

As described in Chapter 1, “Project Purpose and Need,” Manhattan’s East Side is served by only one north-south subway line, the Lexington Avenue Line (4 5 6). As a result, the Lexington Avenue Line is crowded, and service delays occur. The proposed Second Avenue Subway Line would significantly expand north-south subway service on the East Side, improving transit conditions for residents, workers, and visitors. In addition to the benefit of the new subway line, the East Side would also see greatly improved conditions on the Lexington Avenue Line. This chapter describes the new Second Avenue Subway’s effects on the Lexington Avenue Line and on other elements of the city’s subway system, operated by Metropolitan Transportation Authority (MTA) New York City Transit (NYCT), and other MTA-operated services. As described later in this chapter, these effects include temporary service disruptions that would occur during construction as well as the permanent benefits that would result once the project is operational.

A. EXISTING CONDITIONS

SERVICE PROVIDED

NYCT’s existing subway system on the East Side of Manhattan is described below. (The current system includes the temporary closure of the north tracks of the Manhattan Bridge that is scheduled to reopen in 2004.)

PRIMARY EAST SIDE SUBWAY SERVICE

Within Manhattan, southbound service on the Lexington Avenue Line (4 5 6) begins at 125th Street (originating from points in the Bronx). Local service on the southbound 6 route ends at the Brooklyn Bridge Station, and the last express stop within Manhattan on the 4 5 routes is at the Bowling Green Station. South of this station, service continues into Brooklyn. Nine of the 23 stations on the Lexington Avenue Line in Manhattan are express stops. Five of the express stations and three of the local stations also provide transfer opportunities to other subway lines within the study area. As described below, the Lexington Avenue Line is significantly overcrowded and will become more so in the future if no action is taken.

SECONDARY EAST SIDE SUBWAY SERVICE

The Broadway Line provides significant north-south subway service within the secondary study area, and runs parallel to the Lexington Avenue Line at close distances between 23rd and Whitehall Streets. The N R W routes from Queens enter Manhattan’s East Side at the Lexington Avenue-59th Street Station and provide service to the Fifth Avenue-59th Street Station in East Midtown. These routes travel along Broadway where they are joined by the Q Q routes at 57th Street. The N R routes make all stops between 57th Street and Whitehall Street, where service extends into Brooklyn via the Montague Street Tunnel. The Q Q W routes make

Second Avenue Subway SDEIS

express stops on the Broadway Line between 57th Street and Canal Street before traversing the Manhattan Bridge to Brooklyn. Service on the Broadway Line south of 23rd Street parallels the Lexington Avenue Line as it continues through the Gramercy Park/Union Square, East Village/Chinatown and Lower Manhattan neighborhoods. Transfers to the 4 5 6 routes are available at the Lexington Avenue-59th Street and Union Square Stations. A transfer to the 6 route is also available at Canal Street.

UNDERSERVED AREAS

Most of the East Side of Manhattan has only one north-south subway line, the Lexington Avenue Line. Several other lines cross the study area, but these provide primarily east-west service. Throughout much of the study area, most of the population lives east of Third Avenue, so that many residents in the eastern edge of Manhattan walk 10 to 15 minutes or ride a crosstown bus to the nearest subway station. Although portions of the eastern edge of the study area are served in the east-west direction by other subway lines, transfers to the Lexington Avenue Line (the primary north-south service in the study area) are either not available or are inconvenient.

SUBWAY RIDERSHIP CHARACTERISTICS

Subway ridership has been on the rise for the past decade after a decline from 1988 to 1991. Since 1991, ridership has increased steadily and reflects a cumulative 41 percent increase from 1991 to 2001.

LEXINGTON AVENUE LINE

The Lexington Avenue Line, as the only north-south line serving Manhattan's East Side, serves large volumes of passengers in both directions each day. Because of the heavy influx of commuters from outside of Manhattan in the morning, exit volumes are considerably higher than entry volumes for locations south of 60th Street in the Manhattan business districts. As expected, the entry/exit activities during the PM peak period exhibit the opposite patterns.

BROADWAY LINE

Approximately 250,000 riders used N R routes to travel between Manhattan and Queens each day in 2000, about one-quarter of the passengers traveling between those two boroughs daily. More than 114,000 riders used the M N R routes to travel between Brooklyn and Manhattan on a typical weekday in 2000, accommodating about 10 percent of the riders making trips between those two boroughs.

SUBWAY EQUIPMENT CHARACTERISTICS

The NYCT subway system was constructed in multiple stages over the past century. Consequently, the equipment and infrastructure used for the different subway lines vary in age, size, and capacity. As described earlier (see Chapter 1), the NYCT subway system is composed of two groups of lines, the A Division and B Division. The Lexington Avenue Line operates with A Division cars and the Broadway Line operates with B Division cars. The two divisions use similar technology for signals and traction power but are incompatible, because of different clearance standards for tunnels and stations. A Division tunnels were built to smaller

specifications than those of the B Division. A new rapid transit line could be integrated into the A Division or the B Division system, but not both.

