2. ALTERNATIVES

2.1 INTRODUCTION

This chapter summarizes the process employed to identify, compare, and screen a reasonable range of alternatives to the Proposed Action to determine whether alternatives exist that would reasonably satisfy the purpose of and need for the Proposed Action. CEQ regulations (40 CFR 1502.14) and FAA Orders 1050.1F and 5050.4B direct a thorough and objective assessment of the proposed action, the no action alternative, and reasonable alternatives. Reasonable alternatives are to be considered to the degree commensurate with the nature of the proposed action. The alternatives analysis presented in this chapter is consistent with FAA Orders 1050.1F and 5050.4B.

CEQ regulations (40 CFR 1502.14) for implementing NEPA require that federal agencies perform the following tasks:

- rigorously explore and objectively evaluate all reasonable alternatives, and—for alternatives that were eliminated from detailed study—briefly discuss the reasons for their elimination;
- devote substantial treatment to each alternative considered in detail, including the proposed action, so that reviewers may evaluate the alternatives' comparative merits;
- include reasonable alternatives not within the jurisdiction of the lead agency;
- identify the no action alternative; and
- identify the agency's preferred alternative or alternatives.

The identification of alternatives considered and the screening process used to determine which alternatives would reasonably satisfy the purpose and need are described in this section. The need for the Proposed Action, as identified in Section 1.4, is to address the following:

- increasing and unreliable travel times between LGA and key locations within New York City;
- limited passenger and employee access to and from LGA, which is primarily via roadway access;
- traffic congestion on off-Airport roadways near the Airport, which contributes to Airport access travel times; and
- limited on-Airport options to provide adequate employee parking and areas for storage of equipment and materials for maintenance activities.

The purpose of the Proposed Action is to provide a time-certain transportation option that connects Airport passengers and employees to and from LGA, as travel times to and from the Airport continue to increase and become more unpredictable. Additionally, this transportation option should ensure adequate parking for Airport employees.

Alternatives that satisfied the purpose and need were then evaluated for construction and operational feasibility. Alternatives that satisfied all screening criteria were carried forward for analysis of environmental consequences.

2.2 AIRPORT SETTING AND LOCATION

For context of identifying and evaluating alternatives, this section briefly describes the Airport setting. LGA is located in a densely developed metropolitan area. Neighboring areas to the west, south, and southeast of the Airport

support a mix of residential, commercial, industrial, manufacturing, transportation, and other land uses with limited outdoor recreation and open space areas.

- The **Residential** neighborhoods of East Elmhurst, Jackson Heights, and North Corona are directly adjacent to the Airport. East Elmhurst, Jackson Heights, and North Corona are densely developed urban neighborhoods, with a variety of one- and two-family residences and multi-family residences. These neighborhoods also support **Commercial** uses, including retail stores, parking, commercial buildings, office space, Airport-related services, and hotels.
- **Industrial and Manufacturing** land uses within the Ditmars-Steinway neighborhood and at Willets Point include light manufacturing and processing facilities, warehouse and storage, auto repair and supply shops, and junkyards.
- **Transportation, Parking, and Utilities** land uses include roadways and highways, parking lots and garages, electric power generation and transmission, and water supply and treatment facilities. Adjacent to the Airport are various public parking facilities, rental car facilities, and portions of the following major roadways: the GCP, the Van Wyck Expressway, and the Whitestone Expressway. Additional public transportation features are located at Willets Point, including the Mets-Willets Point Subway and LIRR Stations. Major utility facilities are located directly west of the Airport, including the Bowery Bay Wastewater Treatment Plant and the Astoria Energy Combined Cycle Plant, both located in the Ditmars-Steinway neighborhood.
- **Open Space and Outdoor Recreation** land uses include parks, recreation areas (including amusement parks and zoos), playgrounds, athletic fields, conservation land, preserves, cemeteries, and public land. The most notable recreation feature near the Airport is the Flushing Meadows-Corona Park, which is the fourth-largest City park at approximately 900 acres. Attributes of the park that are closest to the Airport include the Flushing Bay Promenade, the Marina, the National Tennis Center, and Citi Field.

2.3 IDENTIFICATION OF POTENTIAL ALTERNATIVES

This section describes the potential alternatives, developed to a conceptual level, that were subject to the screening process described in Section 2.4.

As discussed in Section 1.1, the Port Authority, the MTA, and New York City agencies have conducted numerous studies over the last several decades to improve transit access to LGA. The alternatives presented in this EIS were originally identified through a literature review of those studies including a recent alternatives study[1] conducted by the Port Authority; a total of 18 alternatives were identified from these previous studies. These alternatives were then subsequently informed and expanded upon through the EIS scoping process (a copy of the Scoping Report is provided in **Appendix D**), including identification of new alternatives from FAA and the public. Comments received during scoping identified the same or similar alternatives as those identified in previous studies, as well as 29 new alternatives. Two additional alternatives were identified by the FAA following review of the scoping materials. A total of 47 unique alternatives were identified and are presented in this section. The screening process described in Section 2.4 was used to determine which of these potential alternatives are reasonable.

2.3.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no supplemental access or improvements to existing access routes to LGA would occur. Therefore, Airport access would be generally consistent with existing conditions. Air passengers and

[1] Port Authority of New York and New Jersey, *LGA Airport Access Improvement Project, Purpose and Objectives and Analysis of Alternatives Report*, October 2018.

employees would continue to access LGA using the same modes as they do today, which include automobiles (personal vehicles, rental cars, taxis, and for-hire vehicles), public buses, and shuttle buses. As a result of forecast[2] increases in air passenger volumes,[3] the overall traffic volumes on roadways in the vicinity of LGA would increase over time, resulting in more traffic congestion. This, in turn, would result in longer travel times to LGA and would increase the volatility and unpredictability of travel times for LGA passengers and employees. Employee parking would likely remain in the same location on-Airport.

The No Action Alternative would include reasonably foreseeable, independently planned, and funded projects, as discussed in Section 3.3. Thus, in the No Action Alternative, the components of the LaGuardia Redevelopment Program that have been previously approved and are currently under construction would be completed. This would include reconstruction and consolidation of terminal buildings, expansion of public parking areas and garages, and reconfiguration of on-Airport roadway systems, as discussed in Section 1.3.1.2.

Furthermore, in the absence of the LGA Access Improvement Project, design and implementation of two actions would be undertaken by others. The No Action Alternative includes (1) improvements to be undertaken by the New York City Department of Parks and Recreation (NYC Parks) to the Passerelle Bridge between the Mets-Willets Point Subway Station and the Mets-Willets Point LIRR Station; and (2) improvements to be undertaken by the MTA to reconfigure portions of the Mets-Willets Point LIRR Station to extend existing platforms to accommodate 12-car trains and to ensure Americans with Disabilities Act (ADA) compliance.

2.3.1.1 PASSERELLE BRIDGE REPLACEMENT

The Passerelle Bridge was originally constructed in 1937 for the 1939 World's Fair, and it was rehabilitated in 1962 in advance of the 1964 World's Fair. The Passerelle Bridge is a multi-span steel trestle structure with timber and concrete decking. It is approximately 1,300 feet long, spanning the 7 Line Train Corona Yard and the NYCT Corona Maintenance Facility. The 1960s reconstruction retained the original foundations at the northern end of the bridge and installed new foundations to support a larger and wider bridge at the south end. More recently, the bridge spans over the Bus Depot were modified to provide higher horizontal clearance for buses to pass beneath the bridge.

In 2013, the City of New York inspected the bridge and determined that the bridge has severely deteriorated since construction of the superstructure in the 1960s and began working on a plan to replace the bridge. NYC Parks initiated design of the replacement bridge and earmarked funding for the replacement of the Passerelle Bridge but put those plans on hold once the Port Authority notified NYC Parks of the Proposed Action and its effects on the Passerelle Bridge. If the LGA Access Improvement Project is not implemented, then NYC Parks has indicated it would move forward with replacement of the structure (see Table 1-9).

2.3.1.2 METS-WILLETS POINT LIRR STATION IMPROVEMENTS

Between 2012 and 2014, the MTA considered improvements to the Mets-Willets Point LIRR Station to lengthen the existing platform, which is currently sized to accommodate eight-car trains, and provide ADA-compliant access to the platform. Advanced preliminary design was conducted in 2017 (see Table 1-9). However, the MTA suspended

[2] Port Authority of New York and New Jersey, *Aviation Demand Forecasts LaGuardia Airport, Final Submission*, April 2020.

[3] The forecasts for LGA were prepared and submitted to FAA prior to the COVID-19 public health emergency. FAA acknowledges the recent and ongoing impacts of the COVID-19 public health emergency and the resulting decline in aviation and transit travel demand. However, over the long term, it is expected that demand and airline capacity will grow in line with the US GDP, a relationship that has been in place since before airline industry deregulation in 1978. Thus, it is anticipated that passenger and airline activity in the short term will be lower than forecast, but will recover with long-term forecast activity being realized later than stated in the passenger forecast for LGA.

consideration of these previously planned improvements once the Port Authority initiated coordination with LIRR to expand service along the Port Washington Branch to support the LGA Access Improvement Project due to the nature of the development associated with the Proposed Action. The improvements planned for the Mets-Willets Point LIRR Station include extending the existing revenue service platform, including lighting and associated components; demolishing and replacing the two existing staircases at the western end of the station; and constructing a new elevator for ADA access, to be located west of the existing Passerelle Bridge. Under the No Action Alternative, MTA has indicated it would proceed with these improvements to the Mets-Willets Point LIRR Station.

2.3.2 DIVERSION OF AIR TRAFFIC AT LAGUARDIA AIRPORT ALTERNATIVES

This section describes alternatives that would reduce the number of passengers using LGA. The list includes alternatives that could divert air traffic away from LGA, which would reduce roadway network traffic to and from LGA.

2.3.2.1 ALTERNATIVE 2A: USE OF OTHER EXISTING AIRPORTS ALTERNATIVE

This alternative includes the use of another airport or airports to accommodate the demand at LGA for commercial, cargo, and general aviation operations. Nearby commercial service airports that also serve the greater New York City area, shown on **Exhibit 2-1**, include JFK, EWR, SWF, Westchester County Airport (HPN), and Long Island MacArthur Airport (ISP). This alternative would shift air traffic from LGA to one or more of these other airports to relieve existing traffic congestion at LGA.

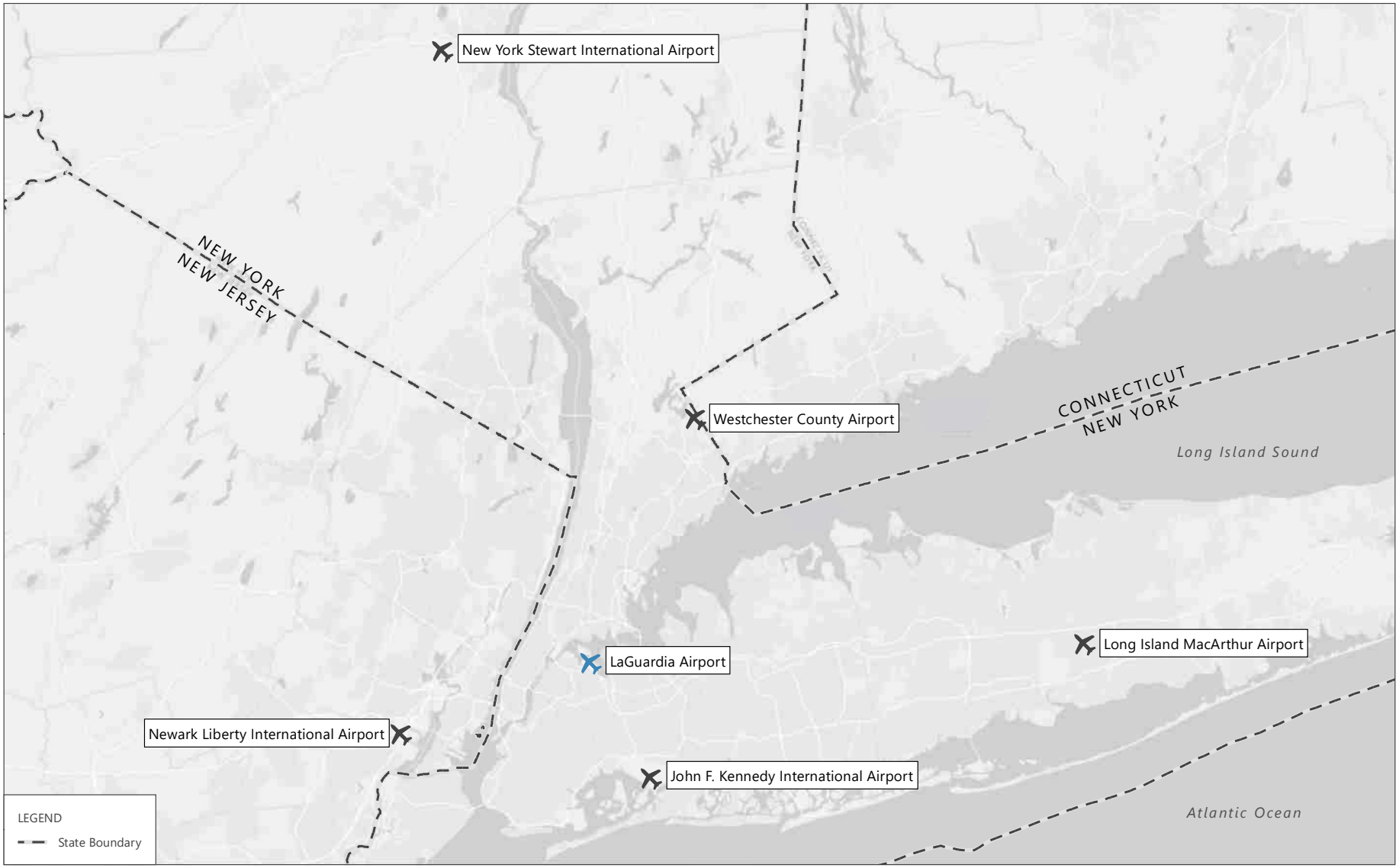
2.3.2.2 ALTERNATIVE 2B: USE OF TRAINS AND BUSES INSTEAD OF AIR TRAVEL ALTERNATIVE

This alternative would result in the use of trains or buses to provide transportation for passengers who currently use LGA. Long distance inter-city train service is provided by Amtrak originating from Penn Station. Most existing Amtrak train service is within the Northeast Corridor,[4] with some long-distance service to Florida, Chicago, and other cities. Several bus companies currently operate scheduled service to and from the Port Authority Bus Terminal in Manhattan. Most of these companies provide bus service to destinations within a 4-hour ride from New York (such as Boston, Philadelphia, and Washington, DC). Long-distance bus service also is provided for travel throughout the United States. This alternative would reduce air traffic at LGA by shifting passengers to trains and buses.

2.3.3 USE OF OTHER MODES OF TRANSPORTATION TO LGA ALTERNATIVES

This section describes other non-bus or non-rail modes of transportation that may provide feasible connections to LGA. **Exhibit 2-2** shows these options.

[4] The Northeast Corridor is an electrified railroad line in the Northeast megalopolis of the United States. It is owned by Amtrak, and it connects Boston to Washington, DC, through Providence, New Haven, New York City, Philadelphia, Wilmington, and Baltimore.



SOURCES: Esri, HERE, Garmin, OpenStreetMap Contributors, and the GIS User Community, June 2020 (basemap); US Census, Geography Division, TIGER/Line Shapefile, 2018 (state boundary line); ESRI 2010 Data, Shapefile, 2010 (airports).

EXHIBIT 2-1

SELECT COMMERCIAL SERVICE AIRPORTS
IN THE NEW YORK CITY METROPOLITAN REGION

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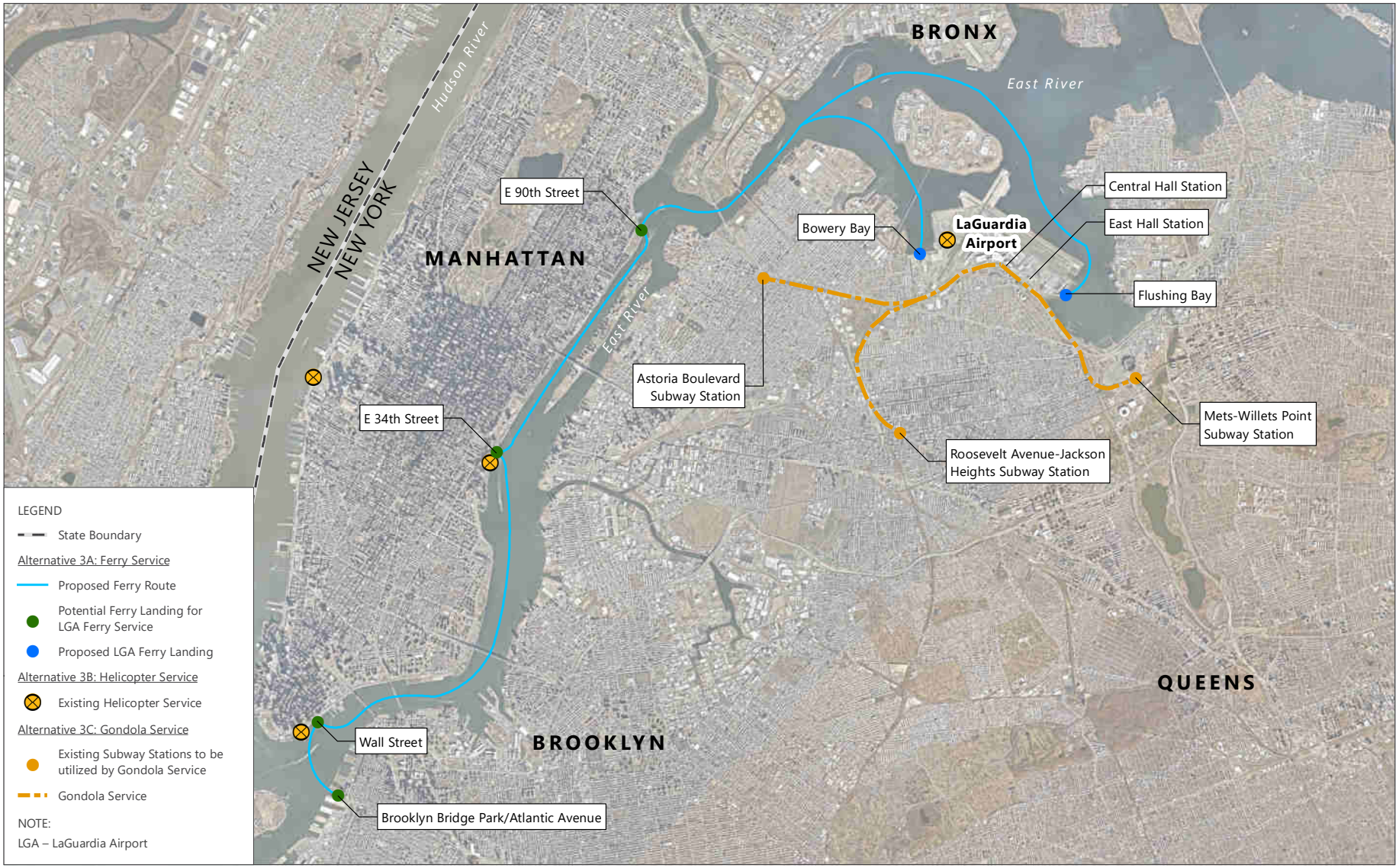

SOURCES: Nearmap, New York, March 2020 (aerial); US Census Bureau, Geography Division, TIGER/Line Shapefiles, 2018 (state boundary); Reynolds Smith & Hills Inc., 2019 (alternatives).

EXHIBIT 2-2

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USE OF OTHER MODES OF TRANPORTATION ALTERNATIVES

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2.3.3.1 ALTERNATIVE 3A: FERRY SERVICE ALTERNATIVE

The Citywide Ferry Study conducted in 2013 by the New York City Economic Development Corporation considered potential landings at both the east and west ends of the Airport (Flushing Bay Ferry Landing and Bowery Bay Ferry Landing, respectively). The study's analysis examined a two-vessel and four-vessel operating schedule for hourly and 30-minute service. In general, a four-vessel service providing trips every 30 minutes would provide better travel times. However, using a ridership model and financial analysis, an hourly two-vessel service was determined the best option for LGA service in the Citywide Ferry Study.[5,6]

The Ferry Service Alternative considered in this EIS is that recommended in the Citywide Ferry Study and would connect the Airport with points in Brooklyn, Queens, and Manhattan along the East River. The potential ferry route for this alternative, as shown in blue on Exhibit 2-2, would begin at Pier 6 in Brooklyn (the Brooklyn Bridge Park/Atlantic Avenue Ferry Landing), travel northwest across the East River to Pier 11 (at the Wall Street Ferry Landing) in Lower Manhattan, north to the East 34th Street Pier in Midtown Manhattan, north to the East 90th Street Pier on the Upper East Side of Manhattan, and east to the Bowery Bay or Flushing Bay Landings serving LGA. Existing ferry stops are operated by the New York Waterway Ferry, New York City Ferry, and New York Water Taxi.[7] New ferry landings would be constructed on the east side of the Airport (Flushing Bay Ferry Landing) to service Terminals B and C / D (future Terminal C) and on the west side of the Airport (Bowery Bay Ferry Landing) adjacent to Terminal A.[8]

Given that the majority of air passengers use Terminals B and C / D (future Terminal C), the ferry service would be a dedicated service to the Flushing Bay Ferry Landing with supplemental service to the Bowery Bay Ferry Landing. Travel times between the Flushing Bay Ferry Landing and East 90th Street, East 34th Street, Pier 11, and Brooklyn Bridge Park/Atlantic Avenue would be 27, 40, 57, and 63 minutes, respectively.[9] Ferry service to the Flushing Bay Ferry Landing was estimated to have a ridership of about 574 daily passengers with an inter-terminal bus to transfer passengers to all terminals, but only about 270 daily passengers without an inter-terminal bus.[10] Travel times between the Bowery Bay Ferry Landing and East 90th Street, East 34th Street, Pier 11, and Williamsburg would be 15, 28, 44, and 51 minutes, respectively.[11] Ferry service to the Bowery Bay Ferry Landing was estimated to have a ridership of about 626 daily passengers with an inter-terminal bus to transfer passengers to all terminals (approximately 1.7 percent of passengers accessing LGA daily), but only about 40 daily passengers without an inter-terminal bus (approximately 0.1 percent of passengers accessing LGA daily).[12]

Pedestrian access between the Bowery Bay Ferry Landing and Terminal A would require crossing the Employee Parking Access Road. Passengers destined for the other terminals, which serve more than 90 percent of LGA

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[5] New York City Economic Development Corporation, *Citywide Ferry Study 2013 – Final Report*, 2013.

[6] The Citywide Ferry Study concluded the following: "(1) for a LaGuardia Airport ferry service to be viable, it must be combined with an attractive and efficient inter-terminal bus connection to attract and serve riders; (2) hourly service with two vessels is estimated to have a positive operating margin and may be self-sustaining without subsidies; (3) service every half hour with four vessels to Bowery Bay has a significantly slimmer profit margin and may not break even with higher fares than the $25 fare modelled; and (4) if a new ferry landing were to be developed at LaGuardia Airport to accommodate a reactivated service, development at Bowery Bay is recommended at this point in time over Flushing Bay."

[7] Pan Am operated a Water Shuttle from Pier 11 in Lower Manhattan to the Marine Air Terminal at LGA until Pan Am declared bankruptcy in 1991 and the service was acquired by Delta Air Lines. This service was then operated by New York Waterway but was discontinued in 2000.

[8] The LaGuardia Redevelopment Program will result in combining Terminals C and D into a future Terminal C.

[9] New York City Economic Development Corporation, *Citywide Ferry Study 2013 – Final Report*, 2013.

[10] *Ibid.*

[11] *Ibid.*

[12] *Ibid.*

passengers, would need to connect via an inter-terminal Airport bus due to the distance. The Citywide Ferry Study determined that "without an efficient and seamless bus connection to the rest of the LaGuardia Airport market, the likelihood of success is low."[13] The Study also concluded that:

> In short, in order for a ferry service to work at LaGuardia Airport, an attractive and seamless intermodal connection to the air terminals is required. The connection bus may be as important to the success of the ferry as the waterside operation itself as riders will not deem themselves to have arrived at the airport until they get to their required air terminal, not the LaGuardia Airport ferry landing itself.[14]

Further, the Study stated that the use of non-public roads separated from the potential traffic of public drop-off and pick-up areas shared by taxis, car services, or buses, would strengthen the reliability and attractiveness of the overall ferry service.[15] Passenger access between the Flushing Bay Ferry Landing and the terminals would be provided using the existing inter-terminal Airport bus service. In order to provide a dedicated roadway for the inter-terminal Airport bus, either an existing lane of the on-Airport roadway would need to be converted to a dedicated bus lane or a new bus lane would need to be constructed.

2.3.3.2 ALTERNATIVE 3B: HELICOPTER SERVICE ALTERNATIVE

This alternative refers to an increase in the use of helicopter service to access LGA. Currently, helicopter service is offered as an alternative to access airports in the New York City area. This service is both an on-demand charter service and a scheduled service. Blade, a private company, offers service to and from West 30th Street and JFK; to and from Wall Street and LGA; and to and from East 34th Street and EWR.

The scheduled service currently operates every 20 minutes between 7:00 a.m. and 7:00 p.m. Transportation from the helipads to the terminals is provided as part of the fee. Helicopter service passengers would arrive at Terminal A at LGA, and access to Terminals B and C / D (future Terminal C) would be provided by inter-terminal Airport buses.

2.3.3.3 ALTERNATIVE 3C: GONDOLA SERVICE ALTERNATIVE

This alternative would be a gondola system that connects LGA to existing transit lines. Other cities, particularly internationally, have used trams and gondolas as a supplement to existing transit options. The urban gondolas are often used for access to tourist attractions; others are used for recreation and/or to move passengers over and across challenging geographies and/or topographies (see **Exhibit 2-3**). Some cities, both nationally and internationally, are currently assessing proposed gondola systems as an economical approach to transit. A local example of a gondola system is the service over the East River between Manhattan (Second Avenue between 59th and 60th Streets) and Roosevelt Island. The gondola is operated by Leitner-Poma of America on behalf of the Roosevelt Island Operating Corporation of the State of New York, which is a state public benefit corporation created in 1984 to run services on Roosevelt Island.

Due to the slower speed and limited capacity of gondola cars, this alternative assumes connections to three existing subway stations would be required for the implementation of gondola service to offer a similar level of service to the Proposed Action. To access the Astoria Boulevard Subway Station, the gondola would operate along the GCP within the existing right-of-way or with minimal additional right-of-way. Access to the Roosevelt Avenue-Jackson

[13] *Ibid.,* p. 50.

[14] *Ibid.* p. 51.

[15] New York City Economic Development Corporation, *Citywide Ferry Study 2013 – Final Report*, 2013.

Heights Subway Station would operate along Broadway to the Brooklyn Queens Expressway (BQE) and the GCP. The Mets-Willets Point Subway Station would be accessed via the GCP and then Roosevelt Avenue.

EXHIBIT 2-3 EXAMPLE OF GONDOLA

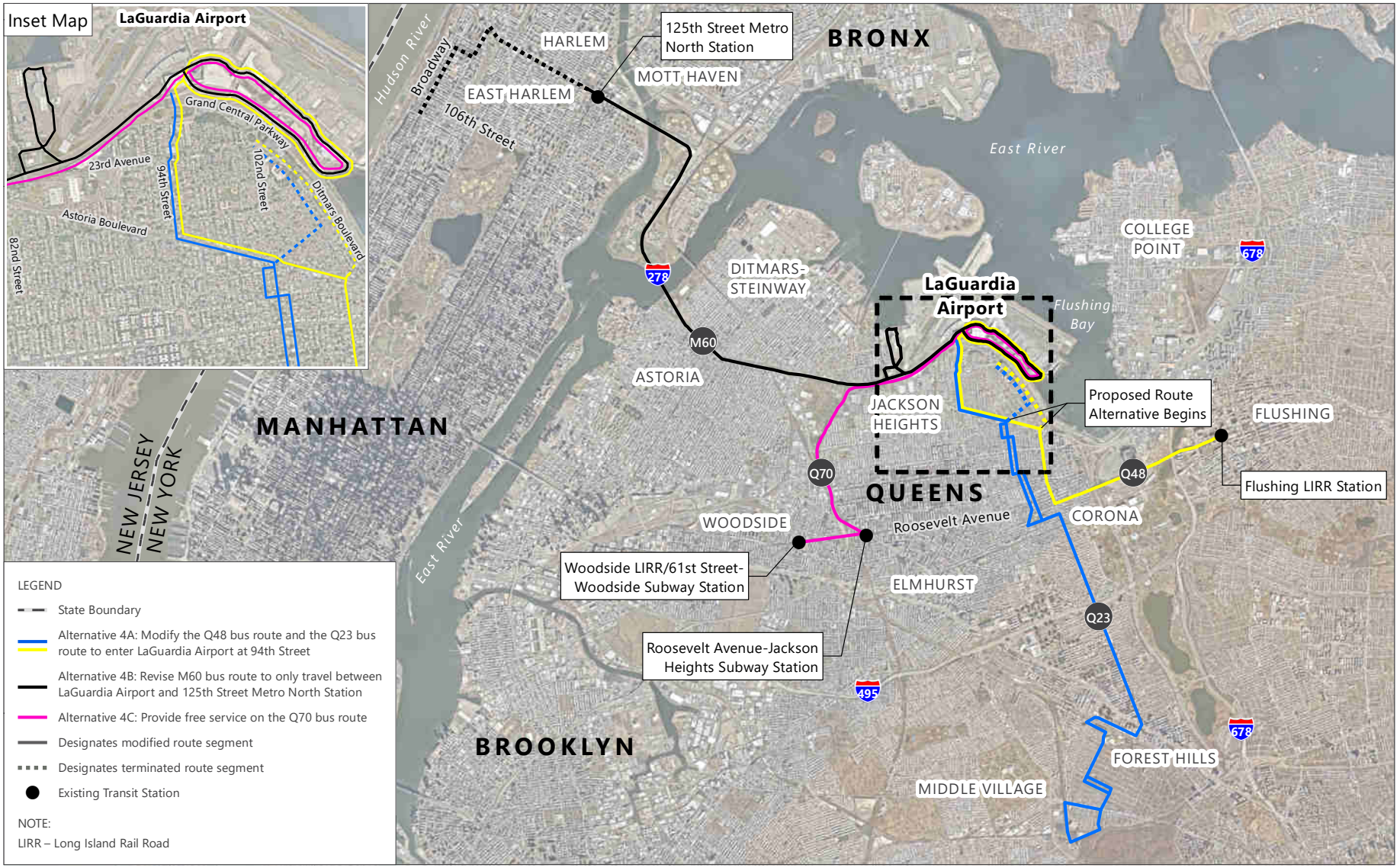
SOURCE: Getty Images, 2019 (stock image).

2.3.4 TRANSPORTATION SYSTEMS MANAGEMENT ALTERNATIVES

The Transportation Systems Management (TSM) alternatives include strategies to improve travel time on the bus routes that provide access to LGA.[16] Improvements to these routes may include increased bus frequency; use of bus "queue jumpers" at select traffic signals, which are short bus lane segments that have traffic signal priority so that buses can bypass waiting queues of traffic; additional roadway sections of dedicated bus lanes along portions of a bus route, if feasible; and express service for some of the buses. The TSM alternatives may include improvements to other bus service, such as increased frequency on routes from Corona and Flushing, new routes, modifications to SBS,[17] or improved transfers. **Exhibit 2-4** depicts the alternatives described in this section.

[16] The Metropolitan Transportation Authority is redesigning the bus network in Queens. The project was announced in April 2019 and is expected to begin implementation of the redesigned bus network in 2021. (Metropolitan Transportation Authority, Queens Bus Network Redesign, https://new.mta.info/queensbusredesign [accessed April 17, 2020].)).

