light rail ride to/from the existing Jamaica Transit Hub, providing direct access to the LIRR (Main Line, Atlantic Branch, and Montauk Branch), and connections to the E, J, and Z Subway services. By connecting with AirTrain JFK at Jamaica, this option would also provide the potential of an integrated AirTrain service to both airports via direct cross-platform transfer between the services and the shared use of the existing Airport-branded station. The guideway would run along the existing Van Wyck Expressway (VWE) and GCP transportation corridors, to LGA from the east, avoiding the construction and operational complexities of interacting with the end of Runway 04-22, west of the Airport terminals.

This option would require the construction of heavy infrastructure, including elevated concrete guideway structures predominantly within the VWE and GCP transportation corridors. This option would have to overcome the construction challenges of constructing in the VWE and GCP ROW for approximately 6 miles, including crossing over the triple-stacked Roosevelt Ave/7-Line bridges over the GCP, crossing the recently reconstructed Kew Gardens Interchange, and crossing over the LIRR rail tracks into Jamaica Station. This option is by far the longest subway or light rail option evaluated at 7 miles, 3 miles longer than the next longest.

LR-4: Light Rail to/from Astoria

Option LR-4 would provide a two-seat ride to LGA via a 4-minute light rail ride to/from the existing Astoria Blvd Subway station, providing transfer access to N and W Subway services. A new dedicated light rail station would be located adjacent to the station above Columbus Sq, providing ADA-compliant passenger access between the two. The guideway would run above the GCP transportation corridor, minimizing the direct impact of the light rail on local communities.

This option would require the construction of heavy infrastructure, including elevated and open-trench concrete guideway structures predominantly along the GCP transportation corridor. This option would have to overcome the construction challenges of crossing the Hell Gate rail trestle (90–100 ft above the ground), complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), and traversing the constrained area north of St Michael's Cemetery. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an open trench south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

LR-5: Light Rail to/from Jackson Heights

Option LR-5 would provide a two-seat ride to LGA via a 5-minute light rail ride to/from the existing Jackson Hts-Roosevelt Av/74 St-Broadway stations, providing multiple transfer access to the E, F, M, R, and 7-Line services and the busy community hub around the station. A new dedicated light rail station would be located above Broadway adjacent to the 7-Line station, providing ADA-compliant passenger access. LR-5 could also link to the proposed IBX project's Jackson Heights terminus. The

guideway would run above city streets to the BQE and GCP transportation corridors, on to LGA, avoiding city traffic.

This option would require the construction of heavy infrastructure, including elevated concrete guideway structures along predominantly city streets (for approximately 1.3 miles), open-trench concrete structures within the GCP transportation corridor (for approximately 1 mile), and elevated structures on-Airport (for approximately 0.5 mile). This option would have to overcome the construction challenges of complying with FAA Airport Design Standards while negotiating the 90-year-old utilities under the GCP at the end of Runway 04-22 (a challenge as yet unresolved as discussed in Section 3.2.1.1.1 of the Report), constructing a cut-and-cover tunnel at the BQE/GCP intersection, and constructing the transfer station and guideway above city streets. For the purpose of cost comparison, the Indicative Capital Cost for this option was developed on the basis of a baseline solution of an open trench south of Runway 04-22 despite this approach not being compliant with FAA Airport Design Standards.