A Division and B Division trains also have different loading capacities. The MTA Board adopted NYCT subway car loading guidelines that provide for a minimum standing space of 3 square feet per standing passenger. The number of passengers this translates to, in combination with the seated capacity, is known as the “guideline capacity.” The seated and rush hour guideline capacities and maximum crush loads for the A and B Divisions of the NYCT subway fleet are summarized in Table 5B-1.

**Table 5B-1
NYCT Subway Car Loading Policies**

Division	Car Length (feet)	Seated Capacity (Passengers)		Guideline Capacity (Passengers)		Crush Load (Passengers)	
		Per Car	Per Train	Per Car	Per Train	Per Car	Per Train
A	51	38-44	376-440	110	1,110	165-170	1,650-1,700
B	60	50	500	145	1,450	230	2,300
	75	70-74	560-592	175	1,400	255-260	2,040-2,080

Source: NYCT Division of Operations Planning/Facilities & Equipment Planning, *Subway Vehicle Passenger Capacities*, December 18, 1992.

SUBWAY SERVICE CHARACTERISTICS

Subway service is characterized by its “throughput” (the number of trains that travel through a line segment during the peak hour) and capacity to carry passenger demand. The operational effectiveness of a service and its ability to meet its schedules are often dictated by demand peaks, regularity of train headway, running times between stations, station dwell times, and station crowding. These characteristics on the Lexington Avenue and Broadway Lines are described below. The discussion is primarily focused on service characteristics during peak periods, with particular attention to the most heavily traveled hours.

SERVICE FREQUENCY AND DWELL TIMES

Scheduled service intervals, or the time between trains—also known as headways—are determined by three components: the demand for subway service; the minimum time between trains as defined by safety, signal, and alignment constraints; and station “dwell” times (the time a train is stopped in a station). Scheduled service throughout the city’s subway system differs by time of day to accommodate fluctuations in ridership demand. Accounting only for the safety, signal, and alignment constraints, trains on the Lexington Avenue and Broadway Lines can theoretically be scheduled every 2 minutes, for an hourly throughput of 30 trains. However, schedules are also limited by dwell times, as described below.

Station dwell times are dependent on ridership levels, exiting/entering passenger volumes, physical layout/constraints on the platform, and transfer opportunities. Actual dwell times can vary significantly from those scheduled because of incidents such as train queuing, door holding, and especially heavy passenger boarding and exiting volumes. As dwell times increase, the number of trains that can operate decreases. Longer dwell times increase headways between trains, so that fewer trains can be processed. With fewer trains serving the segment, the trains and stations on that segment become more crowded, and the time needed for boarding and

Second Avenue Subway SDEIS

exiting increases, further increasing headways between trains. This creates a cyclical downward pattern that reduces train throughput during peak travel periods when it is most needed.

Lexington Avenue Line

Along the heavily used Lexington Avenue Line, the theoretical throughput of 30 trains an hour cannot be maintained during peak periods because of the excessive dwell times at stations. These excessive dwell times are often the result of high exiting and boarding volumes, transfers across the platform, physical constraints at the station, and train bunching. At the Grand Central-42nd Street Station, dwell times were observed to cluster in the 50- to 60-second range, well above the 30- to 45-second range needed to maintain 30 trains per hour. The headways were observed to average about 2.4 minutes for the express trains. These gaps translate to about 25 express trains serving Grand Central during the AM peak hour, when 29 express trains are scheduled.

Broadway Line

Since the passenger demand on the Broadway Line is lower than on the Lexington Avenue Line, scheduled headway intervals are longer. However, actual throughput is close to scheduled throughput, because trains are not overcrowded and dwell times are not excessive.

TRAIN CROWDING

Survey data from stations with high “leave loads” were used to assess the operating conditions and comfort level on the Lexington Avenue and Broadway Lines. Leave load refers to a visual observation of the number of people in a subway car as the train exits a station.

The volume-to-capacity (v/c) ratio indicates the extent of passenger crowding on a train. A v/c ratio greater than 1.00 indicates that the standing passengers have less than 3 square feet per person, representing a level of crowding during the peak hours that exceeds NYCT subway car passenger loading guidelines. Table 5B-2 presents the survey data and v/c ratios for the Lexington Avenue 4 5 express and 6 local services in the southbound direction during the AM peak hour. No significant crowding problems were observed on the Broadway Line N R services during normal operating conditions.