[17] Select Bus Service (SBS) provides a complementary service to the subway system by connecting neighborhoods to subway stations and major destinations. To improve reliability and service along these high-ridership corridors, a combination of tools is implemented. This includes off-board fare payment, bus lanes, traffic signal priority, and longer spacing between stops.



SOURCES: Nearmap, New York, March 2020 (aerial); Nearmap, New York, July 2020 (aerial); Reynolds Smith & Hills Inc., 2019 (alternatives); Metropolitan Transportation Authority, August 2019 (subway stations).

EXHIBIT 2-4

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TRANSPORTATION SYSTEMS MANAGEMENT ALTERNATIVES

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2.3.4.1 ALTERNATIVE 4A: MODIFY THE Q48 BUS ROUTE AND THE Q23 BUS ROUTE TO ENTER LAGUARDIA AIRPORT AT 94TH STREET ALTERNATIVE

This alternative would modify the Q48 and Q23 bus routes. The Q48 bus route currently serves LGA. The route begins at the Flushing LIRR Station and operates along Roosevelt Avenue to 108th Street and then to Ditmars Boulevard. The route follows Ditmars Boulevard and accesses LGA at 82nd Street and then follows Runway Drive to provide service to Terminal B, then loops around to access Terminals C / D (future Terminal C) and exits LGA at 102nd Street and 23rd Avenue/Ditmars Boulevard. The Q23 bus route begins in the Forest Hills area and does not currently provide access to LGA. The route terminates in the East Elmhurst area near Ditmars Boulevard and 102nd Street. Both routes operate 7 days a week and 24 hours per day.

Under this alternative, both routes could be modified to provide different access to LGA and provide reduced headways (time between buses on the route) for LGA passengers. The Q48 bus route would access LGA at 94th Street from Astoria Boulevard rather than 82nd Street from Ditmars Boulevard, reducing the trip length by approximately 0.5 miles from the western end of the route. The route would provide access to Terminals B and C / D (future Terminal C).

The Q23 bus route would be extended along Astoria Boulevard rather than to its current terminus on Ditmars Boulevard. The route would follow Astoria Boulevard to 94th Street, entering LGA and following the same route as that of the Q48 bus route to provide access to Terminals B and C / D (future Terminal C). This route extension is approximately 0.5 miles.

2.3.4.2 ALTERNATIVE 4B: REVISE THE M60 BUS ROUTE TO ONLY TRAVEL BETWEEN LAGUARDIA AIRPORT AND 125TH STREET METRO NORTH STATION ALTERNATIVE

The M60 bus route is an SBS route. This existing bus route begins at Broadway and West 106th Street on the Upper West Side of Manhattan and travels via the 125th Street Metro North Station on the Upper East Side of Manhattan to LGA, providing service to Terminals A, B, and C / D (future Terminal C). The route operates 7 days a week and 24 hours per day. Dedicated bus lanes are provided along 125th Street, and the route has fewer stops than a typical route to lessen the trip times. As an SBS route, off-board fare payment is used to collect passenger fares. This alternative would eliminate the portion of the existing M60 bus route between Broadway and West 106th Street on the Upper West Side of Manhattan and the 125th Street Metro North Station on the Upper East Side of Manhattan. In addition, this alternative would eliminate interim stops along the bus route, and the bus would serve as an express bus between the 125th Street Metro North Station and the LGA terminals.

2.3.4.3 ALTERNATIVE 4C: PROVIDE FREE BUS SERVICE ON THE Q70 BUS ROUTE ALTERNATIVE

This alternative would provide free bus service on the existing Q70 bus route, which is an SBS route. The route begins at the Woodside LIRR/61st Street-Woodside Subway Station and operates on Roosevelt Avenue to the Roosevelt Avenue-Jackson Heights Subway Station, along Broadway, the BQE, and the GCP to LGA, providing service to Terminals B and C / D (future Terminal C). The route operates 7 days a week and 24 hours per day. With this alternative, riders would not pay to board the bus. The current Q70 bus route requires passengers to pay at the stop before boarding the bus; passengers using the subway system and transferring to the Q70 bus route are allowed one transfer free of charge.

2.3.5 TRANSPORTATION DEMAND MANAGEMENT ALTERNATIVES

The Transportation Demand Management (TDM) alternatives consist of measures to reduce travel demand and, consequently, congestion, mainly focusing on strategies to reduce private automobile travel to and from the Airport.

These alternatives would include the promotion of public transit, walking, bicycling, and carpools and van pools using some combination of the following strategies:

- provide secure bicycle parking;
- provide priority and/or reduced-fee parking for carpools or van pools;
- reduce demand for, or encourage the more efficient use of, taxis and other on-demand car services;
- promote mobile phone applications that encourage shared rides at Airport taxi stands and for on-demand car service;
- promote shared-ride services;
- promote bus and shuttle services; and
- increase on-Airport public parking rates.

For evaluation of this alternative, it was assumed that all strategies would be implemented.

2.3.6 EMERGING TRANSPORTATION TECHNOLOGIES ALTERNATIVES

These alternatives include emerging technologies for providing access to LGA. In addition to those listed in the following subsections, other technologies continue to evolve and may offer new transportation options in the future. However, as some of those technologies would require significant modifications to existing infrastructure and are still in development, this discussion focuses on emerging transportation technologies that can be implemented using existing rights-of-way.

2.3.6.1 ALTERNATIVE 6A: TRANSPORTATION NETWORK COMPANIES ALTERNATIVE

This alternative would increase the use of transportation network company (TNC) vehicles through an incentive program. TNCs are a commercial ride-sharing service using mobile technology to connect passengers with drivers. Uber and Lyft are examples of TNCs. The TNC drivers typically use their own vehicles to provide the needed transportation for a fee, which is paid for through a mobile application. The mobile technology also provides the ability for the passenger to obtain a price quote before the ride, track the vehicle's location, and identify the driver through vehicle tag numbers, type and color of vehicle, and driver picture. At LGA, TNCs currently have a dedicated area for passenger pick up, which would be expanded as part of this alternative.

2.3.6.2 ALTERNATIVE 6B: AUTONOMOUS VEHICLES ALTERNATIVE

This alternative would initiate the use of autonomous vehicles (AVs) at LGA.[18] AVs are vehicles that use technology to partially control or fully replace the human driver, while avoiding roadway obstacles and adjusting to traffic conditions. There are six levels of AVs based on the level of automation. Level 0 vehicles include no automated features with the driver in complete control; Level 1 includes a feature such as cruise control; Level 2 includes two or more features such as adaptive cruise control and lane assist; Level 3 includes features that allow the driver to give up vehicle control under certain operating conditions and during select portions of a trip; Level 4 is a fully autonomous vehicle that monitors all conditions and adjusts as needed; and Level 5 is a fully autonomous vehicle that monitors roadway conditions and performs safety-critical tasks through the duration of the trip with or without a driver present.[19] AVs use a variety of technologies and sensors to monitor the roadway and roadway conditions.

[18] AVs are being tested in various cities in the United States, but AVs are not currently in operation for commercial use.

[19] This level of autonomous vehicle also has been called a "Connected Autonomous Vehicle" or "CAV."

According to the University of Michigan Center for Sustainable Systems, it is anticipated that fully automated, Level 4 AVs may be available around 2030.[20]

2.3.7 OFF-AIRPORT ROADWAY EXPANSION ALTERNATIVES

This section describes potential alternatives that are focused on improvements to the existing roadways that provide access to LGA. **Exhibit 2-5** depicts Alternatives 7A through 7E.

2.3.7.1 ALTERNATIVE 7A: ADDITIONAL TRAVEL LANES ON GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would widen the 3-mile route of the GCP through Queens from the RFK Bridge to the Long Island Expressway interchange to increase the capacity of the roadway.

The GCP extends through Astoria and East Elmhurst past the southern boundary of LGA property. The GCP is flanked to the north and south by two streets, one westbound and the other eastbound, that operate as a pair and together serve as a major arterial route for local traffic. West of 32nd Street, the pair of streets is named Hoyt Avenue. East of 32nd Street, the pair of streets is named Astoria Boulevard. North–south streets cross over the GCP on bridges or, in a few cases, beneath it through underpasses. Most of the local streets intersect with Hoyt Avenue or Astoria Boulevard at signalized intersections. Residential and commercial uses front Hoyt Avenue and Astoria Boulevard with primary access (pedestrian entrances and vehicular driveways) from these two streets. The Astoria Line (N Line) subway crosses over the GCP and Hoyt Avenue at 31st Street, and the Hell Gate rail trestle,[21] which is used by Amtrak and freight railroads, crosses over the GCP and Astoria Boulevard near Steinway Street.

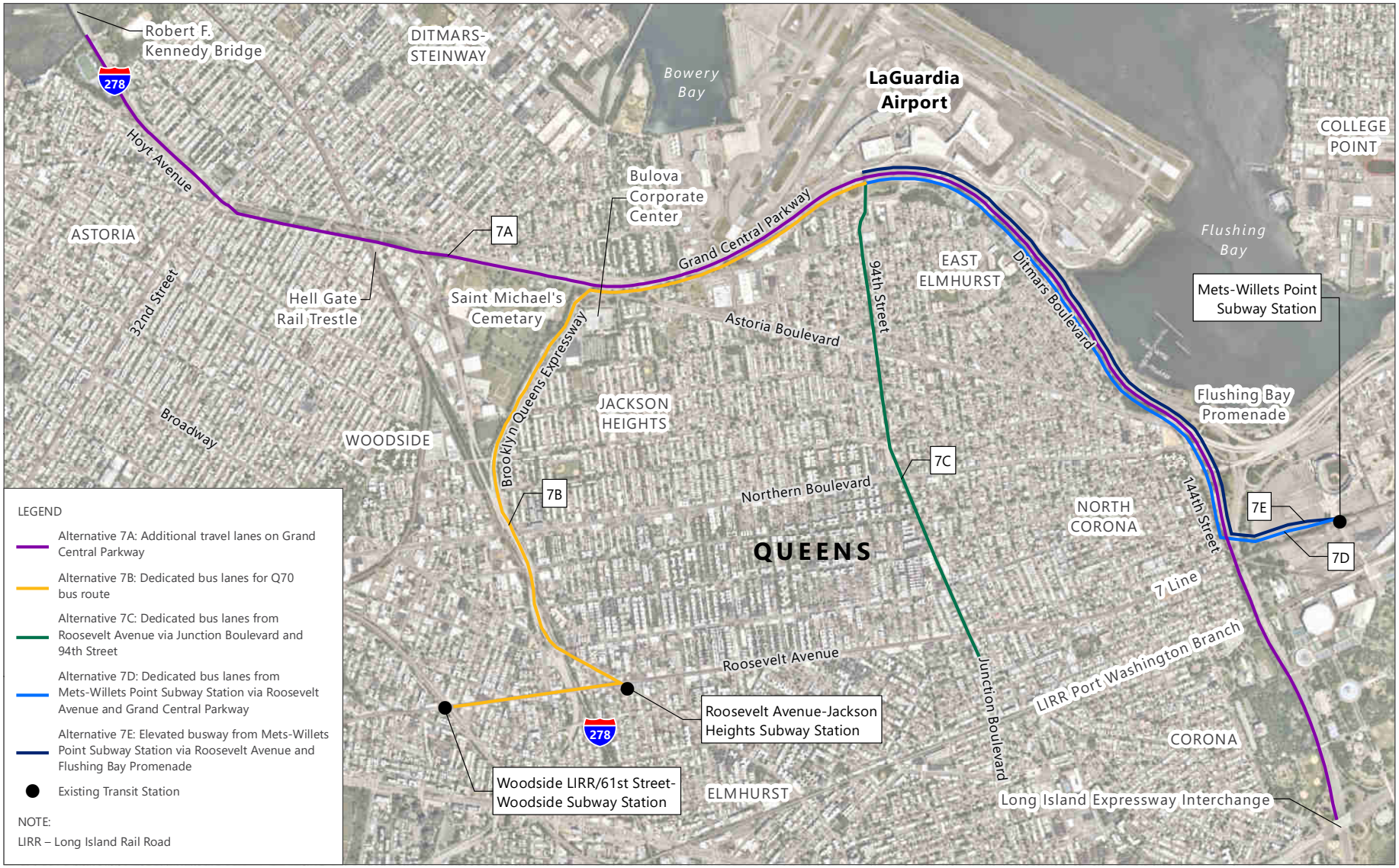
This alternative would include widening the GCP and/or Hoyt Avenue and Astoria Boulevard to provide increased capacity. The neighborhood surrounding the GCP is developed with single- and multi-family residential buildings, with commercial uses along most east–west avenues and certain north–south streets. An office complex (Bulova Corporate Center), big-box retail uses, and light industrial and warehouse buildings are located near the interchange between the GCP and the BQE. A large cemetery (the 88-acre Saint Michael's Cemetery, established in 1852) is located within the triangle of roadways at the GCP / BQE interchange.

2.3.7.2 ALTERNATIVE 7B: DEDICATED BUS LANES FOR Q70 BUS ROUTE ALTERNATIVE

This alternative would provide dedicated bus lanes for the Q70 bus route. The dedicated bus lanes would include separate dedicated traffic signals to allow transit signal priority at intersections along Roosevelt Avenue and Broadway. The Q70 bus route is an SBS route providing nonstop access to Terminals B and C / D (future Terminal C) at LGA from the Roosevelt Avenue-Jackson Heights Subway Station and the Woodside LIRR/61st Street-Woodside Subway Station. The Q70 bus route starts at the Woodside LIRR/61st Street-Woodside Subway Station, traveling east on Roosevelt Avenue to the Roosevelt Avenue-Jackson Heights Subway Station. Roosevelt Avenue has one travel lane with on-street parking on each side of the street. The route then travels along Broadway, which also has one travel lane with on-street parking on each side of the street, to access the BQE. The BQE is a six-lane roadway, with three lanes in each direction, separated by a barrier wall. Paved shoulders vary in width from approximately 5 to 10 feet, and there is a barrier wall on the outside of the paved shoulder. The BQE transitions to a five-lane roadway,

[20] Center for Sustainable Systems, University of Michigan, Autonomous Vehicles Fact Sheet, http://css.umich.edu/factsheets/autonomous-vehicles-factsheet (accessed December 26, 2019).

[21] The Hell Gate Bridge and rail trestle was constructed in 1917 and is an approximately 3-mile-long bridge and viaduct that carries two Amtrak rail lines and one freight rail line from Sunnyside Yard in Queens over the East River and onto Randall's Island and into the Bronx.



SOURCES: Nearmap, New York, June 2020 (aerial); Metropolitan Transportation Authority, August 2019 (subway stations); Reynolds Smith & Hills Inc., 2019 (alternatives).

EXHIBIT 2-5

NORTH 0 2,600 ft

OFF-AIRPORT ROADWAY EXPANSION ALTERNATIVES

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with three lanes southbound and two lanes northbound, also with a barrier separation. From the BQE, the route travels along the GCP, which has three travel lanes westbound and four travel lanes eastbound. The route accesses LGA at 94th Street, serves Terminals B and C / D (future Terminal C), and exits LGA at 23rd Avenue and Ditmars Boulevard.

To implement dedicated bus lanes, parking would need to be removed from both sides of Roosevelt Avenue and Broadway. A general-purpose lane in each direction on the BQE would transition to a dedicated bus lane, resulting in four general-purpose lanes, with two in each direction. As the BQE transitions to the GCP, a general-purpose lane conversion in each direction would result in only one remaining general-purpose lane in the northbound direction and two in the southbound direction. On the GCP, the conversion of a general-purpose lane in each direction to a dedicated bus lane would result in three eastbound general-purpose lanes and two westbound general-purpose lanes. The route would continue to access LGA via 94th Street and serve Terminals B and C / D (future Terminal C).

2.3.7.3 ALTERNATIVE 7C: DEDICATED BUS LANES FROM ROOSEVELT AVENUE VIA JUNCTION BOULEVARD AND 94TH STREET ALTERNATIVE

This alternative would provide dedicated bus lanes for a new bus route along Junction Boulevard and 94th Street. The dedicated bus lanes would include separate dedicated traffic signals to allow transit signal priority at intersections along Junction Boulevard and 94th Street. The new bus route would operate along Junction Boulevard from Roosevelt Avenue to 94th Street and then would follow 94th Street to LGA. Both Junction Boulevard and 94th Street are two-lane facilities with on-street parking on both sides. The implementation of a dedicated bus lane along this route would result in the removal of the on-street parking on both sides of Junction Boulevard and 94th Street. The new bus route would serve Terminals B and C / D (future Terminal C) at LGA.

2.3.7.4 ALTERNATIVE 7D: DEDICATED BUS LANES FROM METS-WILLETS POINT SUBWAY STATION VIA ROOSEVELT AVENUE AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would provide dedicated bus lanes for a new bus route along Roosevelt Avenue and the GCP. The dedicated bus lanes would include separate dedicated traffic signals to allow transit signal priority at intersections along Roosevelt Avenue. From the Mets-Willets Point Subway Station, the route would follow Roosevelt Avenue, a four-lane facility with no parking provided on either side. To access the GCP, Stadium Place North and Shea Road would need to be used. Stadium Place North is a two-lane road with grass shoulders. Shea Road is a four-lane road with grass shoulders and a grass median. These roads would likely need to be upgraded or access would need to be provided through the corner of the stadium parking lot. The GCP headed northbound is a five-lane facility that transitions to four lanes once through the Northern Boulevard interchange. The return trip to the Mets-Willets Point Subway Station would require access along 114th Street, which is a two-lane facility with on-street parking. From 114th Street, the route would follow Roosevelt Avenue back to the Mets-Willets Point Subway Station. A general-purpose lane in each direction on Roosevelt Avenue and a general-purpose travel lane in each direction on the GCP would be converted to a dedicated bus lane. The access to the GCP from Roosevelt Avenue would need to be upgraded. On the return trip, a lane on the GCP in the southbound direction would need to be converted from a general-purpose lane to a dedicated bus lane, on-street parking along 114th Street would need to be removed, and one of the general-purpose lanes on Roosevelt Avenue would need to be converted to a dedicated bus lane. The new bus route would serve Terminals B and C / D (future Terminal C).

2.3.7.5 ALTERNATIVE 7E: ELEVATED BUSWAY FROM METS-WILLETS POINT SUBWAY STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would provide an elevated busway beginning at the Mets-Willets Point Subway Station. The busway would run west parallel to Roosevelt Avenue and then turn north in the median or along the right-of-way of the

GCP and move through the Northern Boulevard interchange to Flushing Bay Promenade. The busway would then turn west parallel to Flushing Bay Promenade and would access LGA at the eastern end, following LaGuardia Road. This alternative would require a bus turnaround to be constructed at the Mets-Willets Point Subway Station and at LGA. Buses on a point-to-point route like this elevated busway require a bus turnaround, which is space at each end of the route for buses to reverse direction by turning around. This bus turnaround could be constructed without having any effect on Roosevelt Avenue, the 7 Line, or the LIRR Port Washington Branch. However, at LGA, a bus turnaround is not physically possible due to on-Airport space constraints. As a result, the elevated busway would connect to the on-Airport roadway system to provide access to Terminals B and C / D (future Terminal C). After accessing the terminals, buses would reconnect to the elevated busway for the return trip to the Mets-Willets Point Subway Station.

2.3.8 SUBWAY EXTENSION ALTERNATIVES

The subway extension alternatives would result in an extension of an existing MTA subway line(s) to LGA and would include construction of a new subway station serving the terminals at LGA. The technology would be the same as the existing subway line.

Each of the potential subway extension alternatives would include the following components:

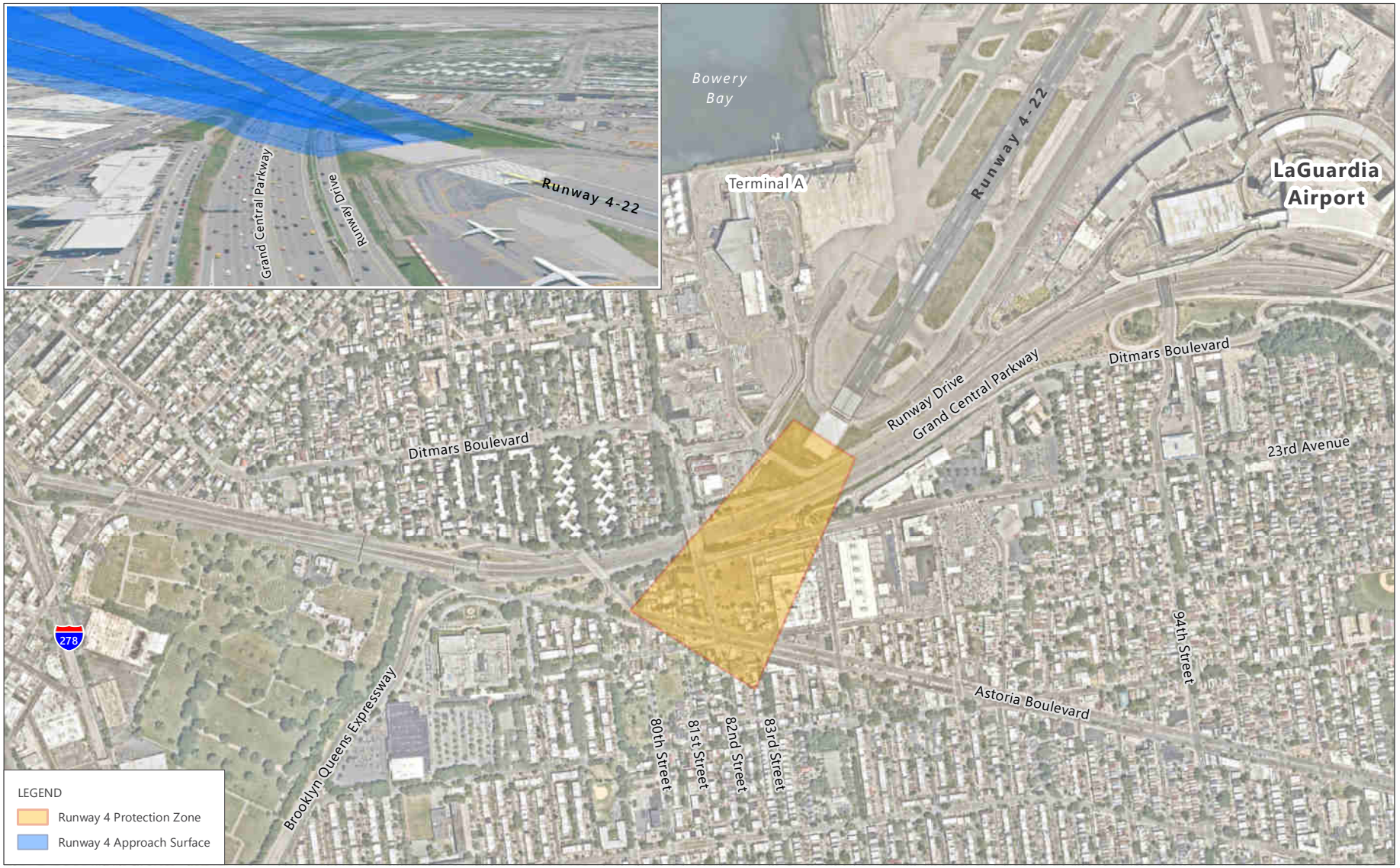
- a new subsurface station at LGA that connects to Terminals B and C – including platforms, stairwells, elevators/escalators, passageway, station agent booths (control area), turnstiles, ventilation, and emergency access;
- connections – including passenger walkway systems connecting a subway station at LGA to passenger terminals, parking garages, public transportation, and ground transportation facilities; and
- subway – including an extension of or branch from an existing subway line(s), tracks, signals, switches, and interlocking systems.

Additionally, it is assumed each subway extension alternative would include:

- Airport employee parking within walking distance (0.25 miles) of an existing subway station where the subway extension would originate;
- utilities infrastructure, both new and modified, to support each alternative; and
- enabling projects to allow construction of each alternative, including utility relocation, demolition of certain existing facilities (such as station platforms, tracks, switching), changes to existing subway schedule times, and addition of operating rollingstock[22] to accommodate extended tracks and additional station stops, while maintaining the current subway schedule.

For each subway extension alternative that would approach LGA from the west, the alignment at or above grade would be within the runway protection zone (RPZ) for Runway 4 (see **Exhibit 2-6**). The RPZ is defined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, as a trapezoidal surface at ground level prior to the threshold or beyond the runway end to enhance the safety and protection of people and property on the ground. While FAA

[22] This refers to in-service passenger equipment cars.



SOURCES: Nearmap, New York, June 2020 (aerial); Runway End Siting Requirements and Approach Surfaces derived from guidance in AC 150/5300-13A (surfaces).

NORTH 0 1,000 ft

EXHIBIT 2-6

RUNWAY 4 PROTECTION ZONE AND APPROACH SURFACE

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AC 150/5300-13A notes that "it is desirable to clear all objects from the RPZ," it also acknowledges that "some uses are permitted" with conditions and other "land uses are prohibited."[23] Interim guidance from the FAA's Office of Airports indicates that prior to contacting the FAA about locating a rail facility land use within an RPZ, "the airport sponsor must identify and document the full range of alternatives that could avoid introducing the land use issue within the RPZ."[24]

The FAA has determined that an at-grade subway alignment alongside Runway Drive would transect the LGA Runway 4 RPZ and would not be permitted, as the height of the subway would interfere with aircraft operations. Further, maintaining vehicular access to Terminal A from the GCP would be unlikely as an at-grade subway alignment alongside Runway Drive would have to transect Ditmars Boulevard north of the GCP. As such, an above-grade subway alignment would need to be considered to provide service from locations west of the Airport. However, the elevated structure would be higher than the existing roadway and within the RPZ, and therefore would be a permanent obstruction to existing aircraft operations on Runway 4. The Runway 4 RPZ starts 200 feet from the runway threshold and extends an additional 2,500 feet to the southwest. In order to have a subway alignment at-grade alongside Runway Drive, Runway 4-22 would need to be shifted far enough to the northeast so that the alignment would be outside the RPZ. Currently, Runway Drive transects the RPZ in a fashion that would require Runway 4-22 to be shifted approximately 3,700 feet in order to be located beyond the RPZ. To accomplish this would require extending the runway platform on the northeast end of Runway 4-22 by 3,700 feet further into the East River, as well as relocating navigational aids, including the Approach Lighting System with Sequenced Flashing Lights (ALSF-1) that extends 1,400 feet off the existing runway deck. This would require extensive fill, impact to navigation in the surrounding water bodies including the nearby federal navigation channel,[25] and potentially require changes to the regional airspace structure and air traffic control procedures. As such, this option is considered infeasible.

Therefore, each subway extension alternative that would approach LGA from the west would include:

- the subway in a tunnel so that no impacts to the approach surface[26] to Runway 4 would occur; and
- a subterranean station at LGA because at the maximum 3 percent grade permitted by MTA, it would not be possible to transition a subway from a tunnel in the vicinity of the end of Runway 4 to an aboveground station at LGA.

Service of any of the subway extension alternatives would be operated by NYCT, with storage and maintenance of rail vehicles at existing NYCT rail yards.[27] Additionally, any changes in subway service plans would be subject to MTA Board approval. **Exhibit 2-7** presents the subway extension alternatives.

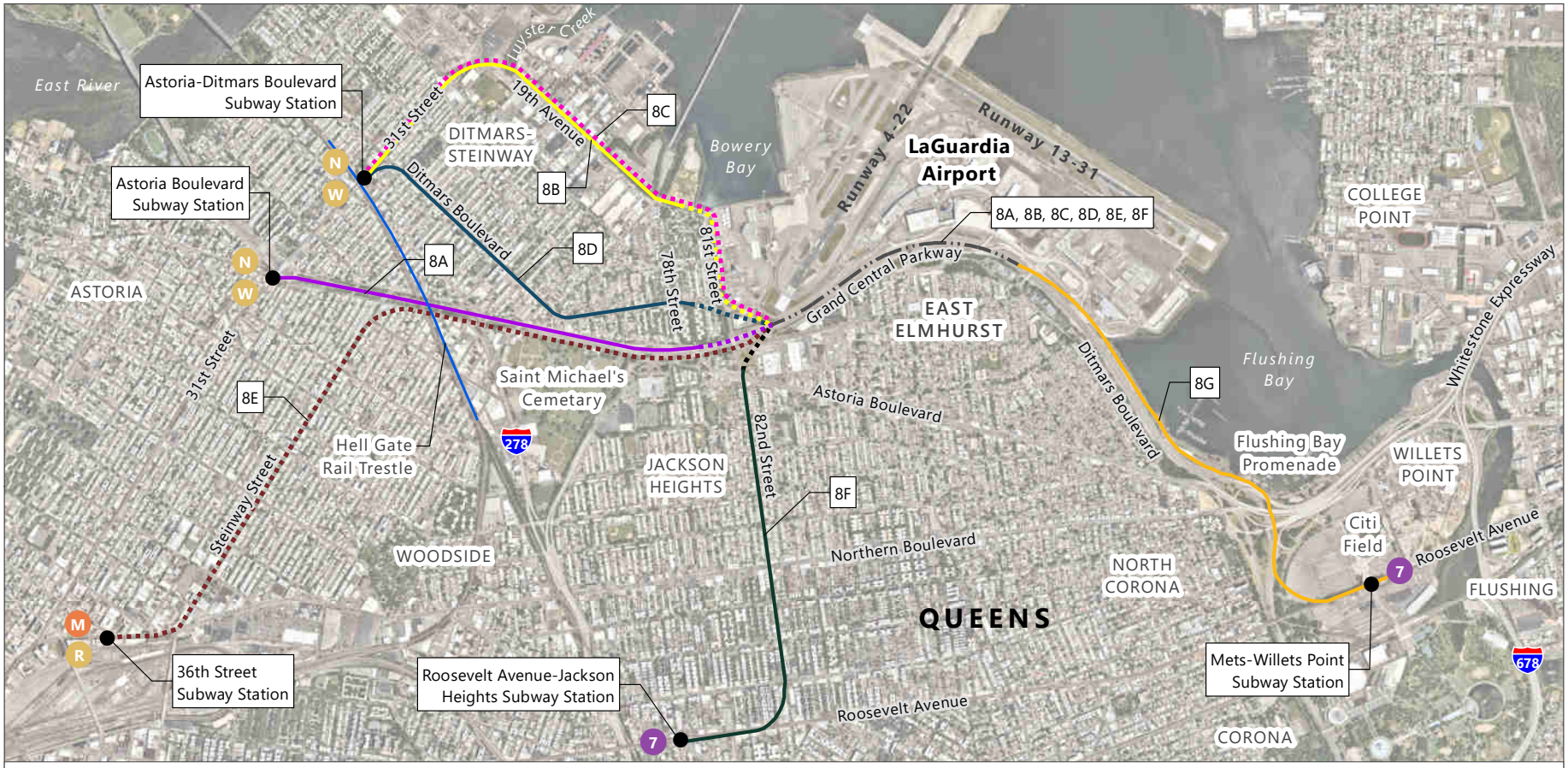
[23] US Department of Transportation, Federal Aviation Administration, Advisory Circular 150/5300-13A, Change 1, *Airport Design*, February 26, 2014.

[24] US Department of Transportation, Federal Aviation Administration, Memorandum: "Interim Guidance on Land Uses Within a Runway Protection Zone," September 27, 2012.

[25] The waterway adjacent to LGA is within the jurisdiction of the Vessel Traffic Service (VTS) New York, which falls under the US Coast Guard. The primary function of VTS New York is to instill good order and predictability on the waters of the Port of New York and New Jersey. This is accomplished by coordinating vessel movements through the collection, verification, organization, and dissemination of information.

[26] Each runway has several imaginary surfaces. An "approach surface" exists primarily to prevent existing or proposed manmade objects, objects of natural growth, or terrain from extending upward into navigable airspace.

[27] Metropolitan Transportation Authority, LGA Access Improvement Project EIS, MTA Coordination Meeting, September 5, 2019 (see Appendix E).



SOURCES: Nearmap, New York, June 2020 (aerial); Metropolitan Transportation Authority, August 2019 (subway stations); Reynolds Smith & Hills Inc., 2019 (alternatives); Ricondo & Associates, Inc., April 2020 (rail trestle).