TABLE ES-6 – SUMMARY OF KEY CHARACTERISTICS – LIGHT RAIL OPTIONS FROM THE WEST LR-1, LR-4, AND LR-5

Evaluation Factor	LIGHT RAIL TO/FROM WOODSIDE (LR-1)	LIGHT RAIL TO/FROM ASTORIA (LR-4)	LIGHT RAIL TO/FROM JACKSON HEIGHTS (LR-5)
Constructability	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Construction of elevated light rail station in dense neighborhood adjacent to existing LIRR and subway stations • Reconstruction of 82nd St Bridge • Total option route length: approx. 3.4 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Tall (90+ ft) long-span (150–200 ft) structures spanning the Hell Gate rail trestle • Reconstruction of 82nd St Bridge • Total option route length: approx. 3 miles	• **Major unresolved constructability challenge**: Complying with FAA Airport Design Standards while also avoiding disruption to 90-year-old, large-diameter sewer structures at the end of Runway 04-22 (see details in Section 3.2.1.1.1 of the Report) • Construction of elevated light rail station in dense neighborhood and urban hub adjacent to existing subway station • Reconstruction of 82nd St Bridge • Total option route length: approx. 3.2 miles
Indicative Capital Cost (2022$)[23]	$4.2 billion[24] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$3.7 billion[24] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)	$4.0 billion[24] (Does not include any additional costs required for an as yet unresolved solution to get past Runway 04-22 in compliance with FAA Airport Design Standards; potentially up to approx. $1–$3 billion)
Indicative Timeline/Schedule	11–12 Years	11–12 Years	11–12 Years
Travel Time[25]	Via LIRR: 27 mins (4 mins on light rail) (Penn Station to Terminal B, then C; shuttle to Terminal A) Via 7-Line: 35 mins (4 mins on light rail) (Times Square to Terminal B, then C; shuttle to Terminal A)	Via N/W-Lines: 36 mins (4 mins on light rail) (Times Square to Terminal B, then C; shuttle to Terminal A)	Via E-Line: 37 mins (5 mins on light rail) (Penn Station to Terminal B, then C; shuttle to Terminal A)
Transfer Experience	• Transfer from LIRR to light rail station would involve vertical move via stairs, escalator, or elevator up to the mezzanine level and a short walk to the light rail station • Transfer from 7-Line to light rail station would involve vertical move down via stairs, elevator, or escalator to the mezzanine and a slightly longer walk to the light rail station than the LIRR transfer	• Transfer from N/W Line to light rail station would involve a vertical move down via stairs, elevator, or escalator to station mezzanine and then a second vertical move up to the light rail platform level via stairs, elevator, or escalator	• Transfer from 7-Line to light rail station would involve vertical move down to mezzanine via stair or escalator and then a second vertical move back up to the light rail platform level via elevator or escalator • Transfer from E, F, M, and R-Lines to light rail station would involve a vertical move up to the subway mezzanine level, followed by a short walk to a second vertical move up via escalator or elevator to the light rail platform level
Ridership[26]	Total annual projected ridership for option: 7.4 million Net increase in annual projected transit ridership: 5.7 million	Total annual projected ridership for option: 4.9 million Net increase in annual projected transit ridership: 3.1 million	Total annual projected ridership for option: 7.3 million Net increase in annual projected transit ridership: 5.5 million
Local Community Impacts	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 5 years <u>Proximity to communities:</u> • 30–50 ft from 23 city blocks of residential and commercial properties from 61st St to 58th St, along 38th Ave and 55th St, along 31st Ave, the BQE, and Boody St • Above and within St Michael's Playground • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • Acquisition of up to 73 properties (private residential, private commercial, industrial, and religious) • Structures over or adjacent to Planeview Park and Overlook Park[27] • Loss of approx. 150 on-street public parking spaces along 38th Ave, 55th St, 31st Ave, 68th St, and Boody St	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 5 years <u>Proximity to communities:</u> • 35–80 ft from one city block of residential and commercial properties on 31st St • 40–75 ft from 12 city blocks of residential and commercial properties along the GCP • 35–50 ft from the north end of St Michael's Cemetery along Astoria Blvd South • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • Acquisition of up to 4 properties (private commercial) • Structures over or adjacent to Columbus Sq Park, Planeview Park, Overlook Park, and to the north of St. Michael's Cemetery[27] • Minimal, if any permanent loss of on-street public parking spaces	<u>Construction:</u> • Heavy civil construction of elevated and at-/below-grade structures for approx. 5 years <u>Proximity to communities:</u> • 35–50 ft from 15 city blocks of residential and commercial properties along Broadway, 69th St, 68th St, the BQE, and Boody St • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties opposite the Airport Terminals <u>Permanent impacts:</u> • Acquisition up to 54 properties (private residential, private commercial, and industrial) • Structures over or adjacent to Planeview Park, Overlook Park[27], and adjacent to Diversity Plaza • Loss of approx. 200 on-street public parking spaces along Broadway, 68th St, 69th St, and Boody St