**Table 5B-2
AM Peak Hour Crowding Conditions on the
Southbound Lexington Avenue Express 4 5 and Local 6 Trains**

Station	Southbound Express 4 5			Southbound Local 6		
	Number of Trains	Average Leave Load	Average V/C Ratio	Number of Trains	Average Leave Load	Average V/C Ratio
125 St	28	983	0.89	21	535	0.49
86 St	28	1,168	1.06	21	949	0.86
68 St	—	—	—	21	1,080	0.98
59 St	26	1,162	1.06	21	914	0.83
51 St	—	—	—	21	789	0.72
Grand Central-42 St	25	1,296	1.18	21	832	0.76
14 St-Union Sq	25	1,112	1.01	21	449	0.41
Brooklyn Bridge	25	1,018	0.93	—	—	—

Source: NYCT Surveys and Vollmer Associates Surveys, 1999, 2001, 2002.

As shown in the table, southbound 4 5 express trains were generally more crowded than 6 local trains during the AM peak hour, and were above guideline capacity on average at all stops on the route between 125th Street and Brooklyn Bridge Stations. This crowding is most noticeable at the Grand Central-42nd Street Station, where the 4 5 express trains leaving the station on average are overcrowded with a v/c ratio of 1.18, which means that on average the passenger load on these trains exceeds guideline capacity by 18 percent, and a number of trains are more crowded than that. The peak load point on the 6 local service occurs at the 68th Street Station, where the average v/c ratio is 0.98, indicating that some trains are overcrowded.

STATION CROWDING

In addition to passenger crowding on subway trains, crowding on station platforms and queuing at stairways and escalators also characterize the condition of a “normal” peak period. The longer passengers wait to enter a train, the more crowded platforms become. Several factors contribute to the overcrowding of stations on the East Side of Manhattan, including inadequate platform space and stairway capacity, the presence of high volumes and transfer movements that may not have been anticipated in the original station designs, and excessive train delays.

Platform and stairwell observations were made at several stations on the Lexington Avenue and Broadway Lines during the AM peak period that represent either the most congested stations or a typical station type. Table 5B-3 presents the criteria used to determine the LOS of station platforms and stairways. Performance level of the fare zones was noted quantitatively based on the number of people observed queuing at the token booth and turnstile areas during the AM peak hour. Using these criteria, the pedestrian circulation at platforms and stairways at key stations on the Lexington Avenue and Broadway Lines is described below.

**Table 5B-3
Pedestrian Circulation Level of Service Criteria**

LOS	Queuing	Walkway/Corridor		Stairways		
	Space (sq. ft./ person)	Space (sq. ft./ person)	Processing Rate (persons/ foot/ minute)	Space (sq. ft./ person)	Processing Rate (persons/ foot/ minute)	V/C Ratio
A	>13	> 35	< 7	> 20.0	< 5	< 0.5
B	10.1 to 13	25.1 to 35	7.1 to 10	15.1 to 20.0	5.1 to 7	0.5 to 0.7
C	7.1 to 10	15.1 to 25	10.1 to 15	10.1 to 15.0	7.1 to 10	0.7 to 1.0
D	3.1 to 7	10.1 to 15	15.1 to 20	7.1 to 10.0	10.1 to 13	1.0 to 1.3
E	2.1 to 3	5.1 to 10	20.1 to 25	4.1 to 7.0	13.1 to 17	1.3 to 1.7
F	< 2	< 5	>25	4.0 or less	>17	> 1.7

Notes:
 Stairway LOS was calculated as follows:
 $v/c = (\text{number of persons descending and ascending stairway during 5-minute period} \times 12) / (\text{width of stairway} - \text{width of obstruction} \times 0.9 \text{ (friction factor)} \times 600)$
 where 12 = number of 5-minute periods in an hour
 600 = capacity of 1 foot of stairway width per hour
Source: NYCT Station Design Guidelines, Fruin (1971).

125th Street (4 5 6)

This station has a mezzanine and two track levels, with northbound (uptown) trains on the upper level and southbound (downtown) trains on the lower level. The station currently handles a large across-the-platform transfer between the local and express trains. About 70 percent of the total

Second Avenue Subway SDEIS

pedestrian traffic originated from the west stairways, with more than half from the northwest stairway. During the AM peak period, this staircase operated at LOS C/D, while the others functioned at LOS A/B. The fare control area was also observed to be uncongested, with no more than five people queued at the token booth. On the subway platforms, space was observed to be sufficient for waiting, walking, and transferring between express and local trains.

86th Street (4 5 6)

This station has two levels. The upper level contains the turnstile areas and local tracks for uptown and downtown 6 local services, while the lower level provides access to the uptown and downtown 4 5 express services. The uptown and downtown platforms are not connected by a mezzanine or cross-passage. Access from the street to the station is made via seven stairways, four on the west side of Lexington Avenue to the downtown platforms and three on the east side to the uptown platforms.

During the AM peak period, sample counts performed at the station show that the northwest stairway handled volumes of 500 to 600 patrons during peak 5-minute periods in the morning, which translates to LOS F conditions. The turnstile area for southbound riders was quite congested because of patron queues. On the southbound local platform, the most severe crowding occurred near the turnstile area and stairways to the lower level. Sample counts were also obtained at the stairways connecting to the southbound express trains from the local train platform. As many as 375 patrons per 5 minutes were counted, 85 percent of whom went downward to the express trains on the lower level. These stairways were estimated to operate at LOS D.