EXHIBIT 2-7

SUBWAY EXTENSION ALTERNATIVES

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2.3.8.1 ALTERNATIVE 8A: FROM ASTORIA BOULEVARD SUBWAY STATION: ELEVATED ABOVE ASTORIA BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would create a branch of the N-W Lines from the Astoria Boulevard Subway Station to LGA. In this alternative, a new elevated subway would extend eastward from the Astoria Boulevard Subway Station along Astoria Boulevard to the GCP. From 31st Street, this alternative would be on an elevated structure within the GCP right-of-way. East of Steinway Street, this alternative would need to cross under the Hell Gate rail trestle that crosses over the GCP. The elevated subway would be predominantly in the south buffer area of the GCP, approximately 30 feet above the existing grade of neighborhood streets (and well above the GCP, which is in a cut below the neighborhood). Farther east, the new elevated subway would pass Saint Michael's Cemetery, a large cemetery on the south side of the GCP. Due to limited space that could accommodate subway columns, the structure might need to cantilever over the existing cemetery. Beyond Saint Michael's Cemetery, several bridges would have to be reconstructed to accommodate the new subway as it descends into a tunnel in order to stay below the Runway 4 approach surface and end at a subterranean station at LGA. This would create a branch in service for the N-W Lines wherein some trains would continue to LGA and other trains would remain on the current route for these lines.

2.3.8.2 ALTERNATIVE 8B: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: ELEVATED ABOVE 31ST STREET AND 19TH AVENUE ALTERNATIVE

This alternative would extend the elevated N-W Lines beyond the final stop at Astoria-Ditmars Boulevard Subway Station to LGA. This alternative would continue the elevated subway within and above 31st Street and would curve behind Consolidated Edison Property to meet 19th Avenue. At 46th Street, the elevated subway would shift to the north side of 19th Avenue and transition to a 1.2-mile-long tunneled section to reach LGA. At the end of 19th Avenue, the tunnel alignment would enter the west end of the Airport just south of the existing fuel farm. It would turn south and continue underground to avoid having an elevated subway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA. The new elevated section of the subway in this alternative would be supported by columns located in the street and/or sidewalks of 31st Street and 19th Avenue. With this subway extension, all trains on the N-W Lines would continue to the Airport.

2.3.8.3 ALTERNATIVE 8C: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: TUNNEL BENEATH 31ST STREET AND 19TH AVENUE ALTERNATIVE

This alternative would extend the N-W Lines beyond the final stop following approximately the same route as Alternative 8B. Beginning north of the Astoria Boulevard Subway Station, the existing elevated subway would ramp down along 31st Street from an elevated subway to an underground subway. This alternative would transition below ground before it reaches Ditmars Boulevard to enter a 3-mile-long tunnel, with the Astoria-Ditmars Boulevard Subway Station moved underground. The underground subway would then continue in a tunnel along the same route as Alternative 8B (see Section 2.3.8.2). This alternative would end at a subterranean station at LGA. The section of the subway in this alternative that would transition from an elevated subway to an underground subway would require the permanent closure of lanes on 31st Street.

2.3.8.4 ALTERNATIVE 8D: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: ELEVATED ABOVE DITMARS BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would extend the N-W Lines beyond the final stop at Astoria-Ditmars Boulevard Subway Station, continuing within and above Ditmars Boulevard approximately 1.25 miles before descending into a tunneled section near 78th Street. At the end of 81st Street, the tunnel alignment would turn slightly south and continue beneath the GCP and run along the south side of the GCP and end at a subterranean station at LGA. The new elevated section of the subway would be supported by columns located in the street and/or sidewalks of Ditmars Boulevard.

2.3.8.5 ALTERNATIVE 8E: FROM 36TH STREET SUBWAY STATION: TUNNEL BENEATH STEINWAY STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would construct a branch of the M and/or R Lines from the 36th Street Subway Station, continuing within and below Steinway Street approximately 1 mile. The alignment would then pass 25th Avenue before curving east, behind the TriBoro Beverage Distribution Center, to meet Astoria Boulevard. The alignment would continue beneath Astoria Boulevard crossing along the north side of Saint Michael's Cemetery before turning north. After the turn, the alignment would continue beneath the GCP to avoid having an elevated subway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA. This would create a branch in service for the M-R Lines wherein some trains would switch to the branch line to LGA and other trains would continue on the current route for these lines.

2.3.8.6 ALTERNATIVE 8F: FROM ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION: ELEVATED ABOVE 82ND STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would construct a branch of the 7 Line from the Roosevelt Avenue-Jackson Heights Subway Station on an elevated structure along 82nd Street. Beginning south of Astoria Boulevard, the elevated subway would ramp down along 82nd Street to an underground subway. This alternative would transition below ground near Astoria Boulevard to enter a 1-mile-long tunnel. The alternative would continue beneath the GCP to avoid having an elevated subway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA. This would create a branch in service for the 7 Line wherein some trains would switch to the branch line to LGA and other trains would continue on the current route to Flushing. The new elevated section of the subway in this alternative would be supported by columns located in the street and/or sidewalks of 82nd Street.

2.3.8.7 ALTERNATIVE 8G: FROM METS-WILLETS POINT SUBWAY STATION: ELEVATED ABOVE ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would construct a branch of the 7 Line from the Mets-Willets Point Subway Station on an elevated structure along the Flushing Bay Promenade and GCP. Beginning west of the Mets-Willets Point Subway Station, an elevated subway would curve from Roosevelt Avenue to meet the GCP. At the curve, the elevated subway would cross a portion of Citi Field's parking lot and a number of highway lanes and ramps west of Citi Field (including Northern Boulevard and the Whitestone Expressway) and then continue west over the ramps of the GCP. The alignment would continue to run parallel with the GCP along the Flushing Bay Promenade terminating at LGA. This would create a branch in service for the 7 Line wherein some trains would switch to the branch line to LGA and other trains would continue on the current route to Flushing.

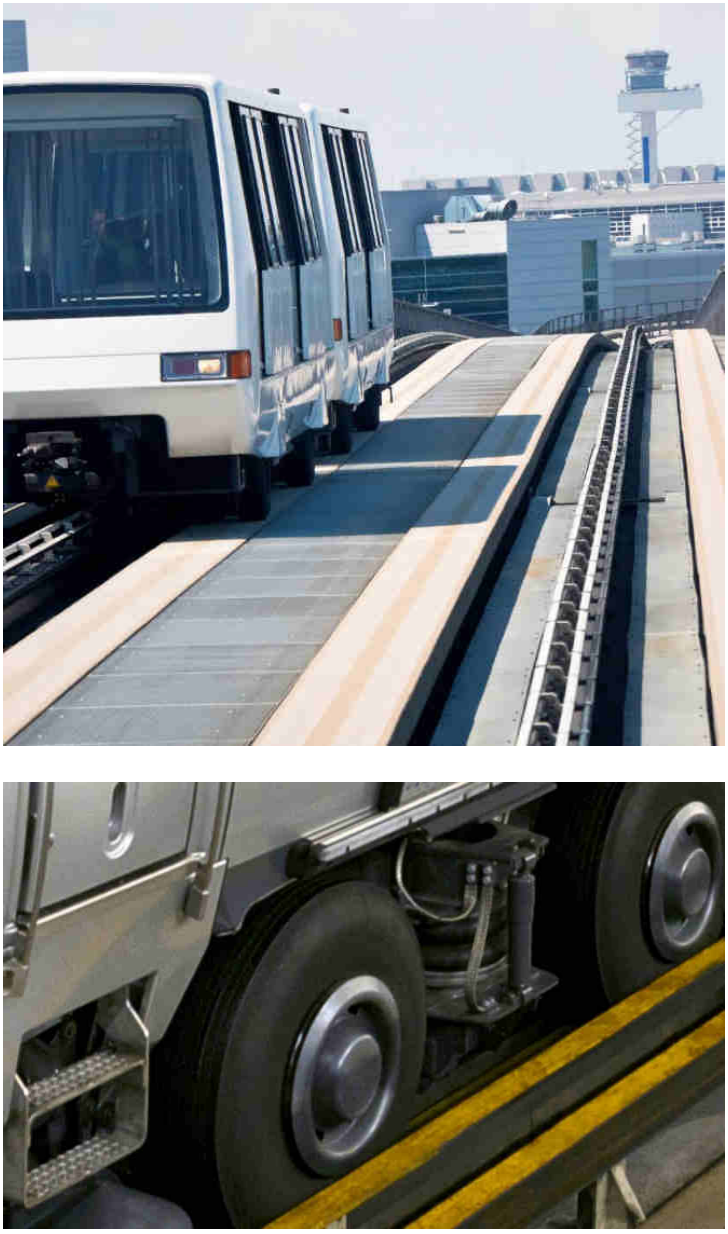
2.3.9 FIXED GUIDEWAY ALTERNATIVES

A fixed guideway alternative would result in a new transit system that would operate between an off-Airport station with connections to the New York City subway and/or commuter rail and the Airport on a dedicated alignment. The system would be independent of the existing MTA subway, rail, and bus systems. The type of technology could include rubber-tire APM, steel wheel–steel rail APM, Personal Rapid Transit, or Group Rapid Transit (see descriptions of these technologies below). These technologies may include varied design specifications (for example, maximum vertical grades and turning radii, required support facilities, and station size).

APM systems that provide access to an airport exist at several airports in the United States, including EWR, JFK, Hartsfield-Jackson Atlanta International Airport, Miami International Airport, and Phoenix Sky Harbor International Airport. Rubber-tire APMs are powered by electricity, operate on a fixed guideway, and are usually on an elevated

guideway (see **Exhibit 2-8**). The capacity of each car of a rubber-tire APM is dependent on the size of the car. Steel wheel–steel rail APMs are similar to rubber-tire APMs but use steel wheels and steel rails instead of rubber tires (see **Exhibit 2-9**).

EXHIBIT 2-8 EXAMPLE OF RUBBER-TIRE AUTOMATED PEOPLE MOVER



SOURCE: Getty Images, 2019 (stock image).

EXHIBIT 2-9 EXAMPLE OF STEEL WHEEL–STEEL RAIL AUTOMATED PEOPLE MOVER

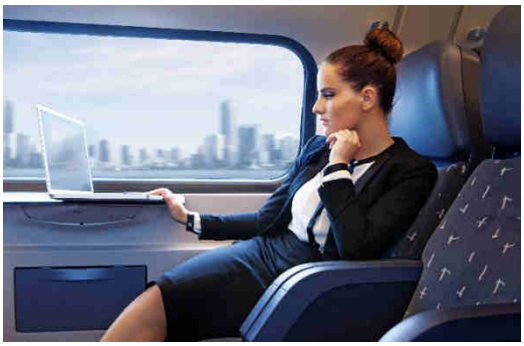
SOURCE: Getty Images, 2019 (stock image).

Personal Rapid Transit systems are small, automated vehicles or pod cars, powered by electric battery, that operate on a fixed guideway, which is typically elevated, but can operate underground or at ground level. There are many variants of PRTs, including those that are suspended from an overhead rail (steel wheels on steel rails) and those that operate on rails (rubber-tired or steel wheels). A pod generally has seating for four but could operate with only one passenger. Pods travel separately from other pods, rather than in trains (see **Exhibit 2-10**). There are multiple Personal Rapid Transit companies within the United States, including JPod, SkyTran, Glydways, the Boring Company, and CyberTran International. Four completed systems are in operation throughout the world (Rotterdam,

Netherlands; Masdar City in Abu Dhabi; Heathrow Airport in London, England; and Suncheon Bay in South Korea). The cars serve stations and are on-call by passengers. Once boarded, the passenger inputs their destination and the car responds, traveling nonstop to the desired destination. A fixed guideway would be designed with the appropriate dimensions so that it would accommodate the range of technologies. The type of technology ultimately used for a fixed guideway system would be determined by the Design-Build-Operate-Maintain Contractor for the project alongside the Port Authority. Fixed guideway alternatives would need to include a yard for vehicle storage and a facility to maintain and repair vehicles.

A Group Rapid Transit system is similar to that of a Personal Rapid Transit system in how it operates and the type of infrastructure needed. The primary difference is the size of the automated vehicle. A Group Rapid Transit automated vehicle has space for up to 24 passengers, which is larger than the four-seat automated vehicle used for a Personal Rapid Transit system.[28]

EXHIBIT 2-10 EXAMPLE OF PERSONAL RAPID TRANSIT PODS



SOURCE: Getty Images, 2019 (stock image).

[28] European Commission, *Guidelines for Implementers of Group Rapid Transit*, June 2010.

At the off-Airport terminal station, passengers would connect between the new fixed guideway system and existing subway, bus, or commuter rail trains for the remainder of their trips. Pedestrian bridges and vertical circulation would be provided to ensure a convenient transfer between the modes. Employee parking could potentially be provided at the off-Airport station.

Each of the potential fixed guideway alternatives would include the following components:

- stations, including platforms, vertical circulation (such as stairwells, elevators, escalators), passageways, station agent booths (control area), and turnstiles;
- connections, including passenger walkway systems connecting the fixed guideway station at LGA to passenger terminals, parking garages, public transportation, and ground transportation facilities;
- an elevated fixed guideway system that would be at least 30 feet above grade and would connect the Airport to the NYCT subway, bus, and/or the MTA commuter rail;
- a facility for operations and the maintenance and storage of vehicles (OMSF); and
- traction power substations (TPSSs).

Additionally, it is assumed each fixed guideway alternative would include:

- Airport employee parking within walking distance (0.25 miles) of where the fixed guideway would originate;
- utilities infrastructure, both new and modified, to support each alternative; and
- enabling projects to allow construction of each alternative, including utility relocation, and demolition of certain existing LIRR/subway station facilities (such as station platforms, tracks, switching).

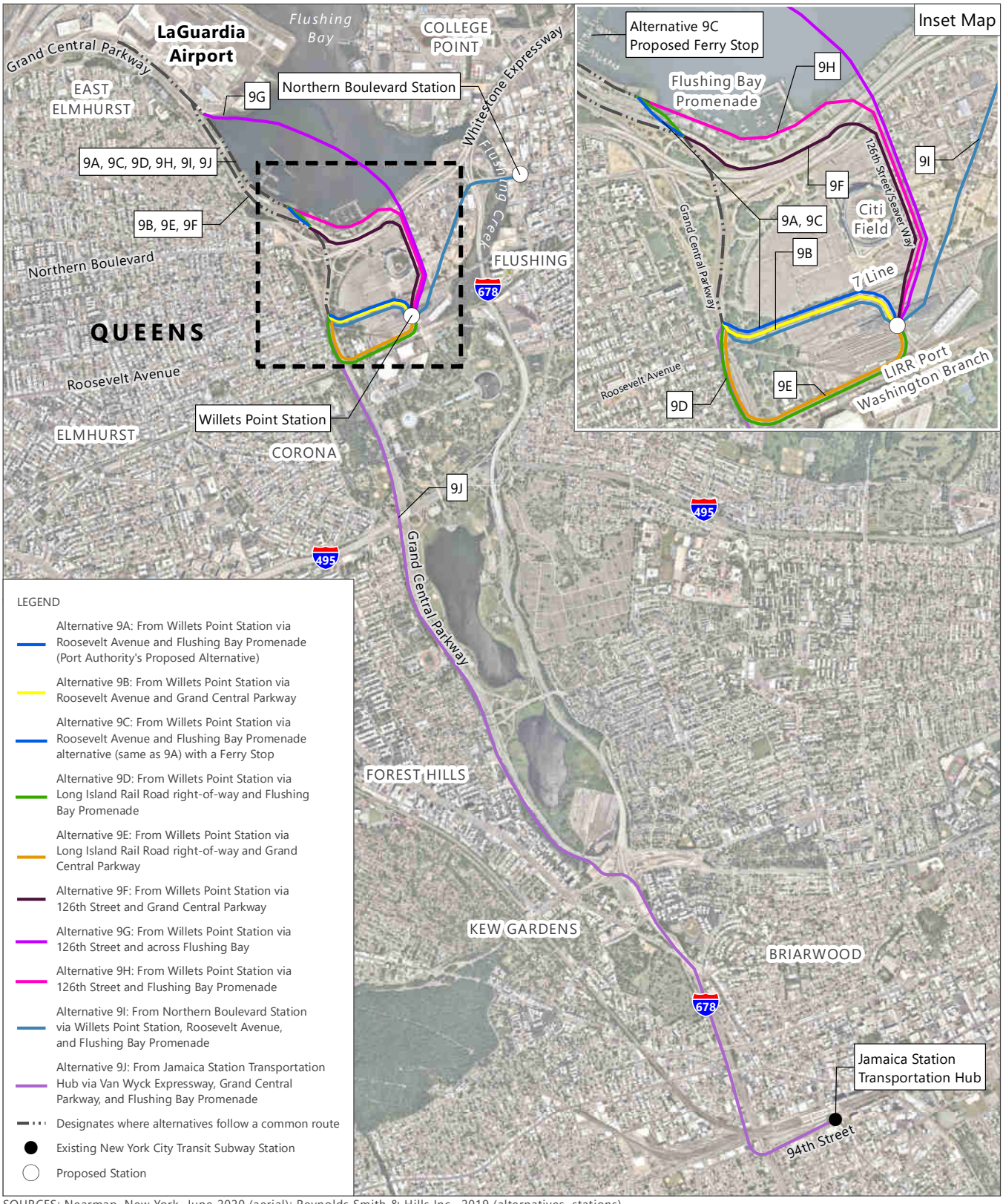
For each fixed guideway alternative that would approach LGA from the south or west, the alignment would be within the RPZ for Runway 4 (see Exhibit 2-6); therefore, each would include:

- the fixed guideway in a tunnel so that no impacts to the approach surface to Runway 4 would occur; and
- a subterranean station at LGA because at a maximum 3 percent grade, it would not be possible to transition a fixed guideway from a tunnel in the vicinity of the end of Runway 4 to an aboveground station at LGA.

The 20 fixed guideway alternatives have been grouped by the location of the origin station. Alternatives 9A through 9J have stations east of LGA and are presented on **Exhibit 2-11**. For the alternatives that have the origin station between the Mets-Willets Point Subway Station (serving the 7 Line) and the Mets-Willets Point LIRR Station (Alternatives 9A through 9H), this location will be referred to as the Willets Point Station. Alternatives 9K through 9M have stations south of LGA and are presented on **Exhibit 2-12**. Alternatives 9N through 9Q have stations west of LGA and are presented on **Exhibit 2-13**. Alternatives 9R, 9S, and 9T, presented on **Exhibit 2-14**, are considered "through lines," which originate at two separate subway stations with a stop at LGA in between.

2.3.9.1 ALTERNATIVE 9A: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE (PORT AUTHORITY'S PROPOSED ALTERNATIVE)

This alternative alignment would begin at the Willets Point Station. This alternative would extend west on an elevated guideway above the south side of Roosevelt Avenue and turn north following the GCP and cross the GCP / Whitestone Expressway interchange. The elevated line would extend along the southern edge of the Flushing Bay Promenade adjacent to the westbound lanes on the GCP to LGA.



SOURCES: Nearmap, New York, June 2020 (aerial); Reynolds Smith & Hills Inc., 2019 (alternatives, stations).

EXHIBIT 2-11

NORTH 0 3,500 ft

FIXED GUIDEWAY ALTERNATIVES (EAST)

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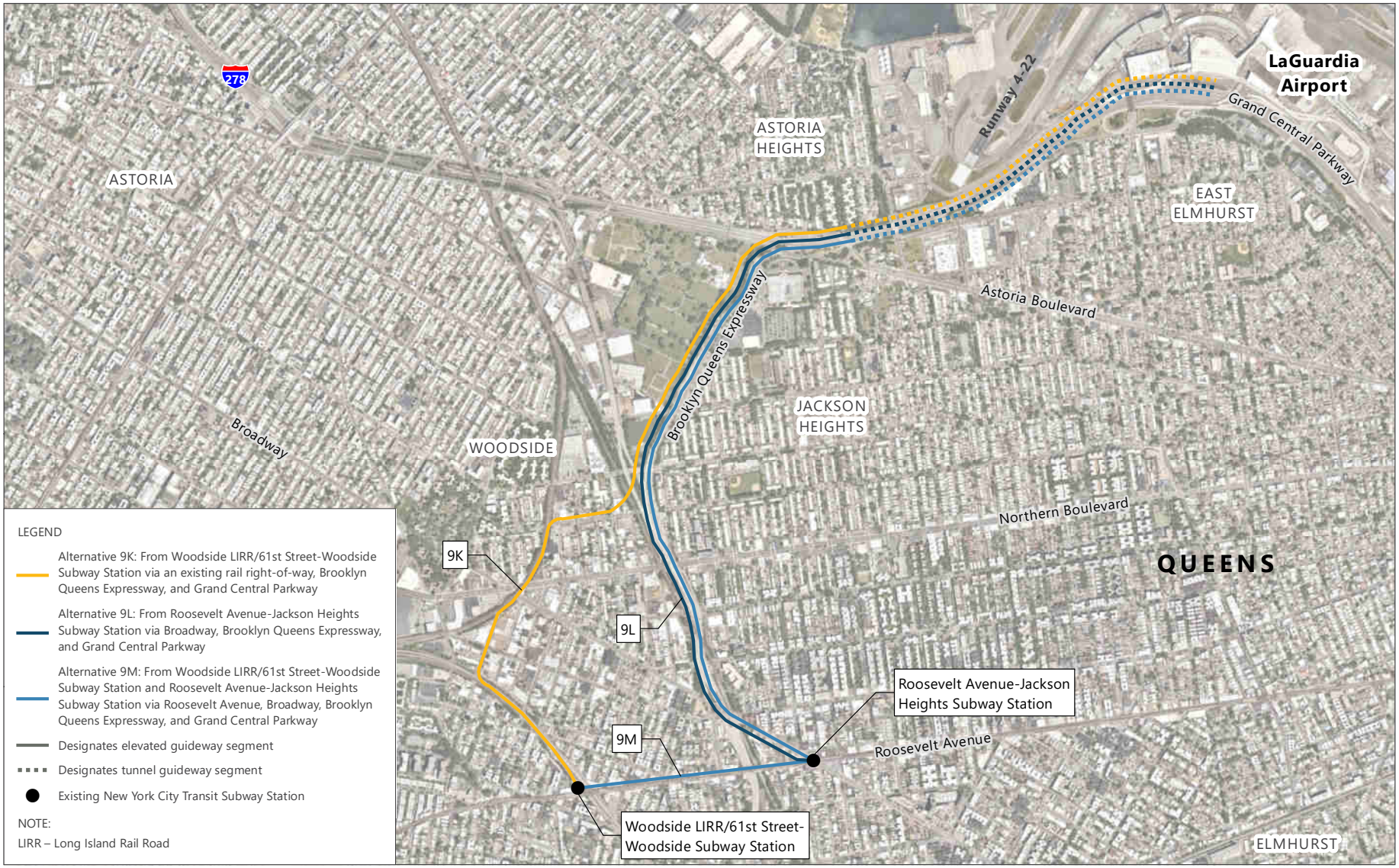

SOURCES: Nearmap, New York, June 2020 (aerial); Reynolds Smith & Hills Inc., 2019 (alternatives, stations).

EXHIBIT 2-12

NORTH 0 2,000 ft

FIXED GUIDEWAY ALTERNATIVES (SOUTH)

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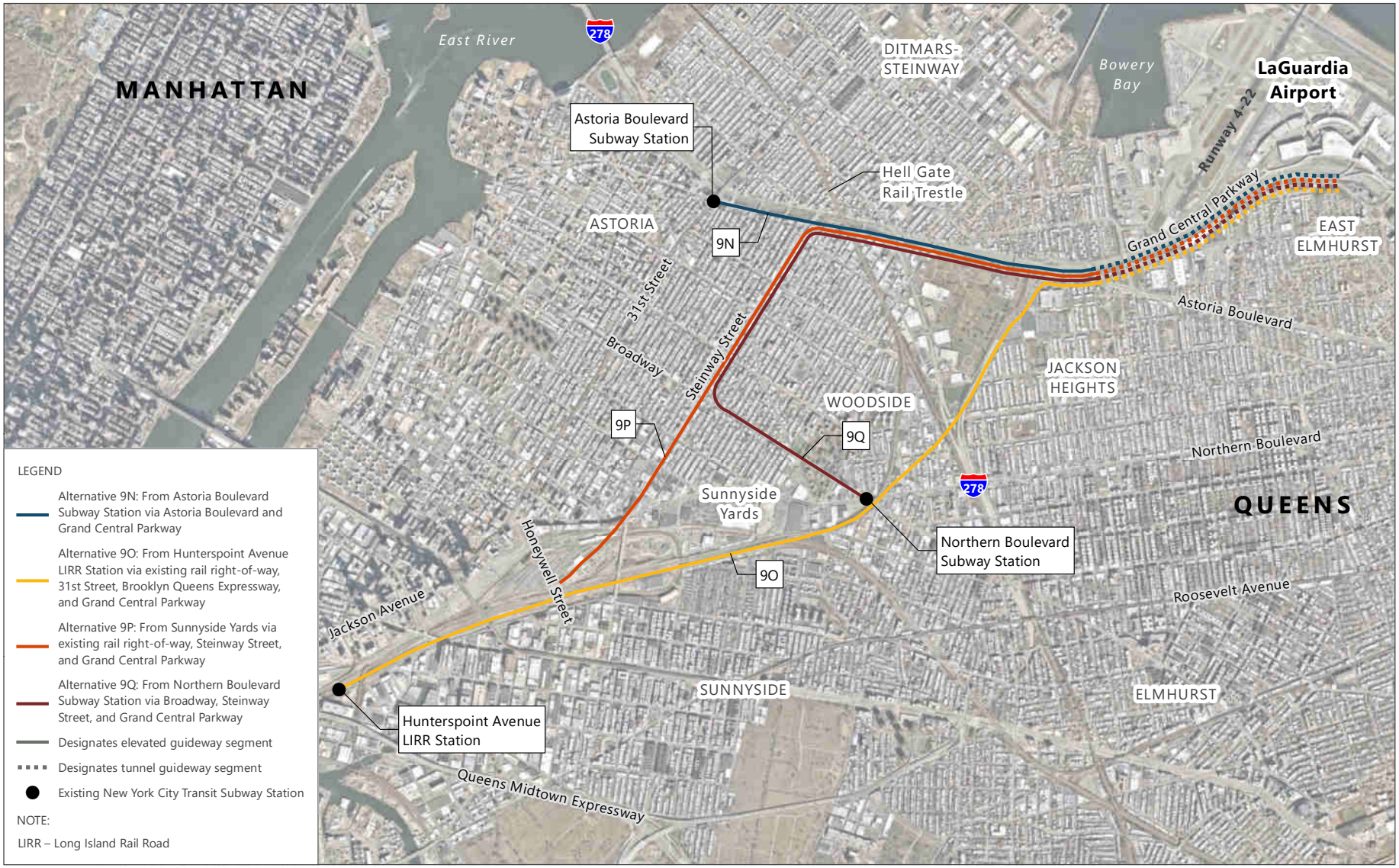

SOURCES: Nearmap, New York, March 2020 (aerial); Reynolds Smith & Hills Inc., 2019 (alternatives, stations).

EXHIBIT 2-13

NORTH 0 3,000 ft

FIXED GUIDEWAY ALTERNATIVES (WEST)

P:\GIS\Projects\lga\MXD\LGA_FEIS_Exh2-13_FixedGuidewayAlternativesWest_20210219.mxd

SOURCES: Nearmap, New York, June 2020 (aerial); Reynolds Smith & Hills Inc., 2019 (alternatives, stations).

EXHIBIT 2-14

NORTH 0 2,500 ft

FIXED GUIDEWAY ALTERNATIVES (THROUGH LINES)

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2.3.9.2 ALTERNATIVE 9B: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Willets Point Station and move west on an elevated guideway above the south side of Roosevelt Avenue following the 7 Line for approximately 0.4 miles to the right-of-way of the GCP. The elevated fixed guideway would then turn north following the median of the GCP to LGA.

2.3.9.3 ALTERNATIVE 9C: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE - WITH A FERRY STOP ALTERNATIVE

The alignment of this alternative would be the same as that described for Alternative 9A. This alternative would also include ferry service to a new ferry terminal along Flushing Bay Promenade, which would likely be located in the vicinity of the existing Marina facilities, and a station on the elevated fixed guideway that would connect to the new ferry terminal.

2.3.9.4 ALTERNATIVE 9D: FROM WILLETS POINT STATION VIA LONG ISLAND RAIL ROAD RIGHT-OF-WAY AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative alignment would begin at the Willets Point Station and travel west on an elevated guideway above the LIRR Port Washington Branch right-of-way. At the GCP, the elevated fixed guideway would turn north and move up the median or in the right-of-way of GCP, cross through the Northern Boulevard interchange and then turn west along the Flushing Bay Promenade. The elevated fixed guideway would then continue parallel to Flushing Bay Promenade to LGA.

2.3.9.5 ALTERNATIVE 9E: FROM WILLETS POINT STATION VIA LONG ISLAND RAIL ROAD RIGHT-OF-WAY AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Willets Point Station and travel west on an elevated guideway above the LIRR Port Washington Branch right-of-way. At the GCP, the elevated fixed guideway would turn north and move up the GCP in the median, cross the Northern Boulevard interchange and continuing along the median of the GCP to LGA.

2.3.9.6 ALTERNATIVE 9F: FROM WILLETS POINT STATION VIA 126TH STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Willets Point Station, travel northeast on an elevated guideway, and cross Roosevelt Avenue and the 7 Line to 126th Street (also known as Seaver Way). At 126th Street, this elevated fixed guideway route would turn north, running just east of Citi Field, cross to the median of the Whitestone Expressway and turn west to follow the median of the Whitestone Expressway to the median of the GCP. The elevated route would then follow the median of the GCP to LGA.

2.3.9.7 ALTERNATIVE 9G: FROM WILLETS POINT STATION VIA 126TH STREET AND ACROSS FLUSHING BAY ALTERNATIVE

This alternative alignment would begin at the Willets Point Station, travel northeast on an elevated guideway, and cross Roosevelt Avenue and the 7 Line to 126th Street. This elevated fixed guideway route would head north on 126th Street crossing over the Whitestone Expressway to Flushing Bay, and then turn toward the northwest on a bridge across Flushing Bay. The bridge would have enough clearance to allow boats to traverse underneath and would also avoid existing docks and piers. The route would return to land at the southeastern corner of LGA to access the on-Airport APM stations.

2.3.9.8 ALTERNATIVE 9H: FROM WILLETS POINT STATION VIA 126TH STREET AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative alignment would begin at the Willets Point Station, travel northeast on an elevated guideway, and cross Roosevelt Avenue and the 7 Line to 126th Street. This elevated fixed guideway route would head north on 126th Street, crossing over the Whitestone Expressway, and then turn to the west to the Flushing Bay Promenade, which it would follow to LGA.

2.3.9.9 ALTERNATIVE 9I: FROM NORTHERN BOULEVARD VIA WILLETS POINT STATION, ROOSEVELT AVENUE, AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative alignment would begin near downtown Flushing at a new station on Northern Boulevard. This elevated fixed guideway route would travel west, cross Flushing Creek, and follow Willets Point Boulevard to the Willets Point Station. From that station, the route would travel northwest to parallel Roosevelt Avenue and cross the 7 Line into the GCP right-of-way at the southwest corner of the Citi Field parking lot. The route would follow the GCP right-of-way to the Flushing Bay Promenade and then follow the Flushing Bay Promenade to LGA.

2.3.9.10 ALTERNATIVE 9J: FROM JAMAICA STATION TRANSPORTATION HUB VIA VAN WYCK EXPRESSWAY, GRAND CENTRAL PARKWAY, AND FLUSHING BAY PROMENADE ALTERNATIVE

The off-Airport terminal for this alternative would be the existing Jamaica Station Transportation Hub in Jamaica, Queens, approximately 6 miles southeast of LGA. From Jamaica Station, this alternative would head west on an elevated guideway over 94th Avenue to the Van Wyck Expressway (I-678). It would continue northwesterly in the median of the Van Wyck Expressway, through the Kew Gardens Interchange, follow the median of the GCP to the Flushing Bay Promenade, and then follow the Flushing Bay Promenade to LGA.