[23] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[24] Costs for heavy infrastructure options approaching LGA from the west/southwest are based on the open-trench construction concept past Runway 04-22 (over the existing 90-year-old utilities), to provide a baseline estimate of the cost of construction. Although this concept does not meet FAA Airport Design Standards, it provides a consistent approach for capital cost comparison purposes. Costs associated with tunnelling and/or relocating utilities would be substantially higher, potentially up to approx. $1–$3 billion.
[25] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[26] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.
[27] Municipal parkland cannot be converted to a non-park use (known as alienation) without State legislative permission. Thus, the acquisition of New York City Parkland for construction of a mass transit option would require legislation authorizing such alienation. Obtaining such legislation is a multi-step process requiring actions by the New York City Council, the Mayor of New York City, the New York State Legislature, and the Governor.

TABLE ES-7 – SUMMARY OF KEY CHARACTERISTICS – LIGHT RAIL OPTIONS FROM THE EAST LR-2 AND LR-3

Evaluation Factor	LIGHT RAIL TO/FROM METS-WILLETS POINT (LR-2)	LIGHT RAIL TO/FROM JAMAICA (LR-3)
Constructability	• Construction of elevated light rail station over LIRR ROW and Passerelle Bridge • 70-ft-high structures over Roosevelt Ave/7-Line • Constrained construction access adjacent to GCP • Total option route length: approx. 2 miles	• Tall (80+ ft) long-span (250–300 ft) structures over LIRR railroad tracks into Jamaica • Tall (100 ft) structures over LIRR Port Washington Branch and Roosevelt Ave/7-Line • Long-span (250–350 ft) structures over Queens Blvd and Kew Gardens Interchanges with VWE • Constrained construction access along VWE and in GCP median • Total option route length: approx. 7 miles
Indicative Capital Cost (2022$)[28]	$2.4 billion	$6.2 billion
Indicative Timeline/Schedule	6–7 Years	11–12 Years
Travel Time[29]	Via LIRR: 31 mins (4 mins on light rail) (Penn Station to Terminal C, then B; shuttle to Terminal A) Via 7-Line: 50 mins (4 mins on light rail) (Times Square to Terminal C, then B; shuttle to Terminal A)	Via LIRR: 45 mins (9 mins on light rail) (Penn Station to Terminal C, then B; shuttle to Terminal A) Via E-Line: 64 mins (9 mins on light rail) (Penn Station to Terminal C, then B; shuttle to Terminal A)
Transfer Experience	• Transfer from LIRR Mets-Willets Point Station to light rail train would involve a vertical move via large elevators and escalators direct from LIRR platform to light rail station • 8-min walk from 7-Line Mets-Willets Point Station to light rail in enclosed walkway	• Subway or LIRR train to transfer at Jamaica same as existing (possible improvement to subway vertical circulation) • LIRR would involve a single level change via escalator or stairs and a short walk to the light rail fare gates • Subway transfer would involve level change to mezzanine via large high-capacity elevators or escalators and from mezzanine to platform via stairs and/or small elevators, and a greater walking distance to the light rail fare gates than the LIRR
Ridership[30]	Total annual projected ridership for option: 4.7 million Net increase in annual projected transit ridership: 3.4 million	Total annual projected ridership for option: 5.9 million Net increase in annual projected transit ridership: 4.3 million
Local Community Impacts	<u>Construction:</u> • Heavy civil construction of elevated structures for approx. 4 years <u>Proximity to communities:</u> • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties along the GCP and opposite the Airport Terminals <u>Permanent impacts:</u> • No permanent private property acquisition • Structures within a portion of Flushing Meadows Corona Park currently used for Mets parking, and along the southern border of Malcolm X Promenade • Minimal, if any permanent loss of public parking spaces	<u>Construction:</u> • Heavy civil construction of elevated structures for approx. 5 years <u>Proximity to communities:</u> • 35–60 ft from 12 city blocks of residential and commercial properties along the VWE, including within the Hoover Manton Playground • 150–200 ft from 32 city blocks of residential and commercial properties along GCP • Over 500 ft across 8 lanes of the GCP from 9 city blocks of residential and commercial properties along the GCP and opposite the Airport Terminals <u>Permanent impacts:</u> • No permanent private property acquisition • Construction and permanent structures over or adjacent to Hoover Manton Playground[31], and along the southern border of Malcolm X Promenade • Minimal, if any permanent loss of on-street public parking spaces