On the lower level, crowding conditions for express riders were similar to those seen on the local platforms, where riders tend to stand near the center of the platform rather than toward the front or rear of the train. During the AM peak period, crowding on the southbound express platform ranges between LOS C and D conditions.

77th Street (6)

This station is the busiest local station on the Upper East Side. The station has two side platforms, each with a separate fare control area. A half-flight of stairs connects each control area with its platform. More than 4,000 passengers enter the station and more than 900 passengers exit the station during the AM peak hour. This southbound platform and the stair between the mezzanine and platform are often very crowded during portions of the AM peak hour, operating at LOS E to F under surge conditions.

68th Street (6)

This station, located near Hunter College on the Upper East Side, has two side platforms connected by a mezzanine at 68th Street. Because of the presence of the college, the entry and exit volumes are nearly equal, with about 1,700 passengers entering the station and more than 1,700 passengers exiting the station during the AM peak hour. The narrow street stairs operate at LOS E to F under surge conditions.

59th Street (4 5 6 N R W)

This station has three levels and provides transfers between the Lexington Avenue and Broadway Lines. The upper level consists of fare zones and local tracks for the 6 route, while the lowest level provides platforms for the 4 5 express services. At mid-level and perpendicular to the Lexington Avenue Line is the platform for the N R W routes. Access to the

station is made via numerous stairways on both sides of Lexington Avenue, and at 60th Street and Third Avenue. Over 4,000 passengers enter and over 7,000 passengers exit from this station during the AM peak hour. The street stairs at 59th Street operate at LOS E to F under surge conditions. The transfer movement between the 4 5 6 and the N R W routes also operates at LOS E to F under surge conditions.

51st Street/53rd Street-Lexington Avenue (6 E V)

The 51st Street Station on the Lexington Avenue Line is a busy local station stop in East Midtown. More than 6,000 passengers exit and more than 5,000 passengers enter this station during the AM peak hour. This station is also a heavily used transfer point between the E V services on the 53rd Street Line and the 6 local service on the Lexington Avenue Line. During the AM peak hour, more than 4,000 passengers transfer from the E V trains to the 6 train and more than 1,000 passengers make the reverse movement. The narrow platforms and limited escalator capacity at the E V Lexington Avenue Station result in severely crowded LOS F conditions on the transfer connection between these two subway lines.

Grand Central-42nd Street (4 5 6 7 S)

The Grand Central-42nd Street Station has multiple levels. The upper level consists of fare zones and a center mezzanine that connects to all of the subway services. The middle level contains four tracks and two center platforms for the Lexington Avenue Line (4 5 6) and a separate area for the 42nd Street Shuttle (S). The lower level contains two tracks and a single island platform for the Flushing Line (7). Access to the station is made via stairways and escalators from within Grand Central Terminal and nearby office buildings.

During the AM peak period, the fare zone areas are very active, with occasional queuing of five or more passengers at token booths. Turnstiles are also heavily used. Conflicting entry and exit movements are typical during the AM peak period. Stairway traffic to and from the center mezzanine and to and from the Lexington Avenue subway platforms is generally heavy and estimated to operate near LOS D/E. On the southbound platform of the Lexington Avenue Line, crowding is severe along the express track (between LOS E and F), with approximately 6 square feet per person for walking and 2 square feet per person for queuing. This compares with the design guidelines of 15 square feet per person for walking and 7 square feet per person for queuing. Along the local track platform, pedestrian traffic conditions are moderately crowded (between LOS C and D), with approximately 22 to 28 square feet per person for walking and 6 to 9 square feet per person for queuing. The more restrictive areas, where there are large obstructions, such as stairwells and benches, are near capacity. The areas of the Grand Central complex that would be potentially affected by the Second Avenue Subway are those at the north end, near Lexington Avenue and 43rd and 42nd Street. The fare control area at the north end (R240) processes about 3,850 and 3,065 people during the peak 15-minute AM and PM periods, respectively, and operates at LOS C/D or better. The entry/exit stairway at the northwest corner of Lexington Avenue and 42nd Street operates at LOS E and C in the AM and PM peak periods, respectively. The two most heavily used platform stairs operate at LOS D and E conditions in the AM peak and at LOS D conditions in the PM peak.

B. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

During the study period (2000 to 2020), NYCT will undertake a number of initiatives to keep its subway system in a state-of-good-repair, and will also undertake major capital improvements and planned route changes. Stations will continue to be rehabilitated, the Manhattan Bridge rehabilitation will be completed, the signal system will be upgraded on selected subway lines, and new technology cars will have replaced most older cars. New buses will also be purchased, and bus depots and maintenance centers will be brought to a state-of-good-repair.