2.3.9.11 ALTERNATIVE 9K: FROM WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION VIA AN EXISTING RAIL RIGHT-OF-WAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Woodside LIRR/61st Street-Woodside Subway Station and would be on an elevated guideway above the existing LIRR right-of-way to 54th Street. It would then turn north to 31st Avenue where it would turn east and access the right-of-way of the BQE. The alternative would then follow the BQE to the GCP. To avoid having an elevated fixed guideway affect the approach surface on Runway 4, the alternative would then move into a tunnel configuration near the GCP / BQE interchange and be in a tunnel beneath the GCP. This alternative would end at a subterranean station at LGA.

2.3.9.12 ALTERNATIVE 9L: FROM ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA BROADWAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Roosevelt Avenue-Jackson Heights Subway Station and follow an elevated guideway above Broadway to the BQE. It would then parallel the east side of the BQE to the GCP. In order to avoid having an elevated fixed guideway affect the approach surface on Runway 4, the alternative would then transition into a tunnel near the GCP / BQE interchange and be in a tunnel beneath the GCP. This alternative would end at a subterranean station at LGA.

2.3.9.13 ALTERNATIVE 9M: FROM WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION AND ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA ROOSEVELT AVENUE, BROADWAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Woodside LIRR/61st Street-Woodside Subway Station and follow an elevated guideway above the existing subway line to the Roosevelt Avenue-Jackson Heights Subway Station. This alternative would then follow Broadway for a short distance to reach the BQE and then parallel the BQE to the GCP. In order to avoid having an elevated fixed guideway affect the approach surface on Runway 4, the alternative would then move into a tunnel configuration near the GCP / BQE interchange and be in a tunnel beneath the GCP. This alternative would end at a subterranean station at LGA.

2.3.9.14 ALTERNATIVE 9N: FROM ASTORIA BOULEVARD SUBWAY STATION VIA ASTORIA BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Astoria Boulevard Subway Station and follow a similar alignment to that discussed for Alternative 8A (see Section 2.2.8.1). This alternative would follow an elevated guideway above Astoria Boulevard and then be predominantly in the south buffer area of the GCP. This alternative would transition into a tunnel to avoid having an elevated fixed guideway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA.

2.3.9.15 ALTERNATIVE 9O: FROM HUNTERSPOINT AVENUE LIRR STATION VIA EXISTING RAIL RIGHT-OF-WAY, 31ST STREET, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Hunterspoint Avenue LIRR Station near the junction of Jackson Avenue and the Queens Midtown Expressway. This alternative would travel east on an elevated guideway above the LIRR right-of-way to 31st Avenue, then travel east to reach the BQE and then parallel the BQE to the GCP. In order to avoid having an elevated fixed guideway affect the approach surface on Runway 4, the alternative would then move into a tunnel configuration near the GCP / BQE interchange and be in a tunnel beneath the GCP. This alternative would continue in a tunnel and end at a subterranean station at LGA.

2.3.9.16 ALTERNATIVE 9P: FROM SUNNYSIDE YARDS VIA EXISTING RAIL RIGHT-OF-WAY, STEINWAY STREET, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Sunnyside Yards at 35th Street and Honeywell Street. This alternative would follow an elevated guideway above the existing rail lines to 39th Street and Steinway Street and turn north following Steinway Street to the GCP and would then transition into a tunnel to avoid having an elevated fixed guideway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA.

2.3.9.17 ALTERNATIVE 9Q: FROM NORTHERN BOULEVARD SUBWAY STATION VIA BROADWAY, STEINWAY STREET, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment would begin at the Northern Boulevard Subway Station and would include an elevated guideway that would follow Broadway west to Steinway Street. At Steinway Street, this alternative would head north following Steinway Street to Astoria Boulevard, cross over the Hell Gate rail trestle, and then turn east to the GCP. This alternative would follow the GCP and would transition into a tunnel to avoid having an elevated fixed guideway affect the approach surface of Runway 4. This alternative would continue in a tunnel and end at a subterranean station at LGA.

2.3.9.18 ALTERNATIVE 9R: THROUGH LINE CONNECTING WILLETS POINT STATION, LAGUARDIA AIRPORT, AND WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION VIA ROOSEVELT AVENUE, GRAND CENTRAL PARKWAY, BROOKLYN QUEENS EXPRESSWAY, AND AN EXISTING RAIL RIGHT-OF-WAY ALTERNATIVE

This alternative alignment is similar to a combined alignment of Alternatives 9B and 9K; it would begin at the Willets Point Station and travel west on an elevated guideway along Roosevelt Avenue to the GCP. This alignment would follow the median of the GCP to the eastern end of LGA and transition into a tunnel to access a subterranean station at LGA. To the west of LGA this alternative would continue in a tunnel to avoid having an elevated fixed guideway affect the approach surface of Runway 4 and would surface aboveground near the intersection of the GCP, Astoria Boulevard, and 81st Street. This alternative would then follow an elevated guideway along the GCP to the BQE, where it would turn south and access the right-of-way of the BQE. This alternative would then turn south around 31st Avenue to 54th Street and continue above the existing LIRR right-of-way, ending at the Woodside LIRR/61st Street-Woodside Subway Station.

2.3.9.19 ALTERNATIVE 9S: THROUGH LINE CONNECTING WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION AND ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA BROADWAY, ROOSEVELT AVENUE, AN EXISTING RAIL RIGHT-OF-WAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative alignment is similar to a combined alignment of Alternatives 9K and 9L; it would begin at both the Roosevelt Avenue-Jackson Heights and the Woodside LIRR/61st Street-Woodside Subway Stations, then merge into a single alignment to access LGA. From the Roosevelt Avenue-Jackson Heights Subway Station, this alternative alignment would follow an elevated guideway above Broadway to the BQE. Leaving the Woodside LIRR/61st Street-Woodside Subway Station, the guideway would be elevated above the LIRR alignment to 55th Street, then turn north to 31st Avenue and join the route from the Roosevelt Avenue-Jackson Heights Subway Station at the BQE and then parallel the BQE to the GCP. In order to avoid having an elevated fixed guideway affect the approach surface on Runway 4, the alternative would then move into a tunnel configuration near the GCP / BQE interchange and be in a tunnel beneath the GCP. This alternative would continue in a tunnel and end at a subterranean station at LGA.

2.3.9.20 ALTERNATIVE 9T: THROUGH LINE CONNECTING WILLETS POINT STATION, LAGUARDIA AIRPORT, AND ASTORIA-DITMARS BOULEVARD SUBWAY STATION VIA ROOSEVELT AVENUE, GRAND CENTRAL PARKWAY, 19TH AVENUE, AND 31ST STREET ALTERNATIVE

This alternative alignment, which is similar to a combined alignment of Alternatives 9B and 8B, would begin at the Willets Point Station and travel west on an elevated guideway along Roosevelt Avenue to the GCP. This alignment would follow the median of the GCP to the eastern end of LGA and transition into a tunnel to access a subterranean station at LGA. To the west of LGA this alternative would continue in a tunnel to avoid having an elevated fixed guideway affect the approach surface of Runway 4 and would surface aboveground near the intersection of the GCP, Astoria Boulevard, and 81st Street and then turn north on 81st Street. This alternative alignment would then follow an elevated guideway above 81st Street to 19th Avenue and turn west along 19th Avenue, to 31st Street. At 31st Street, this alternative alignment would turn south, following 31st Street to the Astoria-Ditmars Subway Station.

2.3.10 RAIL ALTERNATIVES

Rail alternatives would result in the construction of a new rail line that would operate between an off-Airport station with connections to the New York City subway and/or commuter rail and the Airport on a dedicated alignment. The

system would operate on separate tracks with separate rail cars from the existing MTA subway and LIRR. Each of the rail alternatives would have direct access to LGA with no intermediate stops. **Exhibit 2-15** shows the rail alternatives.

2.3.10.1 ALTERNATIVE 10A: UNDERGROUND FROM SUNNYSIDE YARDS VIA BROOKLYN QUEENS EXPRESSWAY AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would construct a new underground rail line from Sunnyside Yards[29] to LGA. This new rail line would be underground and would be beneath the existing rail lines bearing north where the lines separate at the eastern end of Sunnyside Yards to Northern Boulevard. In a tunnel configuration, the line would follow Northern Boulevard east to the BQE and follow the BQE, continuing in a tunnel configuration to the GCP. Following the GCP east in the tunnel configuration, the line would end at a subterranean station at LGA. This alternative would require modifications to the Sunnyside Yards to construct the rail line, to construct an underground station, and to construct underground passageways for passengers to access the underground station and the new rail line.

2.3.10.2 ALTERNATIVE 10B: UNDERGROUND FROM MIDTOWN MANHATTAN VIA TUNNEL BENEATH EAST RIVER ALTERNATIVE

This alternative would construct a new underground rail line from Midtown Manhattan (either from Grand Central Terminal or Penn Station) to Sunnyside Yards in Queens and then would follow the same alignment from Sunnyside Yards to LGA, as described for Alternative 10A. This new rail line would be placed in a new or an existing tunnel beneath the East River, have a direct alignment to a subterranean station at LGA. This alternative would require modifications to either Grand Central Terminal or Penn Station to construct the rail line and to construct the connections between the existing station and this new rail line.

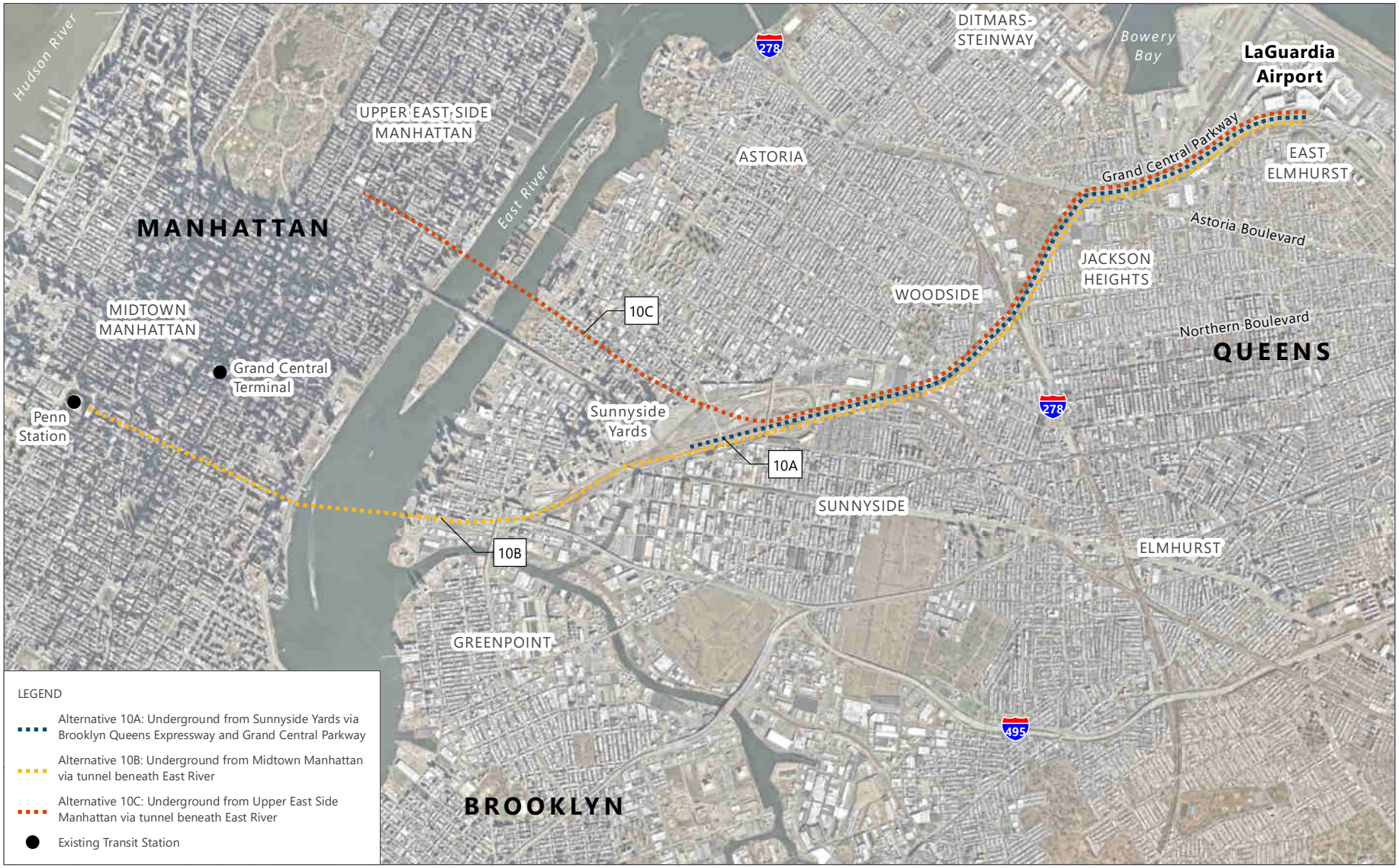
2.3.10.3 ALTERNATIVE 10C: UNDERGROUND FROM UPPER EAST SIDE MANHATTAN VIA NEW TUNNEL BENEATH EAST RIVER ALTERNATIVE

This alternative would construct a new underground rail line from the Upper East Side of Manhattan to Sunnyside Yards in Queens and then would follow the same alignment from Sunnyside Yards to LGA, as described for Alternative 10A. This new rail line would be placed in a new tunnel beneath the East River and end at a subterranean station at LGA. This alternative could require modifications to one of the existing subway stations on the Q Line on the Upper East Side to construct the rail line and to construct a station for passengers to access the new rail line. In addition, connections between the newly constructed station and the existing subway station would need to be constructed.

2.4 SCREENING PROCESS OVERVIEW

For this EIS, the FAA established a two-step screening process to comparatively evaluate the list of potential alternatives to determine which of them are reasonable and should be carried forward for detailed environmental impact analysis. According to guidance from the CEQ and in FAA Order 1050.1F, in order for an alternative to be reasonable, it must meet the purpose and need of the proposed action and must be practical or feasible from the technical and economic standpoint and using common sense. An alternative may still be reasonable even if it is outside the legal jurisdiction of the FAA or if there is a conflict with existing law. The FAA used a two-step screening process to determine the reasonable alternatives to be analyzed in this EIS.

[29] Sunnyside Yards, which is about 4 miles southwest of LGA and 5 miles west of the Mets-Willets Point LIRR Station, is one of the busiest rail yards in the country and a key train storage yard and maintenance hub for Amtrak's Northeast Corridor. It also serves New Jersey Transit and the LIRR, which is developing storage tracks and maintenance facilities there as part of the LIRR East Side Access project.



SOURCES: Nearmap, New York, March 2020 (aerial); Metropolitan Transportation Authority, June 2019 (Long Island Railroad Station); Metropolitan Transportation Authority, August 2019 (subway stations); Reynolds Smith & Hills, 2019 (alternatives).

EXHIBIT 2-15

RAIL ALTERNATIVES

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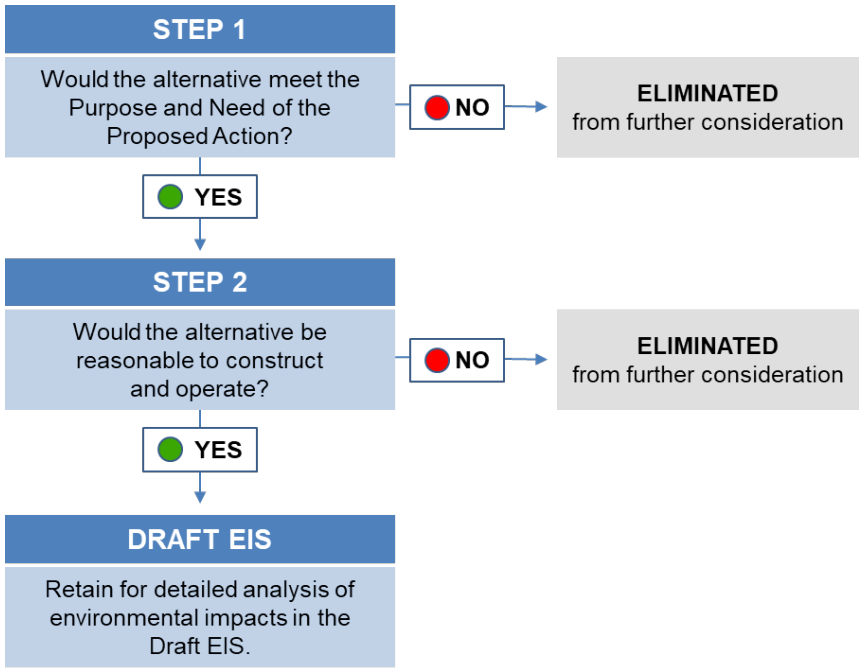
In Step 1, each alternative was analyzed to determine whether the alternative could achieve the Purpose and Need. Alternatives that would not meet all elements of the Purpose and Need were determined to be unreasonable and, therefore, were eliminated from further consideration. Alternatives that met all elements of the Purpose and Need were moved to Step 2 of the screening process.

In Step 2, alternatives that passed the Step 1 screening process were comparatively analyzed with respect to whether the alternative would be reasonable to construct and operate and would be practical or feasible from a technical and economic standpoint, using common sense.[30] These screening criteria include whether the alternative:

- could be implemented without a material effect to major infrastructure, transportation facilities, or utilities;
- could be implemented without affecting peak-hour subway, rail, and/or transit service during construction;
- is reasonable to construct given cost considerations; and
- could provide access to identified locations throughout the New York metropolitan area.

Alternatives that met all elements of the criteria for determining whether the alternative is reasonable to construct and operate were retained for a detailed evaluation of their environmental impacts. Alternatives that would not be reasonable to construct and operate were determined to be unreasonable and, therefore, were eliminated from further consideration. **Exhibit 2-16** conceptually portrays the screening process.

EXHIBIT 2-16 SCREENING PROCESS



NOTE: EIS – Environmental Impact Statement
SOURCE: RS&H, Inc., and Ricondo & Associates, Inc., January 2020.

[30] Council of Environmental Quality, *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations,* 46 *Federal Register* 18026, March 23, 1981. (Number 2a)

2.5 SCREENING STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION?

The FAA developed four questions to determine whether the alternative would meet the Purpose and Need of the Proposed Action and should be advanced to Step 2 of the screening process.

- Does the alternative provide a time-certain transportation option to LGA? For the response to be "yes," the alternative must provide access to LGA on a specific schedule and using a dedicated right-of-way (that is, it would operate 24 hours per day and 7 days per week, be exclusively used by the transportation mode, and be separate from and not be affected by or effect on-road transportation or traffic).
- Does the alternative provide supplemental access to LGA? For the response to be "yes," the alternative can either provide a new mode of access to LGA or an increase in existing access (such as increased frequency of service or a modification in service that increases reliability).
- Does the alternative provide the opportunity to reduce passenger vehicle trips to and from LGA on off-Airport roadways in the vicinity of the Airport without increasing roadway congestion? For the response to be "yes," the potential for a reduction in the number of vehicle trips on roadways in the vicinity of LGA must occur. This is primarily a reduction in the number of vehicles used by passengers or employees. In addition, the alternative cannot directly result in any increase in roadway congestion on off-Airport roadways in the vicinity of the Airport.
- Does the alternative provide adequate replacement Airport employee parking to enable efficient use of on-Airport space? For the response to be "yes," the alternative must provide approximately 216,000 square feet[31] of surface or structured parking located off-Airport within walking distance (0.25 miles) of an access point that has direct access[32] to LGA. For any alternatives that require construction of an elevated OMSF, the parking is assumed to be included as part of that facility to reduce the footprint of development. For other alternatives where an elevated OMSF would not be required, the parking needs to be within walking distance of an access point for that alternative.

2.5.1 NO ACTION ALTERNATIVE

The No Action Alternative would not provide any supplemental access or improvements to existing access routes to LGA, and access to LGA would be generally consistent with existing conditions. This alternative would not provide a time-certain transportation option to LGA, supplemental access to LGA, an opportunity to reduce passenger vehicle trips to and from LGA, or adequate replacement Airport employee parking to enable efficient use of on-Airport space. Because LGA is a highly constrained site with a small footprint and limited opportunity to expand airside and landside support facilities, keeping employee parking in its existing location reduces the Port Authority's flexibility for efficient performance of routine maintenance activities. Although the No Action Alternative does not meet the Purpose and Need of the Proposed Action, it must be carried forward in the assessment of environmental impacts as required by 40 CFR 1502.14(d). The No Action Alternative will serve as the basis for comparison of the impacts of the other alternatives that are carried forward for analysis.

[31] The size of the parcel that accommodates parking is not required to be 216,000 square feet. The parcel needs to be of sufficient size to accommodate either 216,000 square feet of surface parking or 216,000 square feet of structured (for example, multi-level) parking. This square footage is based on the Port Authority need to free up space adjacent to the AOA in the existing employee Lot P10 to provide the flexibility required for efficient performance of routine maintenance activities (see Section 1.4.4).

[32] Direct access is achieved when the transportation method does not require transfers to reach a destination.

2.5.2 DIVERSION OF AIR TRAFFIC AT LGA ALTERNATIVES

2.5.2.1 ALTERNATIVE 2A: USE OF OTHER EXISTING AIRPORTS ALTERNATIVE

This alternative would result in the partial shifting of aircraft operations to one or more of the other commercial service airports in the New York metropolitan region. Other existing commercial service airports in the region include JFK, EWR, SWF, HPN, and ISP. This alternative would have the potential to reduce passenger vehicle trips to and from LGA by transferring those trips to other airports. However, due to federal grant obligations and federal law, the Port Authority does not have the authority to restrict airline operations or force airlines to operate at other airports.[33] While the Port Authority can provide incentives to entice airlines to change how they operate at LGA, JFK, and EWR, these airports operate near capacity for many hours of the day, including peak morning and evening hours. As such, other Port Authority airports would not be able to accommodate much of the air traffic diverted from LGA. In addition, although New York Stewart International Airport is an airport operated by the Port Authority, it is not in the primary catchment area for LGA passengers. Finally, the incentives that the Port Authority can provide would not apply to the ability to move flights to airports outside the system operated by the Port Authority (airports such as Westchester County Airport or Long Island MacArthur Airport). In addition, this alternative does not provide a time-certain transportation option to LGA, supplemental access to LGA, or adequate replacement Airport employee parking to enable efficient use of on-Airport space. This alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.2.2 ALTERNATIVE 2B: USE OF TRAINS AND BUSES INSTEAD OF AIR TRAVEL ALTERNATIVE

This alternative would have the potential to reduce passenger vehicle trips to and from LGA by transferring those trips to trains and buses. However, most of the travelers using trains or buses are going relatively short distances. Amtrak's Northeast Corridor is the busiest passenger rail line in the United States by ridership and service frequency.[34] Thus, travelers already are using train travel for these relatively shorter distances. Additionally, a variety of bus companies also provide service primarily to destinations within a 4-hour radius of New York. These bus companies have been successful in attracting passengers through a variety of incentives, including price and service. However, only one of the busiest air travel routes at LGA (Boston) is within a 4-hour driving radius of New York, and the other top ten destinations are considerably farther from New York than the typical train or bus passenger destination (see **Table 2-1**). The duration of travel between destinations is a primary reason why travelers choose air travel over other modes of transportation, and the use of trains or buses would not be acceptable to those travelers.

This alternative does not provide a time-certain transportation option to LGA, supplemental access to LGA, or adequate replacement Airport employee parking to enable efficient use of on-Airport space. This alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

[33] 14 CFR Part 93.K, *High Density Traffic Airports*.

[34] Amtrak, The Northeast Corridor, https://nec.amtrak.com/ (accessed December 26, 2019).

TABLE 2-1 BUSIEST AIR TRAVEL ROUTES AT LAGUARDIA AIRPORT

RANK	CITY	ANNUAL PASSENGERS	DISTANCE FROM LGA (MILES)	DRIVING TIME FROM LGA (HOURS)
1	Chicago	1,615,000	826	12.7
2	Atlanta	1,203,000	892	14.1
3	Miami	841,000	1,297	19.3
4	Dallas / Fort Worth	776,000	1,584	23.7
5	Fort Lauderdale	714,000	1,282	18.9
6	Boston [1]	652,000	209	3.3
7	Charlotte	598,000	648	10.2
8	Denver	566,000	1,783	26.0
9	Orlando	566,000	1,109	16.5
10	Detroit	487,000	612	9.4

NOTES:
LGA – LaGuardia Airport
1 Only city within a 4-hour drive from LGA.
SOURCE: US Department of Transportation, Bureau of Transportation Statistics, 2019.

2.5.3 USE OF OTHER MODES OF TRANSPORTATION TO LGA ALTERNATIVE

2.5.3.1 ALTERNATIVE 3A: FERRY SERVICE ALTERNATIVE

This alternative would provide ferry service connections to LGA from a variety of locations throughout the metropolitan region, including stops in Manhattan and Brooklyn. This alternative would provide supplemental access to LGA because there currently is no ferry service to LGA. Ferry service would provide an opportunity to reduce the number of passenger vehicle trips to and from LGA by providing a new way to access the Airport. Finally, it is possible that this alternative could provide adequate replacement Airport employee parking at one or more of the off-Airport locations where the ferry would operate. Although ferries would operate on a schedule, this alternative would not provide a time-certain transportation option to LGA because passengers would be required to use buses to access the terminals once arriving at a ferry landing. As noted in Section 2.3.3.1, the Citywide Ferry Study determined that "without an efficient and seamless bus connection to the rest of the LaGuardia Airport market, the likelihood of success is low."[35] Development of a roadway would be required for passenger access between the Flushing Bay Ferry Landing and the terminals. In order to provide a dedicated roadway for the inter-terminal Airport bus, either an existing lane of the on-Airport roadway would need to be converted to a dedicated bus lane or a new bus lane would need to be constructed.

Repurposing an existing public-use lane to a bus-service-only lane would not be practical and would reduce the existing capacity of any modified roadway. The reduction of capacity would vary based on the roadway and the existing number of travel lanes, but it is estimated that converting a public-use lane to a bus-service-only lane would reduce individual roadway capacities between 20 to 50 percent, based on preliminary traffic engineering review. It is anticipated that this would exponentially increase overall congestion, delay, and travel times for passengers traveling on these roadways.

[35] New York City Economic Development Corporation, *Citywide Ferry Study 2013 – Final Report*, 2013, p. 50.

Construction of a new bus lane, with a standard roadway lane width of 12 feet, would require 12 additional feet of roadway width on one-way portions of the terminal circulation roadways, but would require 24 additional feet of roadway width on two-way portions of the roadway. Most terminal on-Airport roadways are currently 2 to 3 lanes; the addition of a bus-service-only lane would increase the amount of space required for these roadways. The LaGuardia Redevelopment Program is relocating the terminals and on-Airport roadways closer to the GCP to maximize airfield efficiency. Particularly for the terminal roadways serving Terminals B and C, there is no room to add additional lanes for a dedicated bus service without impacting the GCP. Neither converting an existing lane nor building new lanes for dedicated bus service is feasible.

Thus, buses would not have a dedicated right-of-way and would have to use the on-Airport roadway network. Therefore, these buses would share the roadways with other vehicles and would be affected by traffic volumes on the on-Airport roadway network, thereby eliminating operational time certainty, which would make the success of this alternative unlikely. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.3.2 ALTERNATIVE 3B: HELICOPTER SERVICE ALTERNATIVE

This alternative would provide helicopter service connections to LGA from locations in Manhattan. Helicopters currently serve LGA from Manhattan. Although helicopter service currently is provided to LGA, this alternative could result in an increase in service and/or additional locations from which helicopters would operate, which would result in the provision of supplemental access to LGA. Any increase in the use of helicopters to access LGA would provide an opportunity to reduce the number of passenger vehicle trips to and from LGA. Finally, it is possible that this alternative could provide adequate replacement Airport employee parking at one or more of the off-Airport locations where the helicopters would operate. Although helicopters would operate on a schedule, this alternative would not provide a time-certain transportation option to LGA because upon arrival at Terminal A, passengers would be required to use buses to access other terminals because there is no secure-side connection from Terminal A to Terminal B or C. Only one helipad (West 30th Street Heliport) in New York City operates 24 hours a day, 7 days a week; the other two helipads are closed overnight and either have limited hours on the weekend (Downtown Manhattan Heliport) or are closed on the weekends (East 34th Street Heliport). There is no room to construct a new dedicated non-public road to all LGA terminals, nor is it practical or feasible to dedicate an existing lane for inter-terminal bus service. In order to provide a dedicated roadway for the inter-terminal Airport bus, either an existing lane of the on-Airport roadway would need to be converted to a dedicated bus lane or a new bus lane would need to be constructed.

Repurposing an existing public-use lane to a bus-service-only lane would not be practical and would reduce the existing capacity of any modified roadway. The reduction of capacity would vary based on the roadway and the existing number of travel lanes, but it is estimated that converting a public-use lane to a bus-service-only lane would reduce individual roadway capacities between 20 to 50 percent. It is anticipated that this would exponentially increase overall congestion, delay and travel times for passengers traveling on these roadways.

Construction of a new bus lane with a standard roadway lane width of 12 feet, would require 12 additional feet of roadway width on one-way portions of the terminal circulation roadways, but would require 24 additional feet of roadway width on two-way portions of the roadway, such as around the end of Runway 4-22 to connect to Terminal A. Most on-Airport roadways are currently 1 to 2 lanes; the addition of a bus-service-only lane would essentially double the amount of space required for these roadways. The LaGuardia Redevelopment Program is relocating the terminals and on-Airport roadways closer to the GCP, particularly for Terminal C; as such, there is no room to add additional lanes for a dedicated bus service without impacting the GCP. There is also insufficient room

to add a dedicated two-lane roadway around the end of Runway 4-22 without impacting the GCP or Runway 4-22 itself. Neither converting an existing lane nor building new lanes for dedicated bus service is feasible.

These buses would have to use the on-Airport roadway network and share the roadways with other vehicles. Thus, these buses would be affected by traffic volumes on the on-Airport roadway network, thereby eliminating operational time certainty. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.3.3 ALTERNATIVE 3C: GONDOLA SERVICE ALTERNATIVE

This alternative would provide gondola service connections with direct access to the terminals at LGA from at least three different transit stations. Because the gondolas would operate on a schedule, this alternative would provide a time-certain transportation option to LGA. In addition, this alternative would provide supplemental access to LGA because no gondola service is currently provided. Use of gondolas to access LGA would provide an opportunity to reduce the number of passenger vehicle trips to and from LGA because a gondola would be a new way to access LGA. Finally, it is possible that this alternative could provide adequate replacement Airport employee parking at one or more of the off-Airport locations where the gondola would operate. Therefore, this alternative would meet the Purpose and Need of the Proposed Action and was evaluated in the Step 2 screening process.