[28] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[29] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[30] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.
[31] Municipal parkland cannot be converted to a non-park use (known as alienation) without State legislative permission. Thus, the acquisition of New York City Parkland for construction of a mass transit option would require legislation authorizing such alienation. Obtaining such legislation is a multi-step process requiring actions by the New York City Council, the Mayor of New York City, the New York State Legislature, and the Governor.

Ferry Services + Shuttle Bus

Since LGA is located on the northern Queens waterfront, it can be reached via direct ferry service from Manhattan. A ferry from Manhattan would provide access from three piers, Pier 11 (Wall Street), Pier 34 (Midtown), and Pier 90 (Upper East Side). To reach one of the piers, riders would need to either walk or take a bus, taxi, or private vehicle to access the ferry. Once on the ferry, passengers would avoid possible traffic congestion and traffic delays, but this option could be less appealing during inclement weather. Upon arriving at the Airport, ferry passengers would then transfer to an on-Airport shuttle bus to reach their destination terminal. Hence, the ferry options would effectively require three transfers between travel modes (access to Terminal A from the Bowery Bay landing would require two mode transfers). The journey time to complete travel has been estimated at 81–83 minutes (including approximately 19 minutes to reach the ferry terminals at the East River from Midtown Manhattan and 29–37 minutes on the ferry from West 34th St), the longest of all the options considered. As a result, the ridership for the ferry options has been projected to be low, generating an increase of travelers using public transit of about 0.4 million additional (0.7 million total) passengers per year (the lowest of all the options evaluated).

Although the ferries are an attractive option because they would generate few impacts on neighborhoods, the low ridership is a serious limitation on their suitability as a mass transit solution for LGA. In comparison, upgrading the existing Q70-SBS bus (B-1C) route is projected to provide about 1.6 million additional (2.7 million total) transit riders only at the higher range of the cost ($100 million for the improved Q70-SBS versus $130–240 million for the ferry options). In addition, the ferry options face potential impacts from storms and inclement weather that could potentially disrupt ferry operations and affect the reliability of the service.

The NYC EDC has recently sent out a Request for Proposals (RFP) to broaden City ferry services, including the option of providing branded service to LGA, if the operator chooses to do so.

The evaluation considered options operating to/from on-Airport ferry landing locations at either Bowery Bay or Flushing Bay (see Figure ES-5) described below. This is followed by a comparison table (Table ES-8) of the options against selected key evaluation factors. A full summary of each option against all evaluation factors can be found in the relevant section of the Report.