SYSTEMWIDE SUBWAY RIDERSHIP

Over the long term, the city’s subway ridership is expected to grow annually by 0.5 to 1.0 percent, according to MTA projections. These percentages translate each year to an increase in ridership on a typical weekday of 30,000 to 60,000 daily passengers.

LEXINGTON AVENUE LINE

In the future, under the No Build Alternative, ridership on the Lexington Avenue Line will continue to grow between 2000 existing and 2020 No Build conditions, as shown in Table 5B-4. Southbound ridership will grow nearly 14 percent with two-thirds of the increase on the 6 local service due to overcrowding on the 4 5 express services and more development near local stations. Northbound ridership will grow by nearly 28 percent, again with nearly two-thirds of the growth on the local.

Table 5B-4
AM Peak Hour Lexington Avenue Line Ridership in Manhattan
Comparing 2000 Existing and 2020 No Build Conditions

Route	Southbound				Northbound			
	2000 Existing	2020 No Build	Change	%	2000 Existing	2020 No Build	Change	%
4 5 Express	58,100	63,100	5,000	8.6%	38,300	44,100	5,800	15.1%
6 Local	46,100	55,400	9,300	20.2%	19,700	30,100	10,400	52.8%
Total	104,200	118,500	14,300	13.7%	58,000	74,200	16,200	27.9%

Notes:
 Southbound based upon leave load volume at 125th Street and passenger boardings south to Bowling Green for the 4 5 or Brooklyn Bridge for the 6.
 Northbound based upon leave load volumes at Borough Hall and passenger boardings north to 86th Street for the 4 5 or passenger boardings between Brooklyn Bridge and 116th Street for the 6. (125th Street boardings are not included northbound.)
Source: NYCT Transit Model Outputs.

CHANGES TO SUBWAY SERVICE

Changes to transit service, equipment, and infrastructure are expected to occur as part of the MTA’s continuing effort to improve transit service and renew its vehicle fleet, trackways, and storage facilities. Most notably, by the project’s analysis year, the New York City Department of Transportation (NYCDOT) will complete its two-decade reconstruction of the Manhattan Bridge. When that work is complete in 2004, the bridge will return to four-track operation, and express service will be restored on the Sixth Avenue Line and retained on the Broadway Line. Although the exact service plan is still under development and subject to public input, Table

5B-5 summarizes the 2020 Future No Build Peak Hour Service Plan assumed in the planning for the full-length Second Avenue Subway. The base service plan details the key train routings and peak hour frequencies before the opening of the Second Avenue Subway. Only those routes that provide service within the study area are shown.

In addition to those changes, several other changes are anticipated that will directly affect subway service or capacity in the study area. (Other changes that will affect the subway system overall are also assumed to occur; for information on these, see the discussion of the No Build Alternative in Chapter 2, “Project Alternatives.”) In particular, these include the completion of a free transfer passageway between the Broadway-Lafayette Street station on the **B D F V** routes and the northbound (uptown) Lexington Avenue local **6** route (to complement the existing southbound transfer), and implementation of MTA’s Long Island Rail Road (LIRR) East Side Access Project.

The East Side Access Project, which was the subject of its own Draft and Final Environmental Impact Statement and Record of Decision, has been approved and elements are now under construction. When complete, that project will provide a direct connection for the LIRR to Grand Central Terminal, allowing LIRR passengers to travel directly to the East Side of Midtown Manhattan. Some of those passengers will then use the Lexington Avenue Line to travel to their final destinations.

In addition to those changes, NYCT will complete the reconstruction now under way of the Times Square–42nd Street Station, which serves the Broadway, Seventh Avenue, and Flushing Lines and the 42nd Street Shuttle.

C. CONSTRUCTION IMPACTS OF THE PROJECT ALTERNATIVES

NO BUILD ALTERNATIVE

As described earlier, the No Build Alternative would not involve major NYCT construction activities along Manhattan’s East Side.

SECOND AVENUE SUBWAY

As described in detail in Chapter 3, “Description of Construction Methods and Activities,” the Second Avenue Subway would have the potential to affect existing subway and commuter rail lines where the new tunnels pass under or over existing transit structures. Several factors would determine whether or not it would be necessary to underpin or otherwise protect these existing subway or rail structures before the Second Avenue Subway tunnel or station excavation begins.

These include geological conditions, the vertical and horizontal separation between the rail lines, and whether the Second Avenue Subway would pass over or under an existing subway or commuter line. (Underpinning methods, as well as other techniques to support or reinforce the earth, are also described in Chapter 3.) In general, if the new Second Avenue Subway tunnel were to be excavated in rock, it would have less impact on the rail service it crosses than if it were excavated in soil. Similarly, if the new tunnel was to pass above the existing transit or rail structure, it would have less impact than if it passed below the existing structure.