2.5.4 TRANSPORTATION SYSTEMS MANAGEMENT ALTERNATIVES

2.5.4.1 ALTERNATIVE 4A: MODIFY THE Q48 BUS ROUTE AND THE Q23 BUS ROUTE TO ENTER LAGUARDIA AIRPORT AT 94TH STREET ALTERNATIVE

This alternative would modify existing bus service to LGA on two bus routes that operate in Queens. Based on a review of land uses and property ownership along the bus routes, it is assumed that this alternative could provide adequate replacement Airport employee parking. In addition, because the Q23 bus route does not currently provide access to LGA, this alternative would provide supplemental access to LGA and would provide an opportunity to reduce the number of passenger vehicle trips to and from LGA. However, this alternative would not provide a time-certain transportation option to LGA because the buses would be subject to traffic congestion on off-Airport roadways and at off-Airport roadway intersections along the route. In addition, buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.4.2 ALTERNATIVE 4B: REVISE M60 BUS ROUTE TO ONLY TRAVEL BETWEEN LAGUARDIA AIRPORT AND 125TH STREET METRO NORTH STATION ALTERNATIVE

This alternative would modify existing bus service to LGA on the M60 bus route that operates from Manhattan to LGA. Based on a review of land uses and property ownership along the bus routes, it is assumed that this alternative could provide adequate replacement Airport employee parking. However, this alternative would not provide a time-certain transportation option to LGA because the buses would be subject to traffic congestion on off-Airport roadways and at off-Airport roadway intersections along the route. In addition, buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. In addition, because this bus route already exists and this alternative would reduce the number of bus stops served by the M60 bus route, this alternative would actually reduce service and access to LGA. Thus, this alternative would not provide supplemental access to LGA nor would this alternative provide an opportunity to reduce the number of passenger vehicle trips to and from LGA. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.4.3 ALTERNATIVE 4C: PROVIDE FREE BUS SERVICE ON THE Q70 BUS ROUTE ALTERNATIVE

This alternative would modify existing bus service to LGA on the Q70 bus route that operates from two subway stations in Queens to LGA. Based on a review of land uses and property ownership along the bus routes, it is assumed that this alternative could provide adequate replacement Airport employee parking. However, this alternative would not provide a time-certain transportation option to LGA because the buses would be subject to traffic congestion on off-Airport roadways and at off-Airport roadway intersections along the route. In addition, buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. In addition, because this bus route already exists, this alternative would not provide supplemental access to LGA. Providing free bus service would have limited effect on ridership, as passengers using the NYCT subway system either before or after boarding the Q70 receive one free transfer included in the fare cost. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.5 TRANSPORTATION DEMAND MANAGEMENT ALTERNATIVES

This alternative would provide TDM measures to promote the use of public transit, walking or bicycling, and using carpools or van pools. The TDM measures could have the effect of providing an opportunity to reduce the number of passenger vehicle trips to and from LGA; some TDM measures could add scheduled service and/or supplemental access. However, none of these TDM measures would result in a time-certain transportation option to LGA as they would not provide dedicated lanes or rights-of-way. Finally, this alternative would not result in the provision of adequate replacement Airport employee parking because these TDM measures do not originate in any one location at which parking could be provided. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.6 EMERGING TRANSPORTATION TECHNOLOGIES ALTERNATIVES

2.5.6.1 ALTERNATIVE 6A: TRANSPORTATION NETWORK COMPANIES ALTERNATIVE

Through the use of incentives, this alternative would increase the use of TNC vehicles, such as Uber and Lyft, in providing service to LGA. TNCs would use existing roads and streets to access LGA. This alternative would not provide a time-certain transportation option to LGA because the TNCs would use existing off-Airport roadways, not dedicated rights-of-way and would be subject to traffic congestion on off-Airport roadways and at off-Airport roadway intersections. TNCs would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. In addition, increased use of TNCs would increase the number of passenger vehicle trips to and from LGA and, thus, would not provide the opportunity to reduce these trips. Finally, TNCs would not result in the provision of adequate replacement Airport employee parking to enable efficient use of on-Airport space because TNCs do not originate in any one location at which adequate replacement Airport employee parking could be provided. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.6.2 ALTERNATIVE 6B: AUTONOMOUS VEHICLES ALTERNATIVE

AVs would use existing roads and streets to access LGA. Limitations for this alternative include significant policy decisions regarding implementation at the federal, state, and local levels; consumer acceptance and interest; and potential infrastructure improvements to limit obstacles. The use of AVs on existing routes to and from LGA does not provide a time-certain transportation option to LGA but would result in supplemental access to LGA as the AVs would be a new form of transportation. The use of AVs would not reduce the number of passenger vehicle trips to and from LGA because it involves swapping one vehicle for another. Finally, the use of AVs would not provide

adequate replacement Airport employee parking to enable efficient use of on-Airport space because AVs do not originate in any one location at which adequate replacement Airport employee parking could be provided. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.7 OFF-AIRPORT ROADWAY EXPANSION ALTERNATIVES

2.5.7.1 ALTERNATIVE 7A: ADDITIONAL TRAVEL LANES ON GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in the addition of travel lanes on the GCP between the RFK Bridge and the Long Island Expressway interchange. This alternative would provide supplemental access to LGA because of the additional lanes on the GCP. However, it is not reasonable to assume that adequate replacement Airport employee parking could be provided as part of adding travel lanes on the GCP, as it would not provide surface or structured parking located off-Airport within walking distance of an access point that has direct access[36] to LGA. In addition, this alternative would not result in the opportunity to reduce vehicle trips. The addition of travel lanes would not result in the provision of a time-certain transportation option to LGA because travel would continue to be affected by traffic volumes and congestion on the GCP. In addition, vehicles would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network that could affect travel times. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.7.2 ALTERNATIVE 7B: DEDICATED BUS LANES FOR Q70 BUS ROUTE ALTERNATIVE

This alternative would create a dedicated bus lane for the existing Q70 bus route for the portion of the Q70 bus route that is not on-Airport. This alternative could provide adequate replacement Airport employee parking to enable efficient use of on-Airport space at a location along the existing Q70 bus route. Although the majority of the Q70 bus route would use a dedicated bus lane, a dedicated bus lane would not be possible at the Airport because of physical space limitations. There is no room to construct a new dedicated non-public road to all LGA terminals, nor is it practical or feasible to dedicate an existing lane for bus service, as discussed in Section 2.5.3.1.

This alternative would not provide a time-certain transportation option to LGA because the buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. In addition, this alternative would not provide supplemental access to LGA because the Q70 bus route to LGA already exists. This alternative would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if additional passengers and employees would use the Q70 bus route as a result of it having a dedicated bus lane. However, this alternative could result in additional congestion on off-Airport streets on which the Q70 bus route travels because a general-purpose travel lane in each direction would have to be converted to a dedicated bus lane, resulting in surface traffic having fewer lanes available, increasing roadway congestion on off-Airport roadways in the vicinity of the Airport. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.7.3 ALTERNATIVE 7C: DEDICATED BUS LANES FROM ROOSEVELT AVENUE VIA JUNCTION BOULEVARD AND 94TH STREET ALTERNATIVE

This alternative would create a new bus route on dedicated bus lanes from Roosevelt Avenue along Junction Boulevard and 94th Street to provide access to LGA. This alternative could provide adequate replacement Airport employee parking to enable efficient use of on-Airport space at a location along the new bus route. This alternative

[36] Direct access is achieved when the transportation method does not require transfers to reach a destination.

also would provide supplemental access to LGA because a bus route using dedicated bus lanes along Junction Boulevard and 94th Street currently does not exist. However, this alternative would not provide a time-certain transportation option to LGA because the buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. This alternative would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the new bus route. Existing parking lanes on Junction Boulevard and 94th Street would be converted to a dedicated bus lane, which would directly result in an increase in roadway congestion and an increase in demand for parking on streets adjacent to Junction Boulevard and 94th Street. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.7.4 ALTERNATIVE 7D: DEDICATED BUS LANES FROM METS-WILLETS POINT SUBWAY STATION VIA ROOSEVELT AVENUE AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would create a new bus route on dedicated bus lanes from the Mets-Willets Point Subway Station along Roosevelt Avenue and the GCP to provide access to LGA. This alternative would provide supplemental access to LGA because a bus route with dedicated bus lanes along Roosevelt Avenue and the GCP currently does not exist. In addition, it is possible that this alternative could provide adequate replacement Airport employee parking to enable efficient use of on-Airport space at a location along the new bus route. However, this alternative would not provide a time-certain transportation option to LGA because buses would use the on-Airport roadway network and would be affected by traffic volumes and congestion on the on-Airport roadway network. Although this alternative would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the new bus route, this alternative could result in additional congestion on streets on which this bus travels because general travel lanes in both directions on Roosevelt Avenue and the GCP would have to be converted to a dedicated bus lane. Repurposing an existing public-use lane to a bus-service-only lane would not be practical and would reduce the existing capacity of any modified roadway. The reduction of capacity would vary based on the roadway and the existing number of travel lanes, but it is estimated that converting a public-use lane to a bus-service-only lane would reduce individual roadway capacities between 20 to 50 percent. It is anticipated that this would exponentially increase overall congestion, delay, and travel times for passengers traveling on these roadways. Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.7.5 ALTERNATIVE 7E: PROVIDE ELEVATED BUSWAY FROM METS-WILLETS POINT SUBWAY STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would construct a dedicated elevated busway from the Mets-Willets Point Subway Station to LGA above Roosevelt Avenue and the Flushing Bay Promenade. This alternative would provide supplemental access to LGA because an elevated busway currently does not exist. In addition, this alternative would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the new elevated bus route. With a parking facility at the Mets-Willets Points Subway Station, this alternative could provide adequate replacement Airport employee parking to enable efficient use of on-Airport space. However, this alternative would not provide a time-certain transportation option to LGA because a bus turnaround at LGA is not physically possible. Therefore, the buses would not have a dedicated right-of-way to the Airport and would need to use the on-Airport roadway network, as there is no room to construct a new dedicated non-public road to all LGA terminals, nor is it practical or feasible to dedicate an existing lane for bus service, as discussed in Section 2.5.3.1.

Therefore, this alternative would not meet the Purpose and Need of the Proposed Action and was eliminated from further consideration.

2.5.8 SUBWAY EXTENSION ALTERNATIVES

Individually, each subway extension alternative would provide a time-certain transportation option to LGA because the subway operates on a schedule and has a dedicated track. The subway extension alternatives would provide supplemental access to LGA because subway service to LGA currently does not exist. In addition, the subway extension alternatives would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the subway to access LGA. It is possible that each of the subway extension alternatives could provide adequate replacement Airport employee parking along the respective subway line, which would result in the efficient use of on-Airport space. All subway extension alternatives would meet the Purpose and Need of the Proposed Action and were evaluated in the Step 2 screening process.

2.5.9 FIXED GUIDEWAY ALTERNATIVES

Individually, each fixed guideway alternative would provide a time-certain transportation option to LGA because the fixed guideway operates on a schedule and has a dedicated track. The fixed guideway alternatives would provide supplemental access to LGA because fixed guideway service to LGA currently does not exist. In addition, the fixed guideway alternatives would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the fixed guideway to access LGA. The fixed guideway alternatives would provide adequate replacement Airport employee parking as part of the OMSF, which would result in the efficient use of on-Airport space. All fixed guideway alternatives would meet the Purpose and Need of the Proposed Action and were evaluated in the Step 2 screening process.

2.5.10 RAIL ALTERNATIVES

Individually, each rail alternative would provide a time-certain transportation option to LGA because rail service operates on a schedule and has a dedicated track. The rail alternatives would provide supplemental access to LGA because rail service to LGA currently does not exist. In addition, the rail alternatives would provide the opportunity to reduce the number of passenger vehicle trips to and from LGA if passengers or employees would use the rail service to access LGA. It is possible that each of the rail alternatives could provide adequate replacement Airport employee parking along the respective rail line, which would result in the efficient use of on-Airport space. All rail alternatives would meet the Purpose and Need of the Proposed Action and were evaluated in the Step 2 screening process.

2.5.11 SUMMARY OF STEP 1 SCREENING PROCESS

Table 2-2 summarizes the Step 1 screening process; 32 of the 47 potential alternatives would meet the Purpose and Need of the Proposed Action. These 32 alternatives plus the No Action Alternative were evaluated in the Step 2 screening process.

TABLE 2-2 (PAGE 1 OF 5) STEP 1 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER	STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION?				MOVE TO STEP 2?
	DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?	
1. No Action Alternative [1, 2]	No	No	No	No	Yes [2]
2. Diversion of Air Traffic at LGA Alternatives					
2A Use of Other Airports Alternative [1]	No	No	Yes	No	No
2B Use of Trains and Buses Instead of Air Travel Alternative	No	No	Yes	No	No
3. Use of Other Modes of Transportation to LGA Alternatives					
3A Ferry Service Alternative [1]	No	Yes	Yes	Yes	No
3B Helicopter Service Alternative	No	Yes	Yes	Yes	No
3C Gondola Service Alternative	Yes	Yes	Yes	Yes	Yes
4. Transportation Systems Management Alternatives					
4A Modify the Q48 Bus Route and the Q23 Bus Route to Enter LaGuardia Airport at 94th Street Alternative	No	Yes	Yes	Yes	No
4B Revise M60 Bus Route to Only Travel Between LaGuardia Airport and 125th Street Metro North Station Alternative	No	No	No	Yes	No
4C Provide Free Bus Service on the Q70 Bus Route Alternative	No	No	No	Yes	No
5. Transportation Demand Management Alternatives [1]	No	Yes	Yes	No	No
6. Emerging Transportation Technologies Alternatives					
6A Transportation Network Companies Alternative [1]	No	Yes	No	No	No
6B Autonomous Vehicles Alternative [1]	No	Yes	No	No	No
7. Off-Airport Roadway Expansion Alternatives					
7A Additional Travel Lanes on Grand Central Parkway Alternative [1]	No	Yes	No	No	No

TABLE 2-2 (PAGE 2 OF 5) STEP 1 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER		STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION				MOVE TO STEP 2?
		DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?	
7. Off-Airport Roadway Expansion Alternatives (continued)						
7B	Dedicated Bus Lanes for Q70 Bus Route Alternative	No	No	No	Yes	No
7C	Dedicated Bus Lanes from Roosevelt Avenue via Junction Boulevard and 94th Street Alternative	No	Yes	No	Yes	No
7D	Dedicated Bus Lanes from Mets-Willets Point Subway Station via Roosevelt Avenue and Grand Central Parkway Alternative	No	Yes	No	Yes	No
7E	Elevated Busway from Mets-Willets Point Subway Station via Roosevelt Avenue and Flushing Bay Promenade Alternative	No	Yes	Yes	Yes	No
8. Subway Extension Alternatives						
8A	From Astoria Boulevard Subway Station: Elevated Above Astoria Boulevard and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
8B	From Astoria-Ditmars Boulevard Subway Station: Elevated Above 31st Street and 19th Avenue Alternative [1]	Yes	Yes	Yes	Yes	Yes
8C	From Astoria-Ditmars Boulevard Subway Station: Tunnel Beneath 31st Street and 19th Avenue Alternative [1]	Yes	Yes	Yes	Yes	Yes
8D	From Astoria-Ditmars Boulevard Subway Station: Elevated Above Ditmars Boulevard and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
8E	From 36th Street Subway Station: Tunnel Beneath Steinway Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
8F	From Roosevelt Avenue-Jackson Heights Subway Station: Elevated Above 82nd Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes

TABLE 2-2 (PAGE 3 OF 5) STEP 1 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER	STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION				
	DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?	MOVE TO STEP 2?
8. Subway Extension Alternatives (continued)					
8G From Mets-Willets Point Subway Station: Elevated Above Roosevelt Avenue and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes
9. Fixed Guideway Alternatives					
9A From Willets Point Station via Roosevelt Avenue and Flushing Bay Promenade Alternative (Port Authority Proposed Alternative) [1]	Yes	Yes	Yes	Yes	Yes
9B From Willets Point Station via Roosevelt Avenue and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
9C From Willets Point Station via Roosevelt Avenue and Flushing Bay Promenade with a Ferry Stop Alternative	Yes	Yes	Yes	Yes	Yes
9D From Willets Point Station via Long Island Rail Road Right-of-Way and Flushing Bay Promenade Alternative [1]	Yes	Yes	Yes	Yes	Yes
9E From Willets Point Station via Long Island Rail Road Right-of-Way and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
9F From Willets Point Station via 126th Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
9G From Willets Point Station via 126th Street and Across Flushing Bay Alternative	Yes	Yes	Yes	Yes	Yes
9H From Willets Point Station via 126th Street and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes
9I From Northern Boulevard via Willets Point Station, Roosevelt Avenue, and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes

TABLE 2-2 (PAGE 4 OF 5) STEP 1 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER		STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION				
		DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?	MOVE TO STEP 2?
9. Fixed Guideway Alternatives (continued)						
9J	From Jamaica Station Transportation Hub via Van Wyck Expressway, Grand Central Parkway, and Flushing Bay Promenade Alternative [1]	Yes	Yes	Yes	Yes	Yes
9K	From Woodside LIRR/61st Street-Woodside Subway Station via an Existing Rail Right-of-Way, Brooklyn Queens Expressway, and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
9L	From Roosevelt Avenue-Jackson Heights Subway Station via Broadway, Brooklyn Queens Expressway, and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
9M	From Woodside LIRR/61st Street-Woodside Subway Station and Roosevelt Avenue-Jackson Heights Subway Station via Roosevelt Avenue, Broadway, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
9N	From Astoria Boulevard Subway Station via Astoria Boulevard and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes
9O	From Hunterspoint Avenue LIRR Station via Existing Rail Right-of-Way, 31st Street, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
9P	From Sunnyside Yards via Existing Rail Right-of-Way, Steinway Street, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
9Q	From Northern Boulevard Subway Station via Broadway, Steinway Street, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes

TABLE 2-2 (PAGE 5 OF 5) STEP 1 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER	STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION				MOVE TO STEP 2?
	DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?	
9. Fixed Guideway Alternatives (continued)					
9R Through Line Connecting Willets Point Station, LaGuardia Airport, and Woodside LIRR/61st Street-Woodside Subway Station via Roosevelt Avenue, Grand Central Parkway, Brooklyn Queens Expressway, and an Existing Rail Right-of-Way Alternative	Yes	Yes	Yes	Yes	Yes
9S Through Line Connecting Woodside LIRR/61st Street-Woodside Subway Station and Roosevelt Avenue-Jackson Heights Subway Station via Broadway, Roosevelt Avenue, an Existing Rail Right-of-Way, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
9T Through Line Connecting Willets Point Station, LaGuardia Airport, and Astoria-Ditmars Boulevard Subway Station via Roosevelt Avenue, Grand Central Parkway, 19th Avenue, and 31st Street Alternative	Yes	Yes	Yes	Yes	Yes
10. Rail Alternatives					
10A Underground from Sunnyside Yards via Brooklyn Queens Expressway and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes
10B Underground from Midtown Manhattan via Tunnel Beneath East River Alternative	Yes	Yes	Yes	Yes	Yes
10C Underground from Upper East Side Manhattan via New Tunnel beneath East River Alternative	Yes	Yes	Yes	Yes	Yes

NOTES:
LGA – LaGuardia Airport
LIRR – Long Island Rail Road
1 Alternative provided by Port Authority of New York and New Jersey.
2 Required to be included per 40 CFR 1502.14(d).
SOURCE: RS&H, Inc., and Ricondo & Associates, Inc., January 2020.

2.6 SCREENING STEP 2: WOULD THE ALTERNATIVE BE REASONABLE TO CONSTRUCT AND OPERATE?

The following questions were answered for each alternative to determine whether it met the Step 2 screening criteria. If the alternative met the Step 2 screening criteria, it was retained for detailed analysis of its potential environmental effects in the EIS.

- Can the alternative be implemented without a material effect to major infrastructure, transportation facilities, or utilities? For the response to be "yes," the alternative cannot result in a material effect to existing major transportation facilities (such as encroachment on a runway;[37] permanent shifting of travel lanes on a major roadway;[38] temporary or permanent closure of travel lanes on a major roadway;[39] or a permanent reduction in subway, rail, or transit service), or existing major infrastructure (such as disrupting supply of power from power generating or distribution facilities), or existing major utilities (such as disrupting or relocating water or sewer lines). A major transportation facility is an existing runway, subway or rail line, or a roadway that is classified by the New York State Department of Transportation (NYSDOT) as a principal arterial, a minor arterial, or a major collector.[40] **Table 2-3** provides a listing of the classification of roadways in the LGA vicinity. Major infrastructure includes electric power plants, electrical distribution facilities, water treatment plants, or wastewater treatment plants. A major utility is a sewer, water, or communications line that serves a large segment of population and cannot be easily replaced or relocated while continuing to provide uninterrupted service. The relocation or modification of major transportation facilities, infrastructure, or utilities would have a material effect if the relocation would result in disruption of services to large segments of the population. Additionally, such relocations or modifications would increase construction cost and may extend construction time in comparison to alternatives that do not affect these facilities. Therefore, the FAA determined that these types of impacts would constitute an alternative that is not practicable or feasible to implement.
- Can the alternative be implemented without affecting peak-hour subway, rail, and/or transit service during construction? For the response to be "yes," the construction of the alternative cannot result in disruption to subway, rail, and/or transit service during peak travel times[41] for any rail or subway lines or significantly interfere

[37] Runway encroachment includes physically impacting an existing runway, violating runway approach or departure surfaces, or impacting runway safety areas as defined in FAA AC 150/5300-13A, *Airport Design*.

[38] A permanent shifting of travel lanes on a limited access roadway would temporarily affect drivers during construction when the travel lanes would shift. A permanent shifting of travel lanes on a non-limited access roadway could result in a permanent loss of street parking.

[39] A temporary closure of travel lanes would occur during the construction of support columns for an elevated gondola, subway, or fixed guideway system. Upon completion of construction, the roadway would have the same number of travel lanes that were in existence prior to the start of construction. A permanent closure of travel lanes would occur to accommodate the placement of support columns or to allow for the transition from an elevated subway or fixed guideway to an underground subway or fixed guideway. Replacement of lost travel lanes, if possible, would require additional widening of the roadway and potential taking of property to maintain the existing number of travel lanes and roadway capacity.

[40] With respect to roadway traffic, the *New York State Highway Design Manual* (Chapter 16, "Maintenance of Traffic") requires that a traffic study be completed in order to evaluate the potential traffic impacts of lane closures on traffic along major roadways. A project that would require continuous lane closures for three or more days on major roads would be considered "significant." For example, if an alternative required the closure of the BQE, up to 260,000 daily drivers would be affected. In addition, if such a closure or partial closure on any major roadway were to occur, a Traffic Management Plan (TMP) would be required. The TMP requires the evaluation of traffic mitigation measures for maintenance of traffic, including detours, off-peak closures, nighttime closures, etc. If the lane closure would result in significant traffic impacts, the New York State Department of Transportation would require that alternative means of construction be done or measures be enacted to mitigate the traffic impact. Given the lack of other roadways to accommodate such a large number of vehicles in the vicinity of LGA, there are very limited options to mitigate traffic affected by lane closures. Therefore, the FAA assumes that closure of major roadways during peak periods for three or more days is unreasonable.

[41] The a.m. peak is from 6:00 a.m. to 9:00 a.m. and the p.m. peak is from 4:00 p.m. to 7:00 p.m.

with MTA subway and/or bus operations. Affecting peak-hour subway, rail, and/or transit service or extended disruption of transit service could affect the daily lives of large segments of the population. Additionally, these effects would increase construction cost and may extend construction time in comparison to alternatives that do not affect these elements. Therefore, the FAA determined that these types of impacts would constitute an alternative that is not practicable or feasible to implement.

- Is the alternative reasonable to construct given cost considerations? For the response to be "yes," the alternative cannot result in a cost that is more than two and a half times greater than the current $2.05 billion estimated project cost. The costs being used for this analysis are based on the average costs[42] of other similar transportation projects.[43] The FAA has determined that a cost of more than two and half times greater than the current estimated cost for the Port Authority's proposed alternative is not reasonable.[44]

TABLE 2-3 ROADWAY CLASSIFICATION IN AIRPORT VICINITY

CLASSIFICATION	ROADWAY
Principal Arterial Interstate	Brooklyn Queens Expressway
Principal Arterial Expressway	Grand Central Parkway
	Van Wyck Expressway
	Whitestone Expressway
Principal Arterial Other	94th Street (between LGA and Northern Boulevard)
	Astoria Boulevard
	Broadway
	Ditmars Boulevard (between 21st Street and 82nd Street)
	Ditmars Boulevard (east of 94th Street)
	Junction Boulevard
	Roosevelt Avenue
	Northern Boulevard
	Steinway Street (south of the Grand Central Parkway)
Minor Arterial	31st Street (south of Ditmars Boulevard)
	Ditmars Boulevard (between 23rd Avenue and 94th Street)
Major Collector	19th Avenue (west of 81st Street)
	23rd Avenue
	31st Street (north of Ditmars Boulevard)
	81st Street (south of 19th Avenue)
	82nd Street (south of Astoria Boulevard)
	126th Street (north of Roosevelt Avenue)
	Steinway Street (north of the Grand Central Parkway)

NOTE:
LGA – LaGuardia Airport
SOURCE: New York State Department of Transportation, *Functional Classification*, 2019.

[42] Costs are based on 2019 dollars and have been adjusted for the differences in construction costs where the transportation project is located in New York City. A survey of other recent transit projects was conducted to identify an average cost per mile. To provide a reasonable average cost per mile, only those projects that were constructed in densely developed urban areas with complex construction issues were chosen. The other transportation projects that were used for determining average costs include subway extensions in New York City (Q Line beneath Second Avenue), Los Angeles, San Francisco, and Seattle. A cost of $976 million per mile for an elevated subway or fixed guideway was used, and a cost of $1.09 billion per mile for an underground subway or fixed guideway was used (CityLab, "Why It's So Expensive to Build Urban Rail in the U.S.," January 26, 2018).

[43] To provide consistent cost comparisons for each alternative, costs are calculated on a straight, per-mile basis and only include construction of the actual transportation facility. Estimated costs do not include costs associated with land acquisition or modifications to other transportation facilities or utilities. Recognizing that the first screening criteria under Step 2 identified major utilities, roadways, etc. that would be impacted, addressing these impacts would result in cost increases. Since alternatives could be screened out based on those impacts, such additional costs do not need to be considered under this screening criterion as well.

[44] The FAA recognizes that a project that would cost twice as much as the Port Authority's preferred alternative is probably not practical, but to be conservative, the FAA has considered costs up to 2.5 times greater to potentially be reasonable.

- Can the alternative provide access to identified locations throughout the New York metropolitan area? For the response to be "yes," the alternative must provide reasonable access to identified access points representative of the origin/destination locations for passengers and employees at LGA.[45] The origin/destination locations are transit stations selected based on annual ridership data (see **Table 2-4**).[46] The station with the greatest ridership was selected as the representative access point for the geographic area. When annual ridership data were not available, representative access points were selected based on the largest number of transfers accessible at the location. Because it is not practical to require all passengers to travel to Manhattan to use the alternative to access LGA, the FAA considers alternatives that have limited geographic connectivity to be unreasonable.

TABLE 2-4 LOCATIONS USED FOR ACCESS POINTS

ORIGIN / DESTINATION	REPRESENTATIVE ACCESS POINT	ANNUAL RIDERSHIP AT REPRESENTATIVE ACCESS POINT	TRANSIT SYSTEM
Bronx	3rd Avenue and 149th Street	7,458,222	2 5
Brooklyn	Atlantic Avenue – Barclays Center	13,571,093	B D N Q R 2 3 4 5
Manhattan – Downtown / Financial District	World Trade Center	N/A	2 3 4 5 A C E J Z R W
Manhattan – Midtown	34th Street / Penn Station	50,400,734	LIRR 1 2 3 A C E
Manhattan – Midtown	42nd Street / Grand Central Terminal	44,928,488	LIRR S 4 5 6 7
Manhattan – Upper East Side	86th Street	14,277,369	4 5 6
Manhattan – Upper West Side	125th Street	9,335,382	A C B D
Queens	Jamaica Center – Parsons – Archer	11,602,228	LIRR E J Z
Long Island	Hicksville	19,114,277 [1]	LIRR

NOTES:
LIRR – Long Island Rail Road
1 Ridership is for the LIRR through Hicksville Station.
SOURCES: Metropolitan Transportation Authority, *Annual Ridership Report*, 2017; Metropolitan Transportation Authority, *Long Island Rail Road Annual Ridership Report*, 2018.

2.6.1 NO ACTION ALTERNATIVE

The No Action Alternative, described in Section 2.3.1, would result in improvements to be undertaken by the NYC Parks to the Passerelle Bridge between the Mets-Willets Point Subway Station and the Mets-Willets Point LIRR Station and improvements to be undertaken by the MTA to reconfigure portions of the Mets-Willets Point LIRR Station to extend existing platforms to accommodate 12-car trains and to ensure Americans with Disabilities Act

[45] Port Authority of New York and New Jersey, *AirTrain LGA, LGA Ground Access Mode Choice Model and AirTrain Ridership Forecast 2025-2045*, October 2018. The identified access points are representative of the origin/destination of approximately 84 percent of the origin/destination locations for passengers and employees at LGA. The 84 percent is derived by adding the percentages of passengers and employees from the following areas: Bronx, Brooklyn, Manhattan, Queens, and Long Island. The remaining 16 percent of passengers and employees come from further points (such as Upstate New York, Staten Island, New Jersey, Pennsylvania, or Connecticut) and would likely experience similar access issues to those alternatives that are not able to meet the criterion based on the identified access points.

[46] Metropolitan Transportation Authority, *Annual Ridership Report*, 2017; Metropolitan Transportation Authority, *Long Island Annual Ridership Report*, 2018; Port Authority of New York and New Jersey, World Trade Center Station, https://www.panynj.gov/path/wtc-station.html (accessed August 28, 2019).

(ADA) compliance, but it would not change existing park access or station operations. The No Action Alternative is carried forward to be analyzed in the EIS as required by 40 CFR 1502.14(d).

2.6.2 USE OF OTHER MODES OF TRANSPORTATION ALTERNATIVES

Of the alternatives considered as other modes of transportation alternatives, only Alternative 3C: Gondola Service Alternative made it through the Step 1 screening process. This alternative would provide gondola service connections to LGA from three different stations. This alternative would not affect peak-hour subway, rail, or transit service during construction. Along the elevated section of this alignment, a variety of underground utilities (such as water lines and sewer lines) exist in locations that support columns and associated foundations would be required to avoid. Supports for the elevated sections of this alternative would be designed to minimize impacts to underground utilities by following New York City Department of Environmental Protection (NYCDEP) guidelines.[47] As an elevated facility, this alternative would require the construction of support columns for the gondola. These support columns would occur at regular intervals and would be in the rights-of-way of Astoria Boulevard, Broadway, the BQE, and the GCP, which are classified as major roadways by NYSDOT. Construction of support columns for the gondola would require the permanent closure of travel lanes affecting up to 75,000 daily drivers on this segment of Astoria Boulevard.[48] In addition, the construction of support columns would result in the temporary closure of travel lanes affecting up to 14,000 daily drivers on this segment of Broadway,[49] the temporary closure of travel lanes affecting up to 260,000 daily drivers on this segment of the BQE,[50] and the temporary closure of travel lanes affecting up to 165,000 daily drivers on this segment of the GCP.[51] Construction of the support columns for this alternative would cause a permanent shifting of travel lanes on Broadway, loss of parking on one side of Broadway, permanent shifting of travel lanes on the BQE, and loss of the emergency stopping lane on the northbound BQE. This is considered a material effect on major transportation facilities. In addition, as an elevated system, the segment of this alternative in the vicinity of Runway 4 would be at least 40 feet above ground surface, which would encroach on the Runway 4 approach surface (see Exhibit 2-6). This would restrict the ability of aircraft to land on that runway. This is also considered an unreasonable impact to a major transportation facility.

The cost for this alternative would be associated with the construction of a gondola system. The most recent cost comparison is a gondola system being considered in Austin, Texas, that would cost approximately $600 million for an 8-mile system.[52] The three gondola lines envisioned for this alternative would span a cumulative distance of approximately 8.1 miles. Using the cost for the Austin system as a guide, the cost for this alternative would be less than the estimated cost associated with the Port Authority's proposed alternative.

Gondola service would provide reasonable access to all identified access points, as there would be three gondola lines to LGA originating at various subway stations.

This alternative would have a material effect on major transportation facilities. Specifically, this alternative would result in the permanent closure of travel lanes on Astoria Boulevard; the temporary closure of travel lanes on

[47] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "Subway Extension Routes 8B, 8C and 8E for LaGuardia Airport," letter to Dibya Shahi, DY Consultants, September 13, 2019 (see Appendix E).

[48] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2011).

[49] *Ibid.*

[50] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[51] *Ibid.*

[52] Wired.com, "Commuter Gondolas Are Coming to America. Probably. Maybe?" https://www.wired.com/2016/09/commuter-gondolas-coming-america-probably-maybe/ (accessed December 26, 2019).