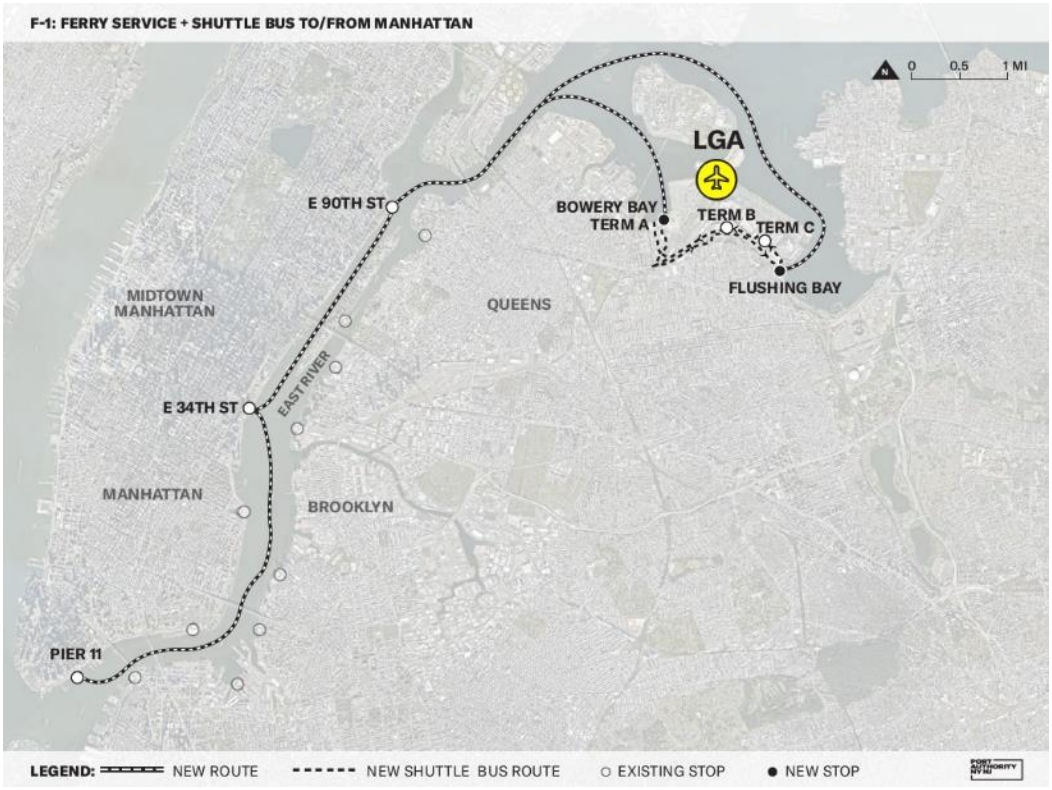


FIGURE ES-5: FERRY SERVICE/SHUTTLE BUS TO/FROM MANHATTAN

F-1: Ferry Service + Shuttle Bus to/from Manhattan

As mentioned above, the ferry options would provide direct access to LGA from waterfront areas of Manhattan by taking advantage of the existing New York waterway network. The ferry would traverse the East River before dropping passengers off at either Bowery Bay (Sub-Option F-1A) or Flushing Bay (Sub-Option F-1B). For the Bowery Bay option, passengers bound for Terminal A would walk from the ferry landing to the terminal. The approximately 90% of Airport passengers utilizing Terminals B and C would need to board a shuttle bus to access those terminals. The Flushing Bay landing would require an on-Airport shuttle to access all three terminals.

F-1A: Express Ferry Service + Shuttle Bus to Bowery Bay

This sub-option would require the construction of a new bus loading area and ferry landing on-Airport and piling and marine dredging in Bowery Bay.

F-1B: Express Ferry Service + Shuttle Bus to Flushing Bay

This sub-option would require the construction of a new bus loading area and ferry landing on-Airport, piling and marine dredging in Flushing Bay, and land reclamation and seawall reconstruction around the new Terminal C facility.