Table 5B-5
2020 Future No Build Peak Hour Service Plan
Affecting Second Avenue Subway Area

Route	North Terminal	Route Description	South Terminal	Scheduled AM Peak Trains per Hour	
				SB	NB
4	Woodlawn	Jerome Av Local, Lexington Av Express, Joralemon St Tunnel, Eastern Pkwy Express	Crown Hts/ Utica Av	15	14
5	Eastchester/ Dyre Av	Dyre Av Line Local, Bronx Express, Lexington Av Express, Joralemon St Tunnel, Eastern Pkwy Express, Nostrand Av Local	Brooklyn College/ Flatbush Av	7	12
5	Nereid Av	White Plains Rd Local, Bronx Express, Lexington Av Express, Joralemon St Tunnel, Eastern Pkwy Express, Nostrand Av Local	Brooklyn College/ Flatbush Av	7	-
6	Pelham Bay Park	Pelham Express, Lexington Av Local	Brooklyn Bridge	13	-
6	Parkchester/ E 177 St	Pelham Local, Lexington Av Local	Brooklyn Bridge	12	20
B	Bedford Park Blvd	Concourse/Central Park West Local, 6 Av Express, Manhattan Bridge ("A/B" tracks), 4 Av Express, West End Local	Coney Island	6	10
D	205 St	Concourse/Central Park West Express, 6 Av Express, Manhattan Bridge ("A/B" tracks), Brighton Local	Coney Island	10	10
J Z	Jamaica Center	Jamaica Skip-Stop, Williamsburg Bridge, Nassau St Local	Broad St	12	12
M	Metropolitan Av	Myrtle Av Local, Williamsburg Bridge, Nassau St Local, Montague St Tunnel, 4 Av Local, West End Local	Bay Parkway	7	7
N	Ditmars Blvd	Astoria Local, 60 St Tunnel, Broadway Express, Manhattan Bridge ("H" tracks), 4 Av Express, Sea Beach Local	Coney Island	8	8
Q	57 St/7 Av	Broadway Express, Manhattan Bridge ("H" tracks), Brighton Express	Brighton Beach	10	10
R	Forest Hills/ 71 Av	Queens Blvd Local, 60 St Tunnel, Broadway Local, Montague St Tunnel, 4 Av Local	Bay Ridge/ 95 St	11	10
W	Ditmars Blvd/ 31 St	Astoria Local, 60 St Tunnel, Broadway Local	Whitehall St	6	6

Source: New York City Transit.

IMPACT ON TRANSIT SERVICES FROM TUNNEL CONSTRUCTION

Excavation of the tunnel for the Second Avenue Subway would affect existing transit services at 15 locations. Table 5B-6 lists these existing transit and commuter railroad services, the affected locations, the general geological conditions (i.e., soil or rock), whether the Second Avenue Subway would pass over or under the existing transit or commuter railroad structure, and the approximate vertical distance from base-of-rail to base-of-rail. This information is also presented in Chapter 3, “Description of Construction Methods and Activities” (see Figure 3-11).

Metro-North’s Harlem–125th Street Station

Work at this station would involve constructing the new Second Avenue Subway (with its upper and lower mezzanine) beneath and perpendicular to the existing, elevated commuter railroad station at Park Avenue and 125th Street. This would be done using cut-and-cover techniques, where the columns supporting the railroad viaduct structure would be underpinned in advance. Underpinning could be accomplished in a variety of ways, all of which would require many months. The new subway mezzanine below 125th Street would be connected to the existing elevated platforms serving the Metro-North Harlem, Hudson, and New Haven Lines. Additional work would include the construction of escalators, stairways, and elevators for the new station.

As most of the construction would be well below the existing, active railroad, only minor commuter rail service impacts would occur. Work at this subway station could affect street-level access to the Metro-North station, but temporary access would be maintained at all times. The underpinning of the supporting columns of Metro-North would not substantially affect rail service, although speed restrictions may be necessary to reduce vibrations.

125th Street Station (4 5 6 Routes)

The work at this location would involve constructing the new Second Avenue Subway beneath and perpendicular to the existing subway station, including a new mezzanine level above the new subway tunnel and below the existing one. This would be done using a combination of cut-and-cover and traditional mining techniques. The new mezzanine below 125th Street would be connected to the existing platforms serving the 4 5 6 routes by relocating some existing stairs and building new ones. Additional work would include the construction of escalators, stairways, and elevators between the existing upper mezzanine and the new Second Avenue Subway.

As much of this construction would be immediately under existing, active tracks, service disruptions would occur. Depending on the location of the rock line in this area (which is being investigated during Preliminary Engineering), underpinning may be required. Work at this station would affect service on the Lexington Avenue Line on selected nights and weekends for approximately 2 years. During these periods, service would be rerouted from the local to express tracks and vice versa, particularly downtown trains, which use the lower level.

63rd Street Line (F Route) and LIRR East Side Access

North of 63rd Street, the Second Avenue Subway would connect to existing tracks on the 63rd Street Line—the southbound tracks connecting at the upper level with the Manhattan-bound tunnel and the northbound tracks branching from the Queens-bound tunnel at the lower level. Construction work would include modifications at the 63rd Street Tunnel bellmouth, removal of a block wall, station and platform restoration and renovation, signal work, and tunnel lighting.