Broadway, the BQE, and the GCP; the permanent shifting of travel lanes on Broadway and the BQE; the permanent loss of street parking on one side of Broadway; the permanent loss of the emergency stopping lane on the BQE; and encroachment on the Runway 4 approach surface. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.3 SUBWAY EXTENSION ALTERNATIVES

2.6.3.1 ALTERNATIVE 8A: FROM ASTORIA BOULEVARD SUBWAY STATION: ELEVATED ABOVE ASTORIA BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would create a branch of the existing N-W Lines from the Astoria Boulevard Subway Station on an elevated subway above Astoria Avenue and the GCP that transitions into a tunnel to access a subterranean station at LGA. This alternative would require extensive, complex construction on the N-W Lines and along the GCP. The branch extension would need two tracks to allow for frequent bi-directional service. These new tracks would connect to the existing northbound track, which is the local track for northbound service, and the center track. The connection to the center track would be via an interlocking system. The merge location would be south of the Astoria Boulevard Subway Station, which might have to be reconstructed and shifted northward to accommodate this new junction. The last station on the Astoria Line to serve the Airport route would be the station before the junction point, the 30th Avenue Subway Station. New crossovers would have to be constructed south of the Astoria Boulevard Subway Station to allow subway trains to move between tracks. Implementation of these improvements would disrupt transit service during peak commuter hours during construction on the N-W Lines, which would affect up to approximately 25,000 daily riders.[53]

From 31st Street, the two tracks would be on an elevated structure within the GCP right-of-way to reach the Airport. East of Steinway Street, the Hell Gate rail trestle that crosses over the GCP would have to be raised to provide for adequate clearance between the elevated subway and the rail line using the Hell Gate rail trestle. This would result in disruption to train service using the rail line, including Amtrak's Northeast Corridor service, which would affect up to approximately 10,000 daily passengers.[54] Disruption of the Hell Gate rail trestle would require a temporary rail bridge adjacent to the existing trestle to provide for ongoing service during construction. Limited easements exist in this area, likely requiring property acquisition and displacement of existing land uses. Furthermore, the work would need to be scheduled in coordination with ongoing construction that also affects Amtrak service, including the LIRR East Side Access project,[55] East River Tunnel repairs, the Gateway Program, and the Penn Station Access Project.[56] In addition, as a branch of the N-W Lines, this alternative would result in the permanent reduction in service at the Astoria-Ditmars Subway Station, as the new service to LGA would have to be sequenced with the existing service along the N-W Lines, which would reduce the number of N-W trains from the east that could operate

[53] Metropolitan Transportation Authority, Introduction to Subway Ridership, http://web.mta.info/nyct/facts/ridership/#chart_s (accessed December 19, 2020).

[54] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

[55] The LIRR East Side Access project provides new Long Island Rail Road service to the Grand Central Terminal on the east side of Manhattan, supplementing existing service to Penn Station on Manhattan's west side and Atlantic Terminal in Brooklyn. When completed, East Side Access will serve approximately 162,000 customers a day, providing a faster and easier commute from Long Island and Queens to the east side of Manhattan in a new 8-track terminal and concourse below Grand Central Terminal

[56] Penn Station Access is an MTA project that would open a new Metro-North Railroad link directly into Penn Station.

through the Astoria-Ditmars Boulevard Subway Station. This would have a permanent effect on up to approximately 13,000 daily users of the Astoria-Ditmars Boulevard Subway Station.[57]

This alternative would result in the construction of support columns for the elevated subway and would require the permanent closure of travel lanes on Astoria Boulevard and the GCP, which would affect up to 75,000 daily drivers on Astoria Boulevard[58] and up to 165,000 daily drivers on this segment of the GCP.[59] The permanent closure of travel lanes would occur because it is not possible to place support columns for an elevated subway along this alignment without placing one of the support columns in an existing travel lane and it is not possible to shift travel lanes due to limitations associated with existing bridges.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner to avoid having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see **Appendix E**):

- 175-inch by 96-inch combined sewer, which varies between 5 and 15 feet below grade, near the intersection of 19th Avenue and 82nd Street;
- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[60] Relocation of combined sewer outfalls and interceptors[61] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[62] of the sewer flow,

[57] Metropolitan Transportation Authority, http://web.mta.info/nyct/facts/ridership/#chart_s (accessed December 19, 2020).

[58] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

[59] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[60] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[61] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[62] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[63] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[64]

Avoidance of these major utilities would require tunneling the subway beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would be challenging due to the complex urban environment. To achieve this depth for a subway tunnel, the distance needed to transition from an elevated subway to an underground subway would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 80th Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 78th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin on Astoria Boulevard as it crosses under the Hell Gate rail trestle (the distance from 78th Street and the GCP to Astoria Boulevard and the Hell Gate rail trestle is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on Astoria Boulevard and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

To provide a general cost for subway construction, the average per mile cost of $976.0 million for elevated subways and $1.09 billion for underground subways was used. On this basis, the 2.09-mile elevated subway and the 0.61-mile underground subway in this alternative would cost approximately $2.7 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

[63] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[64] *Ibid.*

This alternative is on the N-W Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would result in the need to modify the Hell Gate rail trestle, would result in a permanent reduction in service at the Astoria Boulevard Subway Station and the Astoria-Ditmars Boulevard Subway Station, would require the permanent closure of travel lanes on Astoria Boulevard and the GCP, and would affect existing major underground utility lines. Additionally, this alternative would disrupt peak-hour operation of the Amtrak Northeast Corridor and the N-W Lines during construction. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.3.2 ALTERNATIVE 8B: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: ELEVATED ABOVE 31ST STREET AND 19TH AVENUE ALTERNATIVE

This alternative would extend the elevated N-W Lines beyond the final stop at the Astoria-Ditmars Boulevard Subway Station on an elevated subway above 31st Street and 19th Avenue, with a transition into a tunnel to access a subterranean station at LGA. The new elevated section of the subway in this alternative would be supported by columns located either in the street or sidewalks of 31st Street and 19th Avenue. This would require the temporary closure of travel lanes on 31st Street and 19th Avenue, which are identified as major collectors by NYSDOT and would affect up to 10,000 drivers on a daily basis.[65]

The elevated section of this alignment would cross several existing utilities, including City Water Tunnel No. 2, a 60-inch-diameter trunk water main, a 20-inch and a 24-inch cast iron water main, a 96-inch interceptor sewer, a 60-inch combined sewer, a 39-inch combined sewer, several sewer chambers, a 66-inch combined sewer, and four different large-scale sewer interceptor lines (see Appendix E). However, it is possible to minimize impacts to these underground facilities through design of the elevated subway and by following NYCDEP guidelines. The underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 175-inch by 96-inch combined sewer, which varies between 5 and 15 feet below grade, near the intersection of 19th Avenue and 82nd Street;
- 120-inch by 108-inch interceptor, which varies between 15 to 25 feet below grade, underneath 19th Avenue and 81st Street;
- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be

[65] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

amended.[66] Relocation of combined sewer outfalls and interceptors[67] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[68] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[69] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[70]

Avoidance of these major utilities would require placing the subway in bedrock beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for a subway tunnel, the distance needed to transition from an elevated subway to an underground subway would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Also, given the location of the interceptor under 19th Avenue at 45th Street, it is likely that the start of the transition to the underground portion would need to occur at 31st Street and 21st Avenue, which would require the permanent closure of travel lanes and the permanent loss of street

[66] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[67] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[68] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[69] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[70] *Ibid.*

parking on a portion of 31st Street, which is identified as a major collector by NYSDOT. The distance from the Astoria-Ditmars Boulevard Station and 19th Avenue and 45th Street is approximately 5,300 feet.

To provide a general cost for subway construction, the average per mile cost of $976.0 million for elevated subways and $1.09 billion for underground subways was used. On this basis, the 1.97-mile elevated subway and the 0.83-mile underground subway in this alternative would cost approximately $2.82 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the N-W Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would result in the temporary closure of a portion of 31st Street and 19th Avenue and would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on a portion of 31st Street. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.3.3 ALTERNATIVE 8C: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: TUNNEL BENEATH 31ST STREET AND 19TH AVENUE ALTERNATIVE

This alternative would extend the N-W Lines beyond the final stop at the Astoria-Ditmars Boulevard Subway Station in a tunnel beneath 31st Street and 19th Avenue to a subterranean station at LGA. The section of the subway in this alternative that would transition from an elevated subway to an underground subway would require the permanent closure of travel lanes and the permanent loss of parking on 31st Street, which is classified as a major collector by NYSDOT. This closure of travel lanes on 31st Street would affect up to approximately 10,000 daily drivers.[71] In addition, there is insufficient distance along 31st Street for the subway to descend at a 3-degree grade from the existing Astoria Boulevard Subway Station, clear the GCP, and transition underground to a new Astoria-Ditmars Boulevard Subway Station with adequate clearance to support the required elevated infrastructure. These two subway stations are approximately 2,300 feet apart, and there is less than 2,000 feet available once the subway passes the GCP. At that point, the subway is approximately 25 feet above ground level, and based on a maximum 3-degree grade for a subway, the tracks could only descend 59 feet before entering the new underground Astoria-Ditmars Boulevard Subway Station. At this location, the subway would be approximately 35 feet below ground level (assuming the terrain is constant). Based on the required height clearance for the train and platforms, there would be less than 20 feet of cover over the subway station, which would be insufficient to structurally support aboveground infrastructure. In addition, the transition to an underground subway would occur beneath the Hell Gate rail trestle, which would require substantial excavation in proximity to that structure, as portions of the Astoria-Ditmars Boulevard Subway Station lie beneath the trestle. During construction, this excavation could result in interruptions to the operation of the Amtrak Northeast Corridor, which would affect up to approximately 10,000 daily passengers[72] and the N-W Lines, which would affect up to approximately 25,000 daily riders. Furthermore, the work would need to be scheduled in coordination with ongoing construction that also affects Amtrak service, including the LIRR East Side Access project, East River Tunnel repairs, the Gateway Program, and the Penn Station Access Project.

[71] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

[72] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

The alignment for this alternative would be underground and could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- City Water Tunnel No. 2
- 60-inch-diameter trunk water main
- 20-inch and a 24-inch cast iron water main
- 96-inch-diameter interceptor sewer
- 60-inch combined sewer
- 39-inch combined sewer
- several sewer chambers
- 66-inch-diameter combined sewer
- four different large-scale sewer interceptor lines:
  - 175-inch by 96-inch combined sewer
  - 120-inch by 108-inch interceptor underneath 19th Avenue and 81st Street
  - 132-inch by 60-inch double-barrel storm reinforced concrete sewer
  - 129-inch by 96-inch double-barrel combined sewer

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[73] Relocation of combined sewer outfalls and interceptors[74] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[75] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[76] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling,

[73] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[74] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[75] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[76] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

and drainage plan amendments would be required. the construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[77]

Avoidance of these major utilities would require tunneling the subway beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for a subway tunnel, the distance needed to transition from an elevated subway to an underground subway would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given that the transition from an elevated subway to an underground subway would begin at the Astoria Boulevard Subway Station, there is sufficient distance to achieve a 200-foot depth to avoid the utilities. However, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

To provide a general cost for subway construction, the average per mile cost of $1.09 billion for underground subways was used. On this basis, the 2.9-mile subway extension in this alternative would cost approximately $3.15 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the N-W Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utility lines. Specifically, this alternative would result in the permanent closure of a portion of 31st Street, would result in the permanent loss of parking on a portion of 31st Street, and would affect existing major underground utility lines. Additionally, this alternative would disrupt peak-hour subway, rail, and/or transit service during construction, including Amtrak Northeast Corridor service and the N-W Lines. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

[77] *Ibid.*

2.6.3.4 ALTERNATIVE 8D: FROM ASTORIA-DITMARS BOULEVARD SUBWAY STATION: ELEVATED ABOVE DITMARS BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in the development of an elevated subway above Ditmars Boulevard and the GCP. Because this alternative would require excavation in proximity to the existing Hell Gate rail trestle, this alternative could affect passenger rail service during construction, including Amtrak's Northeast Corridor, which could affect about 10,000 daily passengers.[78] Furthermore, the work would need to be scheduled in coordination with ongoing construction that also affects Amtrak service, including the LIRR East Side Access project, East River Tunnel repairs, the Gateway Program, and the Penn Station Access Project. In addition, this alternative would result in the construction of the support columns for the elevated subway in the rights-of-way of Ditmars Boulevard and would require the temporary closure of the roadway, which would affect up to approximately 30,000 drivers on Ditmars Boulevard on a daily basis during construction.[79]

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[80] Relocation of combined sewer outfalls[81] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the

[78] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

[79] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

[80] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[81] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

bulkhead line; (2) the need for temporary fluming[82] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[83] Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall would need to allow for continuous operation and management of the flow in the sewer during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[84]

Avoidance of these major utilities would require tunneling the subway beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for a subway tunnel, the distance needed to transition from an elevated subway to an underground subway would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 80th Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 78th Street and Ditmars Boulevard. At a minimum of 5,000 feet, the start of the transition would have to begin on Ditmars Boulevard at Steinway Street (the distance from 78th Street and Ditmars Boulevard to Ditmars Boulevard and Steinway Street is about 5,000 feet). This would result in the permanent closure of travel lanes and the permanent loss of street parking on a portion of Ditmars Boulevard, which is identified as a principal arterial (other) by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

To provide a general cost for subway construction, the average per mile cost of $976.0 million for elevated subways and $1.09 billion for underground subways was used. On this basis, the 1.89-mile elevated subway and the 0.61-mile

[82] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[83] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[84] *Ibid.*

underground subway in this alternative would cost approximately $2.51 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the N-W Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative could disrupt peak-hour Amtrak Northeast Corridor service during construction, would result in the temporary closure of travel lanes on Ditmars Boulevard, and would result in the permanent shift of travel lanes and the permanent removal of parking lanes on Ditmars Boulevard. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in a permanent closure of a portion of Ditmars Boulevard. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.3.5 ALTERNATIVE 8E: FROM 36TH STREET SUBWAY STATION: TUNNEL BENEATH STEINWAY STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would create a branch extension of the existing M-R Lines from the 36th Street Subway Station in a tunnel beneath Steinway Street and GCP to a subterranean station at LGA. This alternative would affect the operation of the M-R Lines during construction. In addition, as a branch of the M-R Lines, this alternative would result in a permanent reduction in service at subway stations east of the 36th Street Subway Station, as service to LGA would need to be sequenced with the existing M-R Lines subway service, which would reduce the number of M-R trains from the east that could operate through the 36th Street Subway Station. This would have a permanent effect on up to approximately 145,000 daily riders on the M-R Lines east of the 36th Street Subway Station.[85]

The alignment for this alternative would be underground and could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- City Water Tunnel No. 3;
- 82-inch by 90-inch reinforced concrete combined sewer, which is approximately 20 feet below grade, along Northern Boulevard between Steinway Street and 36th Street;
- 42-inch by 36-inch combined concrete sewer, which varies between 20 to 25 feet below grade, along Steinway Street between Northern Boulevard and 35th Avenue;
- 51-inch by 32-inch combined concrete sewer, which varies between 20 to 25 feet below grade, along Steinway Street between 34th Avenue and 35th Avenue;
- 78-inch by 71-inch combined reinforced concrete sewer, which is approximately 30 feet below grade, along Steinway Street between 34th Avenue and Broadway;
- 72-inch by 65-inch combined reinforced concrete sewer, which is approximately 25 feet below grade, along Steinway Street between 34th Avenue and Broadway;
- 54-inch by 44-inch combined brick sewer, which varies between 15 and 20 feet below grade, along Steinway Street between 28th Avenue and 35th Avenue;
- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;

[85] Metropolitan Transportation Authority, http://web.mta.info/nyct/facts/ridership/#chart_s (accessed December 19, 2020).

- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[86] Relocation of combined sewer outfalls and interceptors[87] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[88] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[89] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[90]

Avoidance of these major utilities would require tunneling the subway beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor,

[86] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[87] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[88] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[89] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[90] *Ibid.*

which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

To provide a general cost for subway construction, the average per mile cost of $1.09 billion for underground subways was used. On this basis, the 3.8-mile subway extension in this alternative would cost approximately $4.13 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the M-R Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would have a permanent effect on the service on the M-R Lines and would affect existing major underground utility lines. Additionally, this alternative would disrupt peak-hour subway service on the M-R Lines during construction. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.3.6 ALTERNATIVE 8F: FROM ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION: ELEVATED ABOVE 82ND STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would create a branch extension of the existing 7 Line from the Roosevelt Avenue-Jackson Heights Subway Station on an elevated structure above 82nd Street and the GCP with a transition into a tunnel to access a subterranean station at LGA. This alternative would require extensive, complex construction on the 7 Line and a crossing of the GCP. The branch extension would need two tracks to allow for frequent bi-directional service. These new tracks would connect to the existing eastbound track. The connection to the center track would be via an interlocking system to provide continuing eastbound service. The merge location would be west of the Roosevelt Avenue-Jackson Heights Subway Station, which would have to be reconstructed and shifted to accommodate this new junction. The last station on the 7 Line to serve the Airport route would be the station before the junction point, which is the 69th Street Subway Station. New crossovers would have to be constructed west of the Roosevelt Avenue-Jackson Heights Subway Station to allow subway trains to move between tracks. This would result in disruptions to service on the existing 7 Line during construction. In addition, as a branch of the 7 Line, this alternative would result in a permanent reduction in service at subway stations east of the 69th Street Subway Station, as the new service to LGA would have to be sequenced with the existing service along the 7 Line, which would reduce the number of 7 trains from the east that could operate through the 69th Street Subway Station. This would have a permanent effect on up to approximately 140,000 daily riders on the 7 Line east of the 69th Street Subway Station.[91] In addition, this alternative would result in the construction of the support columns for the elevated subway and would require the temporary closure of 82nd Street, which is identified as a major collector by NYSDOT, and the

[91] Metropolitan Transportation Authority, http://web.mta.info/nyct/facts/ridership/#charts (accessed December 19, 2020).

temporary loss of street parking on 82nd Street. Upon completion of construction, parking would exist on both sides of the streets intermingled with the support columns.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[92] Relocation of combined sewer outfalls and interceptors[93] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[94] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[95] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor

[92] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[93] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[94] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[95] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[96]

Avoidance of these major utilities would require tunneling the subway beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a subway tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the subway tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for a subway tunnel, the distance needed to transition from an elevated subway to an underground subway would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 82nd Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 82nd Street and 23rd Avenue. At a minimum of 5,000 feet, the start of the transition would have to begin on 82nd Street at 34th Avenue (the distance from 23rd Avenue to 34th Avenue is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes and the permanent loss of street parking on a portion of 82nd Street, which is identified as major collector by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

To provide a general cost for subway construction, the average per mile cost of $976.0 million for elevated subways and $1.09 billion for underground subways was used. On this basis, the 2.07-mile elevated subway and the 0.53-mile underground subway in this alternative would cost approximately $2.6 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would disrupt peak-hour subway service on the 7 Line during construction, would have a permanent effect on service on the 7 Line, would result in the temporary closure of travel lanes on a portion of 82nd Street, and would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes and the permanent loss of street parking on a portion of 82nd Street. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

[96] *Ibid.*

2.6.3.7 ALTERNATIVE 8G: FROM METS-WILLETS POINT SUBWAY STATION: ELEVATED ABOVE ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would create a branch extension of the existing 7 Line from the Mets-Willets Point Subway Station on an elevated structure above Roosevelt Avenue and the Flushing Bay Promenade and would require the implementation of a variety of modifications to the 7 Line. The branch extension would need two tracks to allow for frequent bi-directional service. These new tracks would connect to the existing westbound track. The connection to the center track would be via an interlocking system to provide continuing westbound service. The merge location would be west of the Mets-Willets Point Subway Station, which would have to be reconstructed and shifted to accommodate this new junction. New crossovers would have to be constructed west of the Mets-Willets Point Subway Station to allow subway trains to move between tracks. These new crossovers would likely require the full or partial closure of the 7 Line east of the 111th Street Subway Station during construction, which would limit subway service to Flushing. As a branch of the 7 Line, this alternative would result in a permanent reduction in service at subway stations east of the 111th Street Subway Station, as the new service to LGA would have to be sequenced with the existing service along the 7 Line, which would reduce the number of 7 trains from the east that could operate through the 111th Street Subway Station. This would have a permanent effect on up to approximately 60,000 daily riders on the 7 Line east of the 111th Street Subway Station.[97]

This alternative would be elevated and would be designed to minimize impacts to underground utilities by following NYCDEP guidelines.

To provide a general cost for subway construction, the average per mile cost of $976.0 million for elevated subways was used. On this basis, the 1.9-mile subway extension in this alternative would cost approximately $1.85 billion, which is less than the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities. Specifically, this alternative would have a permanent reduction in service on the 7 Line. Additionally, this alternative would disrupt peak-hour subway service during construction. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4 FIXED GUIDEWAY ALTERNATIVES

2.6.4.1 ALTERNATIVE 9A: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE ALTERNATIVE (PORT AUTHORITY'S PROPOSED ALTERNATIVE)

This alternative would result in a fixed guideway from the Willets Point Station to LGA. This alternative, which would cross over the 7 Line, Roosevelt Avenue, and the GCP / Whitestone Expressway interchange, could be designed to avoid the need to relocate these major transportation infrastructure facilities. Construction over the 7 Line and modifications to the Mets-Willets Point LIRR Station would be accommodated during off-peak hours and during weekend closures to avoid disrupting 7 Line and LIRR operations during peak travel times. A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment. This alternative would be elevated and would be designed to minimize impacts to underground utilities by following NYCDEP guidelines.

[97] Metropolitan Transportation Authority, http://web.mta.info/nyct/facts/ridership/#charts (accessed December 19, 2020).

This alternative could be reasonable to construct given cost considerations as it is the basis from which all alternatives are being considered.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would be reasonable to construct and operate and was analyzed in detail in the EIS.

2.6.4.2 ALTERNATIVE 9B: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in a fixed guideway from the Willets Point Station along Roosevelt Avenue and the GCP. This alternative would cross over the 7 Line, Roosevelt Avenue, and the GCP / Whitestone Expressway interchange and would access LGA via the median of the GCP. In addition, the modifications to the Mets-Willets Point LIRR Station would be accommodated during off-peak hours and during weekend closures to avoid disrupting LIRR operations during peak travel times.

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, placing this elevated fixed guideway in the median of the GCP would require modifications to the GCP because the existing median and shoulders are not wide enough to accommodate the support structures of an elevated fixed guideway. Therefore, in order for support columns for the fixed guideway to be constructed in the median of the GCP, a temporary closure of the travel lane closest to the median in the westbound direction would be required and the existing eastbound travel lanes on the GCP would need to be permanently shifted south. The GCP is a principal arterial (expressway) as defined by NYSDOT, and this temporary closure of westbound travel lanes and the permanent shifting of eastbound travel lanes would affect up to approximately 165,000 daily drivers on this segment of the GCP.[98]

This alternative could be reasonable to construct given cost considerations because it would be the same length as Alternative 9A (the Port Authority's proposed alternative) and, therefore, would have a similar cost as the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect to a major transportation facility. Specifically, this alternative would require the temporary closure of the westbound travel lanes on the GCP and the permanent shift south of the eastbound travel lanes on the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.3 ALTERNATIVE 9C: FROM WILLETS POINT STATION VIA ROOSEVELT AVENUE AND FLUSHING BAY PROMENADE WITH A FERRY STOP ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station along Roosevelt Avenue and the Flushing Bay Promenade and would include a ferry stop along Flushing Bay. This alternative, which would cross over the 7 Line, Roosevelt Avenue, and the GCP / Whitestone Expressway interchange, would be designed to avoid the need to relocate these major infrastructure facilities. In addition, the modifications to the Mets-Willets

[98] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

Point LIRR Station would be accommodated during off-peak hours and during weekend closures to avoid disrupting LIRR operations during peak travel times.

This alternative would require the construction of a station for the fixed guideway adjacent to the ferry landing along the Flushing Bay Promenade. The station would need to provide access from ground level, the level from which ferry passengers would disembark from the ferry, to the elevated station. Access would be required to be compliant with the ADA, which means that either elevators or ramps would need to be incorporated into the station design. The station would have either a central platform with two outside tracks or two tracks in the center requiring two platforms, one on each side of the tracks. In either case, the station would be a minimum of 60 feet wide and would require support structures that span that distance. Given design requirements for a fixed guideway station to be along a straight segment of track, the location where a ferry landing with access to the station could be developed is limited. In these areas, the distance between the GCP and Flushing Bay is approximately 50 feet. Because of the physical constraints of this location, the construction of required vertical circulation facilities to access the elevated station (such as elevators, stairs, and ramps) and the required support columns for this elevated station would require the placement of these facilities in the right-of-way of the GCP, requiring the permanent shifting of both the eastbound and westbound travel lanes on the GCP to the south. The GCP is a principal arterial (expressway) as defined by NYSDOT, and this shifting of lanes would affect up to approximately 165,000 daily drivers on this segment of the GCP.[99] In addition, the elevated station likely would block access to portions of the Flushing Bay Promenade.

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines.

This alternative would cost more than Alternative 9A (the Port Authority's proposed alternative) because, in addition to the cost of a fixed guideway, this alternative would include the costs associated with the development of a ferry stop and an intermediate station along the alignment. However, with the additional cost of the ferry stop, the total cost of this alternative would not be more than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

The users of this fixed guideway alternative would access the system from two locations: the Willets Point Station and the intermediate station along the alignment to accommodate ferry passengers. The fixed guideway would provide reasonable access to all identified access points.

This alternative would have a material effect on a major transportation facility. Specifically, this alternative would require the permanent shifting of travel lanes on the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.4 ALTERNATIVE 9D: FROM WILLETS POINT STATION VIA LONG ISLAND RAIL ROAD RIGHT-OF-WAY AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station along the existing rail right-of-way and the Flushing Bay Promenade. This alternative would be constructed on an elevated structure above the LIRR right-of-way and would cross over the 7 Line, Roosevelt Avenue, and the GCP / Whitestone Expressway interchange. Modifications to the Mets-Willets Point LIRR Station would be accommodated during off-peak hours and during weekend closures to avoid affecting LIRR operations at the station.

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines.

[99] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

Construction above the right-of-way of the LIRR would result in the temporary suspension of service for an extended period of time on the Port Washington Branch.[100] This closure would disrupt LIRR operations during peak commuter hours and would affect up to approximately 39,000 daily riders on the LIRR Port Washington Branch.[101, 102] This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 2.3 miles, the cost for this alternative at $2.24 billion would be similar to the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would cause disruptions to transit service during peak-hour service. Specifically, this alternative would disrupt peak-hour commuter and transit service on the LIRR Port Washington Branch during construction. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.5 ALTERNATIVE 9E: FROM WILLETS POINT STATION VIA LONG ISLAND RAIL ROAD RIGHT-OF-WAY AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station along the existing LIRR right-of-way and the GCP. This alternative would be constructed on an elevated structure above the LIRR right-of-way; it would cross over the 7 Line, Roosevelt Avenue, and the GCP / Whitestone Expressway interchange and would access LGA via the median of the GCP. Modifications to the Mets-Willets Point LIRR Station would be accommodated during off-peak hours and during weekend closures to avoid affecting LIRR operations at the station.

A variety of underground utilities (such as water lines and sewer lines) are present along this alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. Construction above the right-of-way of the LIRR would result in the temporary suspension of service for an extended period of time on the Port Washington Branch, which would affect peak-hour commuter and transit service during construction and would affect up to approximately 39,000 daily riders on the LIRR Port Washington Branch.[103, 104] In addition, in order for support columns for the fixed guideway to be constructed in the median of the GCP, the temporary closure of the travel lanes closest to the median in the westbound direction would be required and the existing eastbound travel lanes on the GCP would need to be permanently shifted south. The GCP is a principal arterial (expressway) as defined by NYSDOT and the temporary closure of westbound travel lanes and the permanent shifting of eastbound travel lanes would affect up to approximately 165,000 daily drivers on this segment of the GCP.[105]

[100] Port Authority of New York and New Jersey, *LIRR Track Outage Estimates for Alternative Alignment Concept and Port Authority Preferred Alignment Concept*, September 19, 2019.

[101] Metropolitan Transportation Authority, *Long Island Rail Road, 2018 Annual Ridership Report,* http://web.mta.info/mta/news/books/docs/LIRR-2018-Annual-Ridership-Report.pdf (accessed December 19, 2020).

[102] Port Authority of New York and New Jersey, *LIRR Track Outage Estimates for Alternative Alignment Concept and Port Authority Preferred Alignment Concept*, September 19, 2019.

[103] Metropolitan Transportation Authority, *Long Island Rail Road, 2018 Annual Ridership Report,* http://web.mta.info/mta/news/books/docs/LIRR-2018-Annual-Ridership-Report.pdf (accessed December 19, 2020).

[104] Port Authority of New York and New Jersey, *LIRR Track Outage Estimates for Alternative Alignment Concept and Port Authority Preferred Alignment Concept*, September 19, 2019.

[105] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 2.3 miles, the cost of this alternative at $2.24 billion would be similar to the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities. Specifically, this alternative would require the temporary closure of the westbound travel lanes on the GCP and the permanent shift south of the eastbound travel lanes on the GCP. Additionally, this alternative would disrupt peak-hour commuter and transit service on the LIRR Port Washington Branch during construction. This alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.6 ALTERNATIVE 9F: FROM WILLETS POINT STATION VIA 126TH STREET AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station to LGA via 126th Street and the GCP. This alternative would be constructed on an elevated structure over the 7 Line and in the medians of 126th Street, the Whitestone Expressway, and the GCP. A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; the alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. For this alternative, support columns would be placed in the westbound lanes on Northern Boulevard, which is on the ground level between the eastbound and westbound lanes on the Whitestone Expressway. This would require the temporary closure of the westbound lanes on Northern Boulevard during construction. After completion of construction, the support columns would require the permanent closure of one of the three westbound travel lanes on Northern Boulevard. Northern Boulevard is a principal arterial (other) as defined by NYSDOT. The temporary and permanent closure of these travel lanes would affect up to approximately 45,000 daily drivers on this segment of Northern Boulevard.[106] Finally, in order for support columns for the fixed guideway to be constructed in the median of the GCP, the temporary closure of the travel lanes closest to the median in the westbound direction would be required, and the existing eastbound travel lanes on the GCP would need to be permanently shifted south. The GCP is a principal arterial (expressway) as defined by NYSDOT, and this temporary closure of westbound travel lanes and the permanent shifting of eastbound travel lanes would affect up to approximately 165,000 daily drivers on this segment of the GCP.[107]

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, construction of the 300-foot span over the Whitestone Expressway from the median of 126th Street would require relocation of the major 7-foot by 5-foot storm sewer located beneath 126th Street. Therefore, this alternative would have a material effect on a major utility.

Over 230 buses for 14 bus lines in Queens are maintained and stored at and operated from the Bus Depot. Constructing an elevated structure over the 7 Line and along 126th Street could eliminate travel lanes on 126th Street. This would affect the ability to operate buses on 126th Street during construction. Because this is a primary route for buses to and from the Bus Depot, this would disrupt peak-hour commuter and transit service during the

[106] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2011).

[107] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

construction period affecting more than 100,000 daily riders.[108] In addition, constructing an APM guideway and station in this area would impact the 7 Line and Mets-Willets Point Subway Station, the Bus Depot and/or the NYCT Corona Maintenance Facility as there is inadequate space to construct the guideway and station in this area without affecting one of these transportation facilities (see **Exhibit 2-17**). Thus, this alternative would result in extensive disruption to MTA facilities and transit users during the construction period.