TABLE ES-8 - SUMMARY OF KEY CHARACTERISTICS –FERRY OPTIONS F-1A, AND F-1B

Evaluation Factor	FERRY SERVICE + SHUTTLE BUS TO BOWERY BAY (F-1A)	FERRY SERVICE + SHUTTLE BUS TO FLUSHING BAY (F-1B)
Constructability	• Construction of new bus loading area and ferry landing on-Airport • Provision and siting of new ferry storage/maintenance facility • Total option route length: approx. 7 miles (from Pier 34 in Midtown Manhattan)	• Dredging in Flushing Bay required • Land reclamation and existing seawall reconstruction around Terminal C required for access to Airport roadways • Provision and siting of new ferry storage/maintenance facility • Total option route length: approx. 10 miles (from Pier 34 in Midtown Manhattan)
Indicative Capital Cost (2022$)[32]	$130 million	$240 million
Indicative Timeline/Schedule	3–4 Years	4–5 Years
Travel Time[33]	Via M34 bus: 80 mins (19 mins on M34 bus to East River ferry stop, 29 mins on ferry, 16 mins on Airport shuttle bus) (Penn Station to Terminal C) Via M34 bus: 59 mins (19 mins on M34 bus to East River ferry stop, 29 mins on ferry) (Penn Station to Terminal A)	Via M34 bus: 82 mins (19 mins of M34 bus to East River ferry stop, 37 mins on ferry) (Penn Station to Terminal C)
Transfer Experience	• Transfer: 3 mode changes and 2 transfers from Midtown Manhattan • Need to walk or take bus from Midtown to get to the pier/ferry landing • Bus stops on Marginal Street are around 150 ft from the East 34th St pier and 300–400 feet from the embarkation gangways • Short walk to Terminal A and on-Airport bus pick-up • Passengers for Terminals B and C would need to board a shuttle bus to those terminals	• Transfer: 3 mode changes and 2 transfers from Midtown Manhattan • Need to walk or take bus from midtown to get to the pier/ferry landing • Bus stops on Marginal Street are around 150 ft from the East 34th St pier and 300–400 feet from the embarkation gangways • Longer walk to Airport bus pick-up (approx. 1,200 ft walk from ferry landing) • Passengers for all LGA terminals would need to board a shuttle bus to those terminals
Ridership[34]	Total annual projected ridership for option: 0.7 million Net increase in annual projected transit ridership: 0.4 million	Total annual projected ridership for option: 0.7 million Net increase in annual projected transit ridership: 0.4 million
Local Community Impacts	<u>Construction:</u> • Marine and on-Airport construction work for approx. 1 year <u>Proximity to communities:</u> • Communities over 300 ft from piling and marine dredging in Bowery Bay • Communities over 300 ft from ferry terminal structures near LGA Terminal A <u>Permanent impacts:</u> • No permanent private property acquisition • No impacts to NYC parklands or plazas • No permanent loss of on-street public parking spaces	<u>Construction:</u> • Marine and on-Airport construction work for approx. 2 years <u>Proximity to communities:</u> • Communities over 500 ft across 8 lanes of the GCP from piling, marine dredging, land reclamation work in Flushing Bay, and ferry terminal structures near Terminal C <u>Permanent impacts:</u> • No permanent private property acquisition • No impacts to NYC parklands or plazas • No permanent loss of on-street public parking spaces

[32] Indicative Capital Costs should be considered to have a range of estimating uncertainty of –10% to +30% as a result of the preliminary nature of engineering undertaken (less than 1%).
[33] Standardized Indicative Baseline Off-Peak Travel Time from Midtown Manhattan.
[34] Experience from AirTrain JFK was that actual ridership turned out to be higher than would have been predicted by the AirTrain JFK forecast and underscores the inherent uncertainty of model predictions. The ridership model supporting this effort could also deviate from eventual ridership demand but was utilized to allow ridership comparisons between the options.

Emerging Technologies

The study team employed two independent consultants to analyze the current state of emerging technologies in both foreign and domestic markets. These technologies include:

- Heavy infrastructure solutions such as hyperloop, electric vehicles in narrow tunnels, and personal and group rapid transit systems;
- Light infrastructure solutions such as electric scooters and flying drones/taxis; and
- Variants of existing technologies such as connected autonomous vehicles, aerial trams, electric ferries, and gondolas.

The study team considered examples from the US and around the world to determine their applicability to LGA and their capability to deliver the high-volume transit solutions needed to significantly increase transit access to the Airport. After a thorough review the study team found that each of the emerging technologies suffer from one or more of the following flaws:

- By their design, they lack the operating capacity, speed, and/or performance needed to effectively deliver mass transit to the Airport.
- Working prototypes exist but the technology is still years away from being mature enough for implementation.
- Working prototypes that could serve as the basis for proper evaluation are still under development.

Despite these current drawbacks, the study team concluded that some of these technologies are likely to mature into more viable mass transit solutions in the future. Given the rapid development in the autonomous vehicle market, it is likely that mass transit autonomous vehicles will one day be able to successfully navigate in pedestrian-heavy, mixed-flow traffic environments, which would make them suitable for service to a busy airport terminal frontage. Likewise, other technologies explored may also be considered in the future as they become more mature.