Table 5B-6
Existing Transit and Commuter Rail Services Affected
by Construction of the Second Avenue Subway

Affected Transit Services	Intersected Line and Location	General Geological Conditions	Second Avenue Subway	
			Relative Vertical Position	Approximate Clearance Base of Rail to Base of Rail
Metro-North Railroad	Metro-North Park Avenue Viaduct Park Av and 125th St	Soil	Passes Below	N/A
④⑤⑥	Lexington Avenue Line Lexington Av and 125th St	Soil or Rock	Passes Below	30 feet
ⓕ, LIRR	63rd Street Line 63rd St and Second Av	Rock	Passes Above	30 feet
ⓃⓇⓌ	60th Street Line 60th St and Second Av	Rock	Passes Above Passes Below ¹	25 feet 25 feet
ⓔⓋ	53rd Street Line 53rd St and Second Av	Rock	Passes Above	25 feet
⑦	Flushing Line 42nd St and Second Av	Rock	Passes Above	30 feet
LIRR, Amtrak, NJ Transit	LIRR Mainline Tunnel 33rd St/32nd St and Second Av	Rock	Passes Above	30 feet
Ⓛ	Canarsie Line 14th St and Second Av	Rock	Passes Below	55 feet
ⓕⓋ	Sixth Avenue Line Houston St and Second Av	Soil	Passes Below	50 feet
Non-Revenue	IND BJ Tracks near Stanton St and Chrystie St or near Rivington St and Forsyth St.	Soil	Passes Below	35 feet
ⓐⓂⓏ	Nassau Street Line at Delancey St and Chrystie St or at Delancey and Forsyth St.	Soil	Passes Below	30 feet
ⓔⓓ ³	Sixth Avenue Line along Chrystie Street between Stanton St and Canal St and/or at the Approach to the Manhattan Bridge	Soil	Passes Below ²	35 or 75 feet
ⓐⓌ	Broadway Line Manhattan Bridge Approach	Soil	Passes Below	80 feet
ⓐⓐ	Eighth Avenue Line Fulton St and Water St	Soil	Passes Below	25 feet
②③	Broadway-Seventh Av Line Old Slip and Water St	Rock	Passes Below	30 feet

Notes:

- 1 The Second Avenue Subway's curved tunnel connecting to the 63rd Street Line to Queens would pass below the 60th Street Line, while the main Second Avenue tunnel would pass above it.
- 2 In the Shallow Chrystie Option, the Second Avenue Subway would pass above the ⓕⓋ services and alongside the ⓔⓓ services.
- 3 Service temporarily suspended due to the Manhattan Bridge reconstruction project.

South of 63rd Street, the Second Avenue Subway would also connect to the 63rd Street Line—the southbound tracks connecting with the Manhattan-bound tunnel at the upper level and the northbound tracks connecting to the Queens-bound tunnel at the lower level. Some of this work would also require track outages. Service on the **F** route would be suspended on selected nights and weekends over approximately one year. During these periods, **F** service could be rerouted via the 53rd Street tunnel currently used by the **E V** routes. In addition, speed restrictions could also be required at other times to reduce vibrations during construction. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

In addition, the mainline of the Second Avenue Subway would pass above 63rd Street Tunnel at 63rd Street and Second Avenue. Therefore, it would not be necessary to underpin the existing subway and LIRR structure before tunnel excavation. However, the subway and commuter rail tunnel below would have to be protected from the tunnel work above, and the soil pressure distribution on the tunnel would have to be maintained at current levels. This could be done without affecting existing subway (**F**) and future commuter rail services.

60th Street Line at Second Avenue (N R W Routes)

The two 63rd Street south connector tracks would pass below the 60th Street Line east of Second Avenue. Because this subway line crossing would be deep in rock, it would not be necessary to comprehensively underpin this existing subway structure before tunnel excavation, although rock bolts may be required in selected areas due to the presence of slip planes in the rock. Except for a possible speed restriction during tunnel excavation, the **N R W** services would not be affected during construction. In addition, the mainline of the Second Avenue Subway would pass above the 60th Street Line at Second Avenue. Therefore, it would not be necessary to underpin the existing subway structure before tunnel excavation. However, it would be necessary to support the weight of the new tunnel over the existing tunnel, which would necessitate protecting the subway tunnel below from the construction work above, and the soil pressure distribution on the tunnel would have to be maintained at current levels. This could be done without affecting existing **N R W** services.

East Midtown

Three existing subway structures and one commuter railroad structure would be minimally affected by the construction of the Second Avenue Subway in rock conditions prevalent in East Midtown:

- 53rd Street Line beneath 53rd Street at Second Avenue (**E V** routes);
- Flushing Line beneath 42nd Street at Second Avenue (**7** route); and
- LIRR Mainline Tunnels beneath 33rd and 32nd Streets at Second Avenue (LIRR service to Penn Station, New Jersey Transit non-revenue service, and Amtrak Northeast Corridor service).