This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 2.3 miles, the cost of this alternative at $2.24 billion would be similar to the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and a major underground utility. Specifically, this alternative would impact 126th Street; would result in the permanent closure of travel lanes on Northern Boulevard, the temporary closure of the westbound travel lanes on the GCP, and the permanent shift south of the eastbound travel lanes on the GCP; and would impact a major storm sewer. In addition, this alternative would affect either the bus service operating out of the Bus Depot or train access from the 7 Line to the NYCT Corona Maintenance Facility during construction. As such, this alternative would disrupt peak-hour commuter and transit service for buses operating from the Bus Depot and the 7 Line service out of the NYCT Corona Maintenance Facility. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.7 ALTERNATIVE 9G: FROM WILLETS POINT STATION VIA 126TH STREET AND ACROSS FLUSHING BAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station to LGA via 126th Street and across Flushing Bay. This alternative would cross over the 7 Line, be in the median of 126th Street, cross over the Whitestone Expressway, and cross Flushing Bay. This alternative would require the alignment to span across the Whitestone Expressway at the intersection of Northern Boulevard and 126th Street. No physical space exists within the intersection for the installation of support columns between travel lanes without major impacts or modifications to these existing roadways. To minimize roadway impacts, a 300-foot span would be required, requiring more expensive and complicated construction techniques. The required column placement to support the span would be located within the Marina East parking lot and the median of 126th Street, resulting in the permanent loss of one travel lane on 126th Street.

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, construction of the 300-foot span over the Whitestone Expressway from the median of 126th Street would require relocation of the major 7-foot by 5-foot storm sewer located beneath 126th Street. Therefore, this alternative would have a material effect on a major utility.

[108] Metropolitan Transportation Authority, https://new.mta.info/agency/new-york-city-transit/subway-bus-ridership-2019 (accessed January 24, 2021).

SOURCES: Nearmap, New York, June 2020 (aerial); Ricondo & Associates, Inc., April 2020 (bus flow).

NORTH 0 200 ft

EXHIBIT 2-17

BUS DEPOT AND NEW YORK CITY TRANSIT
CORONA MAINTENANCE FACILITY

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Over 230 buses for 14 bus lines in Queens are maintained and stored at and operated from the Bus Depot. Constructing an elevated structure over the 7 Line and along 126th Street could eliminate travel lanes on 126th Street. This would affect the ability to operate buses on 126th Street during construction. Because this is a primary route for buses to and from the Bus Depot, this would disrupt peak-hour commuter and transit service during the construction period affecting more than 100,000 daily riders.[109] In addition, constructing an APM guideway and station in this area would impact the 7 Line and Mets-Willets Point Subway Station, Bus Depot and/or the NYCT Corona Maintenance Facility as there is inadequate space to construct the guideway and station in this area without affecting one of these transportation facilities (see Exhibit 2-17). Thus, this alternative would result in extensive disruption to MTA facilities and transit users during the construction period.

This alternative would be the same length as Alternative 9A (the Port Authority's proposed alternative). This alternative would include a 300-foot span across the Whitestone Expressway and an elevated structure across Flushing Bay, requiring more expensive and complicated construction techniques. However, the cost is assumed to be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative. Therefore, this alternative could be reasonable to construct given cost considerations.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and a major underground utility. Specifically, this alternative would impact 126th Street and a major storm sewer. This alternative would also affect either the bus service operating out of the Bus Depot or train access from the 7 Line to the NYCT Corona Maintenance Facility during construction, which would disrupt service to commuters reliant on these services. As such, restrictions to bus service or train access would cause disruptions to transit service during peak-hour service for buses operating from the Bus Depot during the construction period or the 7 Line service out of the NYCT Corona Maintenance Facility. This alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.8 ALTERNATIVE 9H: FROM WILLETS POINT STATION VIA 126TH STREET AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would result in an elevated fixed guideway from the Willets Point Station to LGA via 126th Street and the Flushing Bay Promenade. This alternative would be constructed on an elevated structure over the 7 Line, in the median of 126th Street, over the Whitestone Expressway, and along the Flushing Bay Promenade. This alternative would require the alignment to span across the Whitestone Expressway at the intersection of Northern Boulevard and 126th Street. No physical space exists within the intersection for the installation of support columns between travel lanes without major impacts or modifications to these existing roadways. To minimize roadway impacts, a 300-foot span would be required, requiring more expensive and complicated construction techniques. The required column placement to support the span would be located within the Marina East parking lot and the median of 126th Street, resulting in the permanent loss of one travel lane on 126th Street.

A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, construction of the 300-foot span over the Whitestone Expressway from the median of 126th Street would

[109] Metropolitan Transportation Authority, https://new.mta.info/agency/new-york-city-transit/subway-bus-ridership-2019 (accessed January 24, 2021).

require relocation of the major 7-foot by 5-foot storm sewer located beneath 126th Street. Therefore, this alternative would have a material effect on a major utility.

Over 230 buses for 14 bus lines in Queens are maintained and stored at and operated from the Bus Depot. Constructing an elevated structure over the 7 Line and along 126th Street could eliminate travel lanes on 126th Street. This would affect the ability to operate buses on 126th Street during construction. Because this is a primary route for buses to and from the Bus Depot, this would disrupt peak-hour commuter and transit service during the construction period affecting more than 100,000 daily riders.[110] In addition, constructing an APM guideway and station in this area would impact the 7 Line and Mets-Willets Point Subway Station, the Bus Depot and/or the NYCT Corona Maintenance Facility as there is inadequate space to construct the guideway and station in this area without affecting one of these transportation facilities (see Exhibit 2-17). Thus, this alternative would result in extensive disruption to MTA facilities and transit users during the construction period.

This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 2.2 miles, the cost of this alternative at $2.15 billion would be similar to the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and a major underground utility. Specifically, this alternative would impact 126th Street and a major storm sewer. Additionally, it would affect either the bus service operating out of the Bus Depot or the train access from the 7 Line to the NYCT Corona Maintenance Facility during construction. As such, this alternative would disrupt passenger and transit service for buses operating from the Bus Depot or the 7 Line service out of the NYCT Corona Maintenance Facility, which would disrupt service to commuters reliant on these services. This alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.9 ALTERNATIVE 9I: FROM NORTHERN BOULEVARD VIA WILLETS POINT STATION, ROOSEVELT AVENUE, AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would result in an elevated fixed guideway from a new station on Northern Boulevard east of Flushing Creek to LGA via the Willets Point Station, Roosevelt Avenue, and the Flushing Bay Promenade. This alternative would be constructed on an elevated structure over Flushing Creek, along the median of Willets Point Boulevard, over the 7 Line (twice), over the GCP / Whitestone Expressway interchange, and along the Flushing Bay Promenade. A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines.

For this alternative, support columns would be placed in the median of Northern Boulevard and would require the permanent closure of one travel lane in each direction. Northern Boulevard is a principal arterial (other) as defined by NYSDOT. The temporary and permanent closure of these travel lanes would affect up to approximately 45,000 daily drivers on this segment of Northern Boulevard.[111]

[110] Metropolitan Transportation Authority, https://new.mta.info/agency/new-york-city-transit/subway-bus-ridership-2019 (accessed January 24, 2021).

[111] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

Over 230 buses for 14 bus lines in Queens are maintained and stored at and operated from the Bus Depot. Constructing an elevated structure over the 7 Line and along 126th Street could eliminate travel lanes on 126th Street. This would affect the ability to operate buses on 126th Street during construction. Because this is a primary route for buses to and from the Bus Depot, this would disrupt peak-hour commuter and transit service during the construction period affecting more than 100,000 daily riders.[112] In addition, constructing an APM guideway and station in this area would impact the 7 Line and Mets-Willets Point Subway Station, the Bus Depot and/or the NYCT Corona Maintenance Facility as there is inadequate space to construct the guideway and station in this area without affecting one of these transportation facilities (see Exhibit 2-17). Thus, this alternative would result in extensive disruption to MTA facilities and transit users during the construction period.

This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 3.0 miles, the cost of this alternative at $2.93 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and the LIRR Port Washington Branch and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities, as it would result in the permanent closure of travel lanes on Northern Boulevard and would affect either the bus service operating out of the Bus Depot or train access from the 7 Line to the NYCT Corona Maintenance Facility. As such, this alternative would disrupt passenger and transit service for buses operating from the Bus Depot or the 7 Line service out of the NYCT Corona Maintenance Facility, which would disrupt service to commuters reliant on these services. As a result, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.10 ALTERNATIVE 9J: FROM JAMAICA STATION TRANSPORTATION HUB VIA VAN WYCK EXPRESSWAY, GRAND CENTRAL PARKWAY, AND FLUSHING BAY PROMENADE ALTERNATIVE

This alternative would result in a fixed guideway from the existing Jamaica Station transportation hub to LGA via the Van Wyck Expressway, the GCP, and the Flushing Bay Promenade. This alternative would be in the median of the Van Wyck Expressway and the GCP and along the Flushing Bay Promenade. A variety of underground utilities (such as water lines and sewer lines) are present along this elevated alignment; this alternative would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. This alternative would be constructed in the medians of the Van Wyck Expressway and the GCP, and could include realignment of the Kew Gardens interchange. These support columns would be in the rights-of-way for the Van Wyck Expressway and the GCP. For the Van Wyck Expressway, this would require the temporary closure of the travel lanes closest to the median in both directions. This is because it is not possible to temporarily shift travel lanes because of limitations associated with existing bridges. For the GCP, a temporary closure of the travel lane closest to the median in the westbound direction would be required, and the existing eastbound travel lanes on the GCP would need to permanently shifted south. Both the Van Wyck Expressway and the GCP are principal arterials (expressways) as defined by NYSDOT. This temporary closure of travel lanes would affect up to approximately 89,000 daily drivers on this segment of the Van Wyck Expressway.[113] This temporary closure of westbound travel lanes and the permanent shifting of eastbound

[112] Metropolitan Transportation Authority, https://new.mta.info/agency/new-york-city-transit/subway-bus-ridership-2019 (accessed January 24, 2021).

[113] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

travel lanes would affect up to approximately 165,000 daily drivers on this segment of the GCP.[114] This alternative also would result in the temporary closure of the existing JFK AirTrain, in order to develop a co-terminus station at the Jamaica Station transportation hub.

At 6.7 miles, the cost of this alternative would be approximately $6.54 billion, which is more than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the E-J-Z Lines and many branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities. Specifically, this alternative would require the temporary closure of travel lanes on the Van Wyck Expressway and the westbound direction on the GCP to accommodate the placement of support columns for the fixed guideway as well as the permanent shift south of the eastbound travel lanes on the GCP. Additionally, this alternative would disrupt operation of the JFK AirTrain, which would affect peak-hour commuter and transit service during construction. Furthermore, the cost of this alternative would be more than two and a half times greater than the current estimated $2.05 billion project cost. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.11 ALTERNATIVE 9K: FROM WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION VIA AN EXISTING RAIL RIGHT-OF-WAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the existing Woodside LIRR/61st Street-Woodside Subway Station to LGA on an elevated structure above the existing rail right-of-way, the BQE, and the GCP. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, as well as extensive bridge and roadway reconstruction. During construction, this would require the temporary closure of travel lanes on the BQE and the GCP, which would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[115] The BQE is a principal arterial (interstate) and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, construction of the support columns would cause the permanent shifting of travel lanes on the BQE and removal of the emergency stopping lane in the northbound direction.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

[114] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[115] *Ibid.*

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[116] Relocation of combined sewer outfalls and interceptors[117] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[118] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[119] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[120]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the

[116] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[117] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[118] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[119] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[120] *Ibid.*

assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 82nd Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on BQE and the GCP. The BQE is a principal arterial (interstate), and the GCP is a principal arterial (expressway) as defined by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative would not disrupt peak-hour subway, rail, or transit service during construction. This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 3.1 miles, the cost of this alternative at $3.03 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and all branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP, the temporary closure of travel lanes on the BQE and the GCP, the permanent shift of travel lanes on the BQE, and the permanent closure of the emergency stopping lane in the northbound direction of the BQE. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the BQE and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.12 ALTERNATIVE 9L: FROM ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA BROADWAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the existing Roosevelt Avenue-Jackson Heights Subway Station to LGA via Broadway, the BQE, and the GCP. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, as well as extensive bridge and roadway reconstruction. During construction, this would require temporary closure of travel lanes on the BQE and the GCP, which would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[121] The BQE is a principal arterial (interstate), and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, construction of the support columns would cause a permanent shift of travel lanes on the BQE and removal of the emergency stopping lane in the northbound direction.

The section of this alternative that would be on an elevated structure would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

[121] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[122] Relocation of combined sewer outfalls and interceptors[123] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[124] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[125] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[126]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural

[122] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[123] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[124] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[125] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[126] *Ibid.*

supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 82nd Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on BQE and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative would not disrupt peak-hour subway, rail, or transit service during construction. This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 2.9 miles, the cost of this alternative at $2.83 billion would be less than two and a half times the estimated $2.05 billion cost of the Port Authority's proposed alternative.

This alternative is on the 7-E-F-M-R Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP, the temporary closure of travel lanes on the BQE and the GCP, and, after construction of the support columns is completed, a permanent shift of travel lanes on the BQE and the permanent loss of the emergency stopping lane in the northbound direction of the BQE. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the BQE and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.13 ALTERNATIVE 9M: FROM WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION AND ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA ROOSEVELT AVENUE, BROADWAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in a fixed guideway from the existing Woodside LIRR/61st Street-Woodside Subway Station via Roosevelt Avenue to the Roosevelt Avenue-Jackson Heights Subway Station and in the median of Broadway, the BQE, and the GCP. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, as well as extensive bridge and roadway reconstruction. During construction, this would require temporary closure of travel lanes on the BQE and the GCP, which would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[127] The BQE is a principal arterial (interstate)

[127] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, after construction of the support columns is completed, a permanent shift of travel lanes on the BQE would occur and the emergency stopping lane in the northbound direction would be removed.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[128] Relocation of combined sewer outfalls and interceptors[129] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[130] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[131] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor

[128] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[129] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[130] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[131] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[132]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the subway tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 82nd Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on BQE and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative would not disrupt peak-hour subway, rail, or transit service during construction. This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 3.5 miles, the cost of this alternative at $3.42 billion would be less than two and a half times the estimated $2.05 billion cost of the Port Authority's proposed alternative.

This alternative is on the 7-E-F-M-R Lines and all branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP, the temporary closure of travel lanes on the BQE and the GCP, and, after construction of the support columns is completed, a permanent shift of travel lanes on the BQE and the permanent loss of the emergency stopping lane in the northbound direction of the BQE would occur. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the BQE and the GCP.

[132] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.14 ALTERNATIVE 9N: FROM ASTORIA BOULEVARD SUBWAY STATION VIA ASTORIA BOULEVARD AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the existing Astoria Boulevard Subway Station to LGA via Astoria Boulevard and the GCP. This alternative would include an elevated structure above Astoria Boulevard and the GCP. Because there is not enough clearance to construct an elevated structure to pass underneath the existing Hell Gate rail trestle, this alternative would require the modification of the Hell Gate rail trestle, which is a major transportation facility. Disruption of the Hell Gate rail trestle would require a temporary rail bridge adjacent to the existing trestle to provide for ongoing service during construction. Limited easements exist in this area, likely requiring property acquisition and displacement of existing land uses. In addition, during construction, this alternative would have substantial impacts to train service using the rail line, which would disrupt peak-hour Amtrak Northeast Corridor and other passenger rail service across the northeast corridor, which would affect up to approximately 10,000 daily passengers.[133] Additionally, construction of this alternative would need to be scheduled in coordination with ongoing construction that also affects Amtrak service, including the LIRR East Side Access project, East River Tunnel repairs, the Gateway Program, and the Penn Station Access Project.

Construction of the support columns for the fixed guideway would require the temporary closure of travel lanes on the GCP, which would affect up to 165,000 drivers that use this segment of the GCP on a daily basis.[134] In addition, this alternative would result in the permanent closure of travel lanes on Astoria Boulevard, which would affect up to 75,000 daily drivers on Astoria Boulevard on a daily basis.[135] Astoria Boulevard is a principal arterial (other) as defined by NYSDOT. The permanent closure of travel lanes would occur because it is not possible to construct support columns for the fixed guideway without placing one of the support columns in an existing travel lane and it is not possible to shift travel lanes due to limitations associated with existing bridges.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

[133] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

[134] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[135] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[136] Relocation of combined sewer outfalls and interceptors[137] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[138] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[139] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[140]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the

[136] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[137] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[138] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[139] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[140] *Ibid.*

assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 80th Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 78th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin on Astoria Boulevard as it crosses under the Hell Gate rail trestle (the distance from 78th Street and the GCP to Astoria Boulevard and the Hell Gate rail trestle is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on Astoria Boulevard and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative could be reasonable to construct given cost considerations because, even though it is slightly longer than Alternative 9A (the Port Authority's proposed alternative) at 2.5 miles, the cost of this alternative at $2.44 billion would be less than two and a half times the estimated $2.05 billion cost of the Port Authority's proposed alternative.

This alternative is on the N-W Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would result in modification to the Hell Gate rail trestle, the temporary closure of travel lanes on the GCP, the permanent closure of travel lanes on Astoria Boulevard, and the loss of travel lanes on Astoria Boulevard and the GCP. This alternative also would disrupt the peak-hour commuter and transit service for rail service on the Hell Gate rail trestle during the construction period. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on Astoria Boulevard and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.15 ALTERNATIVE 9O: FROM HUNTERSPOINT AVENUE LIRR STATION VIA EXISTING RAIL RIGHT-OF-WAY, 31ST STREET, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the existing Hunterspoint Avenue LIRR Station to LGA on an elevated structure above the existing rail right-of-way, 31st Avenue, the BQE, and the GCP. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, as well as extensive bridge and roadway reconstruction. During construction, this would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[141] The BQE is a principal arterial (interstate) and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, construction of the support columns would cause a permanent shift of travel lanes on the BQE and removal of the emergency stopping lane in the northbound direction.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

[141] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[142] Relocation of combined sewer outfalls and interceptors[143] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[144] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[145] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[146]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural

[142] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[143] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[144] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[145] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[146] *Ibid.*

supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 82nd Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on the BQE and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

Because this alternative would be constructed on an elevated structure above the right-of-way of the LIRR, this alternative would affect the LIRR during construction and would disrupt peak-hour passenger and transit service on various branches of the LIRR.

This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 4.5 miles, the cost of this alternative at $4.39 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and all branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP the temporary closure of travel lanes on the BQE and the GCP, and, after construction of the support columns is completed, a permanent shift of travel lanes on the BQE and the permanent loss of the emergency stopping lane in the northbound direction of the BQE. This alternative also would disrupt peak-hour passenger and transit service on the LIRR during the construction period. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the BQE and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.16 ALTERNATIVE 9P: FROM SUNNYSIDE YARDS VIA EXISTING RAIL RIGHT-OF-WAY, STEINWAY STREET, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from a new station in Sunnyside Yards to LGA via an existing rail right-of-way, Steinway Street, and the GCP. During construction, this would require temporary closure of travel lanes on Steinway Street and the GCP, which would affect up to approximately 12,000 daily drivers on this

segment of Steinway Street[147] and up to approximately 165,000 daily drivers on this segment of the GCP.[148] Steinway Street is a major collector and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, construction of the support columns would cause a permanent shift of travel lanes on Steinway Street and removal of a parking lane on one side of Steinway Street.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[149] Relocation of combined sewer outfalls and interceptors[150] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[151] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[152] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined

[147] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

[148] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[149] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[150] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[151] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[152] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[153]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Also, given the location of the combined sewer line near the intersection of 80th Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur at 78th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin on the GCP as it crosses under the Hell Gate rail trestle (the distance from 78th Street to the Hell Gate rail trestle on the GCP is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on the GCP, which is identified as a principal arterial (expressway) by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

Sunnyside Yards is one of the busiest rail yards in the country and a key train storage yard and maintenance hub for Amtrak's Northeast Corridor. Each of the tracks within Sunnyside Yards is used on a daily basis for train storage or train operations. Thus, the construction and operation of a new station in Sunnyside Yards would result in the need to remove one or more of the tracks on a temporary or permanent basis. The temporary loss of any tracks within Sunnyside Yards would disrupt peak-hour passenger and transit service during the construction period. The permanent loss of any tracks would negatively affect LIRR and Amtrak service, which would affect up to approximately 10,000 daily passengers.[154]

This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 4.2 miles, the cost of this alternative at $4.10 billion

[153] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[154] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative does not have access to other transit stations as there are no existing transit stations at Sunnyside Yards; therefore, it would not provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would affect the permanent throughput capacity of the Sunnyside Yards, would require temporary closure of travel lanes on Steinway Street and the GCP, and, after construction of the support columns is completed, would require the permanent shift of travel lanes on Steinway Street and the loss of street parking on side of Steinway Street. This alternative also would disrupt peak-hour commuter and transit service on the LIRR and Amtrak during the construction period. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the GCP. Finally, this alternative would not provide reasonable access to all identified access points. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.17 ALTERNATIVE 9Q: FROM NORTHERN BOULEVARD SUBWAY STATION VIA BROADWAY, STEINWAY STREET, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in an elevated fixed guideway from the existing Northern Boulevard Subway Station to LGA via Broadway, Steinway Street, and the GCP. During construction, this would require temporary closure of travel lanes on Broadway, Steinway Street, and the GCP, which would affect up to approximately 10,000 daily drivers on this segment of Broadway,[155] up to approximately 12,000 daily drivers on this segment of Steinway Street,[156] and up to approximately 165,000 daily drivers on this segment of the GCP.[157] Broadway is a principal arterial (other), Steinway Street is a major collector, and the GCP is a principal arterial (expressway) as defined by NYSDOT. In addition, construction of the support columns would cause a permanent shift of travel lanes on Broadway and Steinway Street and removal of a parking lane on one side of Broadway and Steinway Street.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated section of this alignment; this section would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a

[155] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

[156] *Ibid*.

[157] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[158] Relocation of combined sewer outfalls and interceptors[159] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[160] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[161] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[162]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,000 linear feet using the assumption of a maximum 3 percent grade. Given the location of the combined sewer line near the intersection of 80th Street and the GCP, it is likely that the end of the transition to the underground portion would need to occur

[158] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[159] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[160] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[161] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[162] *Ibid.*

at 78th Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin on the GCP as it crosses under the Hell Gate rail trestle (the distance from 78th Street to the Hell Gate rail trestle on the GCP is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on the GCP, which is identified as a principal arterial (expressway) by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

Because there is not enough clearance to construct an elevated structure to pass underneath the existing Hell Gate rail trestle, this alternative would require the modification of the Hell Gate rail trestle, which is a major transportation facility. Disruption of the Hell Gate rail trestle would require a temporary rail bridge adjacent to the existing trestle to provide for ongoing service during construction. Limited easements exist in this area, likely requiring property acquisition and displacement of existing land uses. Modifications to the Hell Gate rail trestle would result in substantial impacts to train service using the rail line, which would disrupt peak-hour Amtrak Northeast Corridor and other passenger rail service across the northeast corridor during construction, which would affect up to approximately 10,000 daily passengers.[163] Additionally, construction of this alternative would need to be scheduled in coordination with ongoing construction that also affects Amtrak service, including the LIRR East Side Access project, East River Tunnel repairs, the Gateway Program, and the Penn Station Access Project.

This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 3.6 miles, the cost of this alternative at $3.51 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the M-R Lines and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require modification to the Hell Gate rail trestle, would require temporary closure of travel lanes on Broadway, Steinway Street, and the GCP, and, after construction of the support columns is completed, the permanent shift of travel lanes on Broadway and Steinway Street and the loss of parking on one side of both Broadway and Steinway Street. This alternative also would affect peak-hour Amtrak Northeast Corridor service during the construction period. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the permanent closure of travel lanes on the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.18 ALTERNATIVE 9R: THROUGH LINE CONNECTING WILLETS POINT STATION, LAGUARDIA AIRPORT, AND WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION VIA ROOSEVELT AVENUE, GRAND CENTRAL PARKWAY, BROOKLYN QUEENS EXPRESSWAY, AND AN EXISTING RAIL RIGHT-OF-WAY ALTERNATIVE

This alternative would result in a fixed guideway that connects the Willets Point Station, LGA, and the existing Woodside LIRR/61st Street-Woodside Subway Station. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, the

[163] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

temporary closure of travel lanes in both directions of the BQE and in the westbound direction of the GCP, the permanent shifting south of travel lanes on the eastbound GCP, as well as extensive bridge and roadway reconstruction. During construction, this would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[164] Construction of the support columns would cause a permanent shift of travel lanes on the BQE and removal of the emergency stopping lane in the northbound direction. Therefore, this alternative would affect major transportation facilities.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated sections of this alignment; these sections would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[165] Relocation of combined sewer outfalls and interceptors[166] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[167] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[168] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined

[164] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[165] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[166] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[167] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[168] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[169]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require at least 5,700 linear feet for the approach from the Mets-Willets Point Station and at least 5,000 feet for the approach from the Astoria-Ditmars Boulevard Subway Station using the assumption of a maximum 3 percent grade. The difference in distance required for the transition is because the height of the APM is greater for the approach from the Mets-Willets Point Station to account for the elevation of at least 75 feet above grade as the APM line crosses over the 7 Line and Roosevelt Avenue. For the approach from the Mets-Willets Point Station, it is likely that the end of the transition to the underground portion would need to occur at the western end of the Flushing Bay Promenade. At a minimum of 5,700 feet, the start of the transition would have to begin immediately after the APM line crosses over the 7 Line. This would result in the APM guideway being only 20 feet above ground at the GCP and Whitestone Expressway interchange, which would result in the need to modify the interchange to either depress the traffic lanes or create elevated traffic lanes for the interchange. This means that the transition would result in a material effect to the GCP and Whitestone Expressway, both of which are identified as major roadways by the NYSDOT.

For the approach from the Astoria-Ditmars Boulevard Subway Station, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP given the location of the combined sewer line near the intersection of 82nd Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on BQE and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

[169] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

This alternative would not disrupt peak-hour subway, rail, or transit service during construction. This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 5.1 miles, the cost of this alternative at $5.05 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7 Line and all branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP; the temporary closure of travel lanes on the BQE, the westbound direction of the GCP, and Broadway; the modification of the GCP and Whitestone Expressway interchange; the permanent shift of travel lanes on the BQE; the loss of the emergency stopping lane in the northbound direction of the BQE; and the permanent shift south of the eastbound travel lanes on the GCP. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the modification of the GCP and Whitestone Expressway interchange and the permanent closure of travel lanes on the BQE and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.19 ALTERNATIVE 9S: THROUGH LINE CONNECTING WOODSIDE LIRR/61ST STREET-WOODSIDE SUBWAY STATION AND ROOSEVELT AVENUE-JACKSON HEIGHTS SUBWAY STATION VIA BROADWAY, ROOSEVELT AVENUE, AN EXISTING RAIL RIGHT-OF-WAY, BROOKLYN QUEENS EXPRESSWAY, AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in a fixed guideway that connects the existing Woodside LIRR/61st Street-Woodside Subway Station, LGA, and the existing Roosevelt Avenue-Jackson Heights Subway Station. Because of a lack of available space to place support columns for an elevated fixed guideway, this alternative would require realignment of the BQE interchange with the GCP, the temporary closure of travel lanes in both directions of the BQE and in the westbound direction of the GCP, the permanent shifting south of travel lanes on the eastbound GCP, as well as extensive bridge and roadway reconstruction. During construction, this would affect up to approximately 260,000 daily drivers on this segment of the BQE and up to approximately 165,000 daily drivers on this segment of the GCP.[170] In addition, construction of the support columns for the fixed guideway along Broadway would require the temporary closure of travel lanes, which would affect up to approximately 14,000 daily drivers on this segment of Broadway.[171] Additionally, construction of the support columns would cause the permanent shift of travel lanes on the BQE, removal of the emergency stopping lane in the northbound direction, the permanent shift of travel lanes on Broadway, and removal of the parking lane on one side of Broadway. Therefore, this alternative would affect major transportation facilities.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated sections of this alignment; these sections would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

[170] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[171] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2021).

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[172] Relocation of combined sewer outfalls and interceptors[173] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[174] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[175] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[176]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural

[172] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[173] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

[174] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[175] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[176] *Ibid.*

supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require 5,700 linear feet for the approach from the Mets-Willets Point Station and at least 5,000 linear feet for the approach from the Roosevelt Avenue-Jackson Heights Subway Station using the assumption of a maximum 3 percent grade. The difference in distance required for the transition is because the height of the APM is greater for the approach from the Mets-Willets Point Station to account for the elevation of at least 75 feet above grade as the APM line crosses over the 7 Line and Roosevelt Avenue. For the approach from the Mets-Willets Point Station, it is likely that the end of the transition to the underground portion would need to occur at the western end of the Flushing Bay Promenade. At a minimum of 5,700 feet, the start of the transition would have to begin immediately after the APM line crosses over the 7 Line. This would result in the APM guideway being only 20 feet above ground at the GCP and Whitestone Expressway interchange, which would result in the need to modify the interchange to either depress the traffic lanes or create elevated traffic lanes for the interchange. This means that the transition would result in a material effect to the GCP and Whitestone Expressway, both of which are identified as principal arterials (expressways) by NYSDOT.

For the approach from the Roosevelt Avenue-Jackson Heights Subway Station, it is likely that the end of the transition to the underground portion would need to occur at 80th Street and the GCP given the location of the combined sewer line near the intersection of 82nd Street and the GCP. At a minimum of 5,000 feet, the start of the transition would have to begin at 31st Avenue and the BQE (the distance from 80th Street and the GCP to 31st Avenue and the BQE is about 5,000 feet). This means that the transition would result in the permanent closure of travel lanes on BQE and the GCP, both of which are identified as major roadways by NYSDOT. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative would not disrupt peak-hour subway, rail, or transit service during construction. This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 4.3 miles, the cost of this alternative at $4.20 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7-E-F-M-R Lines and all branches of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the realignment of the BQE interchange with the GCP; the temporary closure of travel lanes on the BQE, the westbound travel lanes on the GCP, and Broadway; as well as the permanent shift south of the eastbound travel lanes on the GCP. After construction of the support columns is completed, this would result in the permanent shift of travel lanes on the BQE, the permanent loss of the emergency stopping lane in the northbound direction of the BQE, the permanent shift of travel lanes on Broadway, and the permanent loss of a parking lane on one side of Broadway. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the modification of the GCP and Whitestone

Expressway interchange and the permanent closure of travel lanes on the BQE and the GCP. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.4.20 ALTERNATIVE 9T: THROUGH LINE CONNECTING WILLETS POINT STATION, LAGUARDIA AIRPORT, AND ASTORIA-DITMARS BOULEVARD SUBWAY STATION VIA ROOSEVELT AVENUE, GRAND CENTRAL PARKWAY, 19TH AVENUE, AND 31ST STREET ALTERNATIVE

This alternative would result in a fixed guideway that connects the Willets Point Station, LGA, and the existing Astoria-Ditmars Boulevard Subway Station. This elevated fixed guideway would cross over the 7 Line and the GCP / Whitestone Expressway interchange, and it would run along the Flushing Bay Promenade and above 19th Avenue and 31st Street. Construction of structural columns would require the temporary closure of the westbound travel lanes and the permanent shift south of the eastbound travel lanes affecting up to 165,000 daily drivers on this segment of the GCP,[177] and the temporary closure of travel lanes affecting up to 10,000 daily drivers on 31st Street and 19th Avenue.[178] Construction of the support columns would cause the permanent shift of travel lanes on 31st Street and 19th Avenue and removal of the parking lane on one side of both 31st Street and 19th Avenue. Therefore, this alternative would affect major transportation facilities.

A variety of underground utilities (such as water lines and sewer lines) are present along the elevated sections of this alignment; these sections would be designed to minimize impacts to underground utilities by following NYCDEP guidelines. However, the underground portion of this alignment could not be constructed in a manner that avoids having a material effect on the following major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which varies between 15 to 25 feet below grade, underneath 19th Avenue and 81st Street.

Relocation of these utilities would require feasibility studies for the alignment/route of the relocated utilities to satisfy NYCDEP clearance requirements between relocated utilities and existing utilities. This would require a determination as to whether relocated utilities would necessitate additional replacement or relocation of other existing utilities (water main, gas main, electric line, etc.), and whether affected drainage plans would need to be amended.[179] Relocation of combined sewer outfalls and interceptors[180] could also result in changes to the slope of the utility, which could result in the need for additional pump stations or modification of existing pump stations. In addition, the relocation of combined sewer outfalls and interceptors could result in (1) the relocation and reconstruction of the outfall, which also would affect the existing shoreline, pier head, and/or bulkhead and could

[177] New York City Department of Transportation, *2015 New York City Screenline Traffic Flow*, 2015.

[178] New York State, Traffic Data Viewer, Annual Average Daily Traffic, available at: https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=28537cbc8b5941e19cf8e959b16797b4 (accessed March 11, 2011).

[179] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[180] Encountering an interceptor is typically cause for redesigning a project to avoid service disruption. New York City Department of Environmental Protection representatives could not cite the last time an interceptor had been relocated. (New York City Department of Environmental Protection Meeting Notes, January 22, 2021 [see Appendix E].)

extend the outfall and riprap beyond the bulkhead line; (2) the need for temporary fluming[181] of the sewer flow, although major storm events could overwhelm the system resulting in area-wide sewer backups and flooding; and (3) land acquisition and/or the purchase of easements from private property owners.[182] An additional complexity is that the interceptors are pressurized to maintain flows 24 hours per day; any changes would be difficult to implement and could affect everyone within the service area. Relocation of these utilities could only begin after lengthy surveys and coordination with other utility providers and transportation agencies to understand what other effects may occur as a result of the alignment/route of the relocated utilities and the relocation of the combined sewer outfalls or interceptors. In addition, feasibility studies, which would include flow monitoring and modeling, and drainage plan amendments would be required. The construction plans for a relocated combined sewer outfall or interceptor would need to allow for continuous operation and management of the flow in the sewer or interceptor during construction to ensure that flooding does not occur anywhere within the system. Finally, relocation of the interceptor or combined sewer outfall could take more than 3 years to design and 10 years to construct.[183]

Avoidance of these major utilities would require tunneling the APM beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, an APM tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the APM tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the APM tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would also be challenging due to the complex urban environment. To achieve this depth for an APM tunnel, the distance needed to transition from an elevated APM to an underground APM would require 5,700 linear feet for the approach from the Mets-Willets Point Station and at least 5,000 linear feet for the approach from the Astoria-Ditmars Boulevard Subway Station using the assumption of a maximum 3 percent grade. The difference in distance required for the transition is because the height of the APM is greater for the approach from the Mets-Willets Point Station to account for the elevation of at least 75 feet above grade as the APM line crosses over the 7 Line and Roosevelt Avenue. For the approach from the Mets-Willets Point Station, it is likely that the end of the transition to the underground portion would need to occur at the western end of the Flushing Bay Promenade. At a minimum of 5,700 feet, the start of the transition would have to begin immediately after the APM line crosses over the 7 Line. This would result in the APM guideway being only 20 feet above ground at the GCP and Whitestone Expressway interchange, which would result in the need to modify the interchange to either depress the traffic lanes or create elevated traffic lanes for the interchange. This means that the transition would result in a material effect to the GCP and Whitestone Expressway, both of which are identified as major roadways by NYSDOT.

[181] Fluming refers to construction of temporary sewer facilities to allow for the relocation of existing lines, as sewer flows must be maintained at all times.

[182] Guo Zhan Wu, P.E., Chief, Regulatory Review, New York City Department of Environmental Protection, "RE: LGA EIS - Utilities Impact," email to Wendy Yu and Dibya Shahi, DY Consultants, January 7, 2021 (see Appendix E).

[183] *Ibid.*

Given the location of the interceptor under 19th Avenue at 45th Street, it is likely that the start of the transition to the underground portion would need to occur at 31st Street and 21st Avenue, which would require the permanent closure of travel lanes and the permanent loss of street parking on a portion of 31st Street, which is identified as a major collector by NYSDOT. The distance from the Astoria-Ditmars Boulevard Station and 19th Avenue and 45th Street is approximately 5,300 feet. Finally, construction of a station at the Airport at a depth of 200 feet would require specific engineering analyses and means and methods of construction to excavate a station and not affect existing structures and roadways at the Airport that exist above the excavation. Deep stations would also require special ventilation and enough vertical circulation elements to meet safety regulations and may require continuous dewatering.

This alternative could be reasonable to construct given cost considerations because, even though it is longer than Alternative 9A (the Port Authority's proposed alternative) at 4.9 miles, the cost of this alternative at $4.89 billion would be less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative is on the 7-N-W Lines and the Port Washington Branch of the LIRR and would provide reasonable access to all identified access points.

This alternative would have a material effect on major transportation facilities and major utilities. Specifically, this alternative would require the temporary closure of the westbound travel lanes on the GCP, 31st Street, and 19th Avenue, as well as the permanent shift south of the eastbound travel lanes on the GCP. After construction of the support columns is completed, this would result in the permanent shift of travel lanes on 31st Street and 19th Avenue and the permanent loss of a parking lane on one side of both 31st Street and 19th Avenue. In addition, this alternative would affect existing major underground utility lines. Avoiding the material effect on major utilities would result in the modification of the GCP and Whitestone Expressway interchange and the permanent closure of travel lanes on 31st Street. Therefore, this alternative would not be reasonable to construct and operate and has been eliminated from further consideration.

2.6.5 RAIL ALTERNATIVES

2.6.5.1 ALTERNATIVE 10A: UNDERGROUND FROM SUNNYSIDE YARDS VIA BROOKLYN QUEENS EXPRESSWAY AND GRAND CENTRAL PARKWAY ALTERNATIVE

This alternative would result in a new rail line from Sunnyside Yards in a new tunnel to LGA. This alternative would be in a tunnel beneath the BQE and the GCP and could not be constructed in a manner that avoids having a material effect on the following known major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Avoidance of these major utilities would require tunneling the rail line beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide

structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a rail tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the rail tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the rail tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would be challenging due to the complex urban environment.

Sunnyside Yard is one of the busiest rail yards in the country and a key train storage yard and maintenance hub for Amtrak's Northeast Corridor. It also serves New Jersey Transit and the LIRR, which is developing storage tracks and maintenance facilities there as part of the LIRR East Side Access project. Thus, the construction and operation of a new underground station in Sunnyside Yards would result in the need to remove one or more of the tracks on a temporary or permanent basis. This would negatively affect nearly all LIRR passengers and negatively affect Amtrak service, which would affect up to approximately 10,000 daily Amtrak passengers.[184] Additionally, initiating new service to LGA from Sunnyside Yards would be problematic because of the lack of storage capacity either at ground level or underground at Sunnyside Yards or at LGA.

To provide a general cost for subterranean rail construction, the per mile cost of $1.09 billion for underground subways was used. On this basis, the 3.8-mile rail extension in this alternative would cost approximately $4.13 billion, which is less than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative does not have access to other transit stations as there are no existing transit stations at Sunnyside Yards; therefore, it would not provide reasonable access to all identified access points.

This alternative would have a material effect on a major transportation facility and major utilities. Specifically, this alternative would reduce LIRR and Amtrak service by affecting the permanent throughput capacity of the Sunnyside Yards, and it would affect existing major underground utility lines. Additionally, this alternative would disrupt peak-hour passenger and transit service on the LIRR and Amtrak during the construction period. Finally, this alternative would not provide reasonable access to all identified access points. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.5.2 ALTERNATIVE 10B: UNDERGROUND FROM MIDTOWN MANHATTAN VIA TUNNEL BENEATH EAST RIVER ALTERNATIVE

This alternative would result in a new rail line from Midtown Manhattan in either a new or existing tunnel beneath the East River. This alternative would continue in a tunnel through Sunnyside Yards beneath the BQE and the GCP and could not be constructed in a manner that avoids having a material effect on the following known major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;

[184] Carol Boehm, Director Business Development, Infrastructure Access and Investment, Amtrak, "Amtrak Ridership Numbers on the Northeast Corridor and ACELA between NYC and Boston," email to David Full, RS&H, January 13, 2021.

- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Avoidance of these major utilities would require tunneling the rail line beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a rail tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the rail tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the rail tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would be challenging due to the complex urban environment.

The construction of a new rail line in an existing rail corridor would affect either Penn Station or Grand Central Terminal. Upon completion of the LIRR East Side Access project and the Penn Station Access Project, neither of these terminals would have the capacity to increase the number of tracks or platforms. A new rail line into either Penn Station or Grand Central Terminal would affect existing rail service into the terminal. In order to provide new service to/from either Penn Station or Grand Central Terminal, LIRR would be required to cancel trains on other branches and "re-assign" the East River slots to the LGA service (if an existing tunnel was used). It would not be possible to limit the train cancellations to one or two LIRR branches because of the way that slots are allocated within the East River Tunnels (and will be allocated in 63rd Street Tunnel when LIRR East Side Access project is completed). All LIRR electric branches (for example, Babylon, Port Washington, Huntington/Port Jefferson, Ronkonkoma, Long Beach, Hempstead, West Hempstead, and Far Rockaway) would see service cuts. In addition, service on the LIRR diesel branches also would be affected through the cancellation of scheduled connecting trains (for transfer between diesel and electric trains). These diesel branches include Oyster Bay, Montauk, Port Jefferson (east of Huntington), and Greenport (the Main Line east of Ronkonkoma).[185] Thus, this alternative would affect this rail corridor and these terminals, all of which are major transportation facilities. This alternative would also affect peak-hour passenger and transit service during the construction period.

To provide a general cost for subterranean rail construction, the per mile cost of $1.09 billion for underground subways was used. On this basis, the 7.2-mile rail extension in this alternative would cost approximately $7.82 billion, which is more than two and half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative would not provide reasonable additional access to all identified access points. For example, passengers and employees in Queens, Brooklyn, and Long Island would be required to travel to Midtown Manhattan to access the rail line, which would not provide reasonable access to LGA.

[185] Jacob Balter, Director – Strategic Investments, MTA Construction & Development – Planning/LIRR, "LGA EIS – DEIS Comment," email to Stephen Culberson, Ricondo & Associates, Inc., January 21, 2021.

This alternative would have a material effect on a major transportation facility and major utilities. Specifically, this alternative would have a permanent effect on transit service at Penn Station or Grand Central Terminal and would affect existing major underground utility lines. Additionally, this alternative would disrupt peak-hour passenger and transit service at Penn Station or Grand Central Terminal during the construction period. Finally, this alternative would not provide access to identified access points and would not be reasonable to construct given cost considerations. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.5.3 ALTERNATIVE 10C: UNDERGROUND FROM UPPER EAST SIDE MANHATTAN VIA NEW TUNNEL BENEATH EAST RIVER ALTERNATIVE

This alternative would result in a new rail line from the Upper East Side of Manhattan in a new tunnel beneath the East River. This alternative would be in a tunnel to Sunnyside Yards and would continue beneath the BQE and the GCP to LGA. This alternative would be underground and could not be constructed in a manner that avoids having a material effect on the following known major utilities, some of which provide services to more than 650,000 residents of Queens (see Appendix E):

- 132-inch by 60-inch double-barrel storm reinforced concrete sewer, which varies between 10 to 20 feet below grade, at the intersection of 80th Street and the GCP;
- 129-inch by 96-inch double-barrel combined sewer, which is approximately 30 feet below grade, at the intersection of 82nd Street and the GCP; and
- 120-inch by 108-inch interceptor, which is approximately 20 feet below grade, near the intersection of 90th Street and the GCP.

Avoidance of these major utilities would require tunneling the rail line beneath the utilities. Geotechnical information based on borings at LGA indicate that bedrock is at least 150 feet deep, groundwater is present at 6 to 13 feet below ground surface, and the predominant soil is a mixture of marshy soil, sediment, and clay not suited to provide structural support. NYCDEP requires 20-foot separation between their utility and other structures. Thus, a tunnel beneath the combined sewer outfall and/or interceptor would need to be at least 50 feet deep. Due to the poor soil conditions and presence of groundwater at LGA, a rail tunnel not in bedrock would need to be constructed on pilings and would need extensive water pumps to keep groundwater out of the rail tunnel. Additionally, structural supports would need to be provided for the combined sewer outfall and/or interceptor, which would greatly complicate construction even further. For these reasons, construction of a tunnel through the soils beneath these utilities was determined to not be practicable.

Alternatively, the rail tunnel could be constructed in bedrock, which would require a tunnel approximately 175 to 200 feet below ground surface. Emergency access and ventilation of tunnels at these depths would be challenging due to the complex urban environment. To provide a general cost for subterranean rail construction, the per mile cost of $1.09 billion for underground subways was used. On this basis, the 5.8-mile rail extension in this alternative would cost approximately $6.3 billion, which is more than two and a half times the estimated $2.05 billion cost associated with the Port Authority's proposed alternative.

This alternative would not provide reasonable additional access to all identified access points. For example, passengers and employees in Queens, Brooklyn, and Long Island would be required to travel to the Upper East Side of Manhattan to access the rail line, which would not provide reasonable access to LGA.

This alternative would have a material effect on major underground utility lines. In addition, this alternative would not provide access to identified access points and would not be reasonable to construct given cost considerations. Therefore, this alternative would not be reasonable to construct and operate and was eliminated from further consideration.

2.6.6 COMBINATION ALTERNATIVES

It is recognized that various alternatives could be combined together, such as including TDM measures with a fixed guideway alternative. Any combinations of alternatives described in previous sections were the result of specific comments received during the scoping process. For purposes of screening, any additional combinations were not analyzed because it is recognized that if the individual components fail the Step 2 screening process then all combinations of alternatives would fail for the same reasons.

2.6.7 SUMMARY OF STEP 2 SCREENING PROCESS

Table 2-5 summarizes the Step 2 screening process. One of the 32 remaining alternatives was considered to be reasonable to construct and operate.

2.7 ALTERNATIVES SCREENING BY OTHER AGENCIES

As part of the One Federal Decision process, written concurrence on the "Alternatives to be Carried Forward for Analysis" is required by all cooperating agencies. A preliminary draft of the alternatives screening process and evaluation was distributed to the agencies on September 20, 2019. Resolution of comments and a final concurrence on the Alternatives to be Carried Forward for Analysis was achieved on October 7, 2019. Documentation regarding concurrence from cooperating and participating agencies as part of One Federal Decision is included in Appendix A.

2.8 IDENTIFICATION OF ALTERNATIVES RECOMMENDED FOR DETAILED EVALUATION IN THE ENVIRONMENTAL IMPACT STATEMENT

As shown in Table 2-5, only one of the alternatives (Alternative 9A) was considered to be reasonable to construct and operate. This alternative (Alternative 9A, see **Exhibit 2-18**) is the Proposed Action. The Proposed Action and the No Action Alternative are analyzed in detail in this EIS.

2.8.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no construction activities connected with the LGA Access Improvement Project would occur. However, in the absence of the LGA Access Improvement Project, implementation of two dependent actions[186] would be undertaken by others: construction of improvements to the Mets-Willets Point LIRR Station by the LIRR and replacement of the Passerelle Bridge by NYC Parks. Descriptions of the projects follow:

- The improvements planned for the Mets-Willets Point LIRR Station include extending the existing revenue service platform, including lighting and associated components, to accommodate passengers on all cars of a 12-car train. Improvements also include demolishing and replacing the two existing staircases at the western end of the station and constructing a new elevator west of the existing Passerelle Bridge to provide ADA access. Under the No Action Alternative, LIRR would proceed with these improvements to the Mets-Willets Point LIRR Station, which would remain an events-only station.
- NYC Parks, as the owner of the Passerelle Bridge, would move forward with replacement of the structure either by replacing the existing structure on existing foundations or by adopting the Port Authority's proposed design of constructing a replacement pedestrian bridge east of its existing alignment, then demolishing the existing Passerelle Bridge. A replacement Passerelle Bridge would provide NYC Parks a design life of at least 75 years, increase the design load capacity, and decrease maintenance costs, key factors in NYC Parks' decision-making process.

[186] These two actions are analyzed under the No Action Alternative as the projects would be different under the Proposed Action versus the No Action Alternative. Other ongoing projects in the vicinity of LGA would also be implemented with or without the Proposed Action; however, they would not be influenced by the Proposed Action. These cumulative actions are discussed in Section 3.2.4.

TABLE 2-5 (1 OF 3) STEP 2 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER	STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION?				MOVE TO STEP 2?	STEP 2: WOULD THE ALTERNATIVE BE REASONABLE TO CONSTRUCT AND OPERATE?				MOVE TO ANALYZE IN DETAIL IN EIS?
	DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?		CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT A MATERIAL EFFECT TO MAJOR INFRASTRUCTURE, TRANSPORTATION FACILITIES, OR UTILITIES?	CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT AFFECTING PEAK HOUR SUBWAY, RAIL, AND/OR TRANSIT SERVICE DURING CONSTRUCTION?	IS THE ALTERNATIVE REASONABLE TO CONSTRUCT GIVEN COST CONSIDERATIONS?	CAN THE ALTERNATIVE PROVIDE ACCESS TO IDENTIFIED ORIGIN / DESTINATION LOCATIONS?	
1. No Action Alternative [1]	No	No	No	No	Yes [2]	N/A	N/A	N/A	N/A	Yes [2]
2. Diversion of Air Traffic at LGA Alternatives										
2A Use of Other Airports Alternative [1]	No	No	Yes	No	No					
2B Use of Trains and Buses Instead of Air Travel Alternative	No	No	Yes	No	No					
3. Use of Other Modes of Transportation to LGA Alternatives										
3A Ferry Service Alternative [1]	No	Yes	Yes	Yes	No					
3B Helicopter Service Alternative	No	Yes	Yes	Yes	No					
3C Gondola Service Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
4. Transportation Systems Management Alternatives										
4A Modify the Q48 Bus Route and the Q23 Bus Route to Enter LaGuardia Airport at 94th Street Alternative	No	Yes	Yes	Yes	No					
4B Revise M60 Bus Route to Only Travel Between LaGuardia Airport and 125th Street Metro North Station Alternative	No	No	No	Yes	No					
4C Provide Free Bus Service on the Q70 Bus Route Alternative	No	No	No	Yes	No					
5. Transportation Demand Management Alternatives [1]	No	No	Yes	No	No					
6. Emerging Transportation Technologies Alternatives										
6A Transportation Network Companies Alternative [1]	No	Yes	No	No	No					
6B Autonomous Vehicles Alternative [1]	No	Yes	No	No	No					
7. Off-Airport Roadway Expansion Alternatives										
7A Additional Travel Lanes on Grand Central Parkway Alternative [1]	No	Yes	No	No	No					
7B Dedicated Bus Lanes for Q70 Bus Route Alternative	No	No	No	Yes	No					
7C Dedicated Bus Lanes from Roosevelt Avenue via Junction Boulevard and 94th Street Alternative	No	Yes	No	Yes	No					
7D Dedicated Bus Lanes from Mets-Willets Point Subway Station via Roosevelt Avenue and Grand Central Parkway Alternative	No	Yes	No	Yes	No					
7E Elevated Busway from Mets-Willets Point Subway Station via Roosevelt Avenue and Flushing Bay Promenade Alternative	No	Yes	Yes	Yes	No					

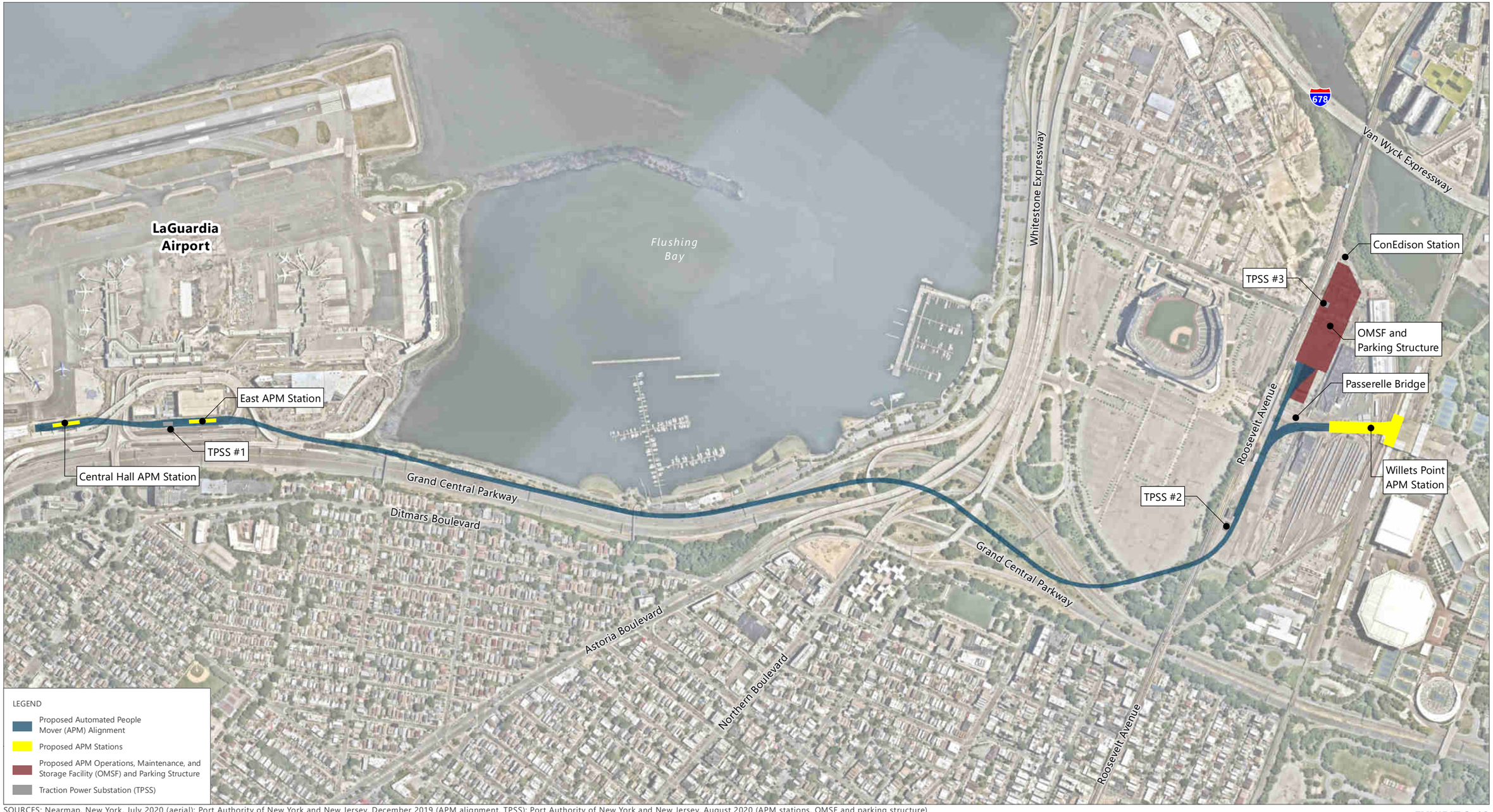
TABLE 2-5 (2 OF 3) STEP 2 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER		STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION?				MOVE TO STEP 2?	STEP 2: WOULD THE ALTERNATIVE BE REASONABLE TO CONSTRUCT AND OPERATE?				MOVE TO ANALYZE IN DETAIL IN EIS?
		DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?		CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT A MATERIAL EFFECT TO MAJOR INFRASTRUCTURE, TRANSPORTATION FACILITIES, OR UTILITIES?	CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT AFFECTING PEAK HOUR SUBWAY, RAIL, AND/OR TRANSIT SERVICE DURING CONSTRUCTION?	IS THE ALTERNATIVE REASONABLE TO CONSTRUCT GIVEN COST CONSIDERATIONS?	CAN THE ALTERNATIVE PROVIDE ACCESS TO IDENTIFIED ORIGIN / DESTINATION LOCATIONS?	
8. Subway Extension Alternatives											
8A	From Astoria Boulevard Subway Station: Elevated Above Astoria Boulevard and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8B	From Astoria-Ditmars Boulevard Subway Station: Elevated Above 31st Street and 19th Avenue Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8C	From Astoria-Ditmars Boulevard Subway Station: Tunnel Beneath 31st Street and 19th Avenue Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8D	From Astoria-Ditmars Boulevard Subway Station: Elevated Above Ditmars Boulevard and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8E	From 36th Street Subway Station: Tunnel Beneath Steinway Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8F	From Roosevelt Avenue-Jackson Heights Subway Station: Elevated Above 82nd Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
8G	From Mets-Willets Point Subway Station: Elevated Above Roosevelt Avenue and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9. Fixed Guideway Alternatives											
9A	From Willets Point Station via Roosevelt Avenue and Flushing Bay Promenade Alternative (Port Authority Proposed Alternative) [1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9B	From Willets Point Station via Roosevelt Avenue and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9C	From Willets Point Station via Roosevelt Avenue and Flushing Bay Promenade with a Ferry Stop Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9D	From Willets Point Station via Long Island Rail Road Right-of-Way and Flushing Bay Promenade Alternative [1]	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
9E	From Willets Point Station via Long Island Rail Road Right-of-Way and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9F	From Willets Point Station via 126th Street and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9G	From Willets Point Station via 126th Street and Across Flushing Bay Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9H	From Willets Point Station via 126th Street and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9I	From Northern Boulevard via Willets Point Station, Roosevelt Avenue, and Flushing Bay Promenade Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9J	From Jamaica Station Transportation Hub via Van Wyck Expressway, Grand Central Parkway, and Flushing Bay Promenade Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No

TABLE 2-5 (3 OF 3) STEP 2 SCREENING RESULTS

ALTERNATIVE NAME AND NUMBER		STEP 1: WOULD THE ALTERNATIVE MEET THE PURPOSE AND NEED OF THE PROPOSED ACTION?				MOVE TO STEP 2?	STEP 2: WOULD THE ALTERNATIVE BE REASONABLE TO CONSTRUCT AND OPERATE?				MOVE TO ANALYZE IN DETAIL IN EIS?
		DOES THE ALTERNATIVE PROVIDE A TIME-CERTAIN TRANSPORTATION OPTION TO LGA?	DOES THE ALTERNATIVE PROVIDE SUPPLEMENTAL ACCESS TO LGA?	DOES THE ALTERNATIVE PROVIDE THE OPPORTUNITY TO REDUCE PASSENGER VEHICLE TRIPS TO AND FROM LGA ON OFF-AIRPORT ROADWAYS NEAR THE AIRPORT WITHOUT INCREASING ROADWAY CONGESTION?	DOES THE ALTERNATIVE PROVIDE ADEQUATE REPLACEMENT AIRPORT EMPLOYEE PARKING TO ENABLE EFFICIENT USE OF ON-AIRPORT SPACE?		CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT A MATERIAL EFFECT TO MAJOR INFRASTRUCTURE, TRANSPORTATION FACILITIES, OR UTILITIES?	CAN THE ALTERNATIVE BE IMPLEMENTED WITHOUT AFFECTING PEAK HOUR SUBWAY, RAIL, AND/OR TRANSIT SERVICE DURING CONSTRUCTION?	IS THE ALTERNATIVE REASONABLE TO CONSTRUCT GIVEN COST CONSIDERATIONS?	CAN THE ALTERNATIVE PROVIDE ACCESS TO IDENTIFIED ORIGIN / DESTINATION LOCATIONS?	
9K	From Woodside LIRR/61st Street-Woodside Subway Station via an Existing Rail Right-of-Way, Brooklyn Queens Expressway, and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9L	From Roosevelt Avenue-Jackson Heights Subway Station via Broadway, Brooklyn Queens Expressway, and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9M	From Woodside LIRR/61st Street-Woodside Subway Station and Roosevelt Avenue-Jackson Heights Subway Station via Roosevelt Avenue, Broadway, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9N	From Astoria Boulevard Subway Station via Astoria Boulevard and Grand Central Parkway Alternative [1]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9O	From Hunterspoint Avenue LIRR Station via Existing Rail Right-of-Way, 31st Street, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9P	From Sunnyside Yards via Existing Rail Right-of-Way, Steinway Street, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No
9Q	From Northern Boulevard Subway Station via Broadway, Steinway Street, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
9R	Through Line Connecting Willets Point Station, LaGuardia Airport, and Woodside LIRR/61st Street-Woodside Subway Station via Roosevelt Avenue, Grand Central Parkway, Brooklyn Queens Expressway, and an Existing Rail Right-of-Way Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9S	Through Line Connecting Woodside LIRR/61st Street-Woodside Subway Station and Roosevelt Avenue-Jackson Heights Subway Station via Broadway, Roosevelt Avenue, an Existing Rail Right-of-Way, Brooklyn Queens Expressway, and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9T	Through Line Connecting Willets Point Station, LaGuardia Airport, and Astoria-Ditmars Boulevard Subway Station via Roosevelt Avenue, Grand Central Parkway, 19th Avenue, and 31st Street Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
10. Rail Alternatives											
10A	Underground from Sunnyside Yards via Brooklyn Queens Expressway and Grand Central Parkway Alternative	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No
10B	Underground from Midtown Manhattan via Tunnel Beneath East River Alternative	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
10C	Underground from Upper East Side Manhattan via New Tunnel Beneath East River Alternative	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No

NOTES:
EIS – Environmental Impact Statement
LGA – LaGuardia Airport
LIRR – Long Island Rail Road
1 Alternative provided by Port Authority of New York and New Jersey.
2 Required to be included per 40 CFR 1502.14(d).
SOURCE: RS&H, Inc., and Ricondo & Associates, Inc., 2020.



SOURCES: Nearmap, New York, July 2020 (aerial); Port Authority of New York and New Jersey, December 2019 (APM alignment, TPSS); Port Authority of New York and New Jersey, August 2020 (APM stations, OMSF and parking structure).

EXHIBIT 2-18

PROPOSED ACTION

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Implementation of the Mets-Willets Point LIRR Station improvements and the replacement Passerelle Bridge would not result in service changes from existing conditions, and therefore would not have any operational impacts. Under the No Action Alternative, Airport operations would continue as under existing conditions; however, as passenger activity increases at the Airport consistent with the forecast (see Section 1.3.3), it is expected that passenger roadway access trips would increase given the lack of direct connection to the local and regional rail system, which would deteriorate local traffic conditions.

2.8.2 PROPOSED ACTION

Under the Proposed Action (Alternative 9A), construction activities associated with the LGA Access Improvement Project would include construction of an above-grade fixed guideway APM system and associated APM stations, the APM OMSF and Parking Structure, improvements to the Mets-Willets Point LIRR Station, demolition and relocation of Marina facilities, demolition and reconstruction of the Passerelle Bridge, new and relocated utilities, two new stormwater outfalls into Flushing Creek,[187] and on-site solar photovoltaic (PV) arrays if the Port Authority determines they are technically feasible and the FAA determines they do not interfere with aircraft operations. Temporary actions would also be implemented during construction, including temporary replacement parking for Citi Field and a temporary MTA bus storage/parking facility at the MTA/Tully Site.

The Proposed Action would include physical structures for and operations of an above-grade fixed guideway APM system and associated APM stations, new shuttle service on the LIRR Port Washington Branch, the APM OMSF and Parking Structure, and relocated Marina facilities. Additional infrastructure would also be in place, including improvements to the Mets-Willets Point LIRR Station to support making the station a full-time station on the Port Washington Branch and adding shuttle service to Manhattan from Mets-Willets Point, the replacement Passerelle Bridge, new and relocated utilities, one new permanent stormwater outfall into Flushing Creek, and, if feasible, on-site solar PV arrays. See Section 1.6 and Appendix B for additional details.

2.9 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

In accordance with 40 CFR 1502.14(e), the FAA has identified the Proposed Action as its preferred alternative. The "agency's preferred alternative," as defined by CEQ is "the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors."[188] As disclosed in this Final EIS, the FAA has conducted a thorough and independent analysis of alternatives considering its statutory mission and responsibilities with regards to transportation policy and has concluded that the Proposed Action best meets the stated Purpose and Need and the Port Authority's goals and objectives.

As part of the One Federal Decision process, written concurrence on the "Identification of the Preferred Alternative" is required by all cooperating agencies. The preliminary Administrative Draft EIS was distributed to the agencies on June 1, 2020, to document the FAA's rationale for selecting the Preferred Alternative. Concurrence on the Identification of the Preferred Alternative (the Proposed Action) was achieved on June 16, 2020 (see Appendix A.3).

[187] The stormwater outfall at the MTA/Tully Site would be temporary and would be removed following construction.

[188] Council of Environmental Quality, *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, 46 Federal Register 18026, March 23, 1981 (Number 4a).

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