The subway lines carry trains in revenue service between Queens and Manhattan. The LIRR Mainline Tunnel carries commuter trains between Queens, Nassau, and Suffolk Counties and Manhattan; New Jersey Transit trains between Penn Station and storage yards in Sunnyside, Queens; and Amtrak trains between New York and New England. Because the Second Avenue Subway would pass above these subway and railroad structures, no underpinning of the structures would be required. However, it would be necessary to structurally support the new tunnel over the existing tunnel structures, requiring special precautions to shield the subway and railroad tunnels below from the construction work above. It would also be necessary to maintain

Second Avenue Subway SDEIS

the soil pressure distribution on the existing tunnels at current levels. This could be done without affecting existing subway or rail services.

Transfer connections are being evaluated between the Second Avenue Line and the **E V** routes on the 53rd Street Line and the **7** route on the Flushing Line. The connection to the 53rd Street Line would be made at the existing lower mezzanine of the Third Avenue and 53rd Street entrance and the connection to the Flushing Line would be made at the existing lower mezzanine of the Third Avenue and 42nd Street entrance. Constructing these transfer connections could require temporarily closing the Third Avenue station entrance at each station for several nights and weekends over a 6-month period.

14th Street Vicinity

The Second Avenue Subway would pass under the Canarsie Line (**L** route) beneath 14th Street at Second Avenue. Because this subway line crossing would be deep in rock, it would not be necessary to comprehensively underpin this existing subway structure before tunnel excavation. Rock bolts would be installed, if slip planes were identified in the rock through extensive soil borings. Temporary speed restrictions could be required on **L** service, to reduce vibrations for a few weeks during the excavation work immediate to the line crossing. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

A transfer connection is being evaluated between the Second Avenue Line and the **L** route on the Canarsie Line. The connection would be made at the east end of the platform at the Third Avenue and 14th Street Station. Only a relatively small area at the end of the platform would be affected, which would not disrupt subway service or access/egress at this station.

Houston Street to Canal Street

Six existing subway structures would be affected by the construction of the Second Avenue Subway in the weak soils prevalent in the area between Houston and Canal Streets. Five of these six structures carry subway trains in revenue service between Brooklyn and Manhattan:

- Sixth Avenue Line on Houston Street at Second Avenue (**F V** routes);
- Nassau Street Line on Delancey Street at Forsyth Street (**J M Z** routes);
- Sixth Avenue Line along Chrystie Street between Houston and Canal Streets (**B D** routes normally, **S** route currently);
- Sixth Avenue Line on the approach to the Manhattan Bridge (**B D** routes);
- Broadway Line on the approach to the Manhattan Bridge (**O W** routes); and
- IND “BJ” Tracks along Chrystie Street south of Houston Street (non-revenue subway train movements only).

As the excavation of the tunnels for the Second Avenue Subway would pass under existing, active tracks, it would be necessary to underpin or otherwise protect these existing subway structures before tunnel excavation, so as to provide the structures with sufficient support and prevent damage to them. This preparatory work at these subway line crossing-points would affect service on each of these lines on nights and weekends over a 1- to 2-year period. Not all routes would be affected at the same time. During these periods of preparatory work, service would be single-tracked through the affected areas or rerouted to an alternative line. In addition, speed restrictions on existing service could also be required at other times to reduce vibrations during construction. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

With all three options considered for the area between Houston and Canal Streets, it would be necessary to rebuild the existing Grand Street Station, because the existing platforms are too small to accommodate the additional riders who would use this station once the Second Avenue Subway is constructed. As described previously, however, the Shallow Chrystie Option is no longer under consideration, because its impacts would be more severe than with the Deep Chrystie or Forsyth Street Option. For example, even though all three options would create similar service disruptions on the **B D** routes during construction of the Second Avenue Subway, the Shallow Chrystie Option would also result in significant adverse impacts on the **F V** routes.

The Shallow Chrystie Option would include modifications to the existing tunnel structure between Houston and Canal Streets, alteration of the existing side platforms at the Grand Street Station into wider island platforms, track work, signal work, and tunnel lighting. Some of this work would require track outages. Service on the **B D** routes would be suspended on nights and weekends over a 1- to 2-year period. This option would also require that service on the **F V** routes be suspended on selected nights and weekends over a 2- to 3-year period, to allow the tunnel to pass through the mezzanine level of the existing Second Avenue Station on Houston Street.

The Deep Chrystie and Forsyth Street Options would also affect **B D** service between Houston and Canal Streets. Construction work would include removing and replacing part of the existing station box of the Grand Street Station. Some of this work would require track outages. Service on the **B D** routes could be suspended on selected nights and weekends over a 1- to 2-year period, but no impacts to the **F V** routes are anticipated.

Lower Manhattan

The subway structure that carries the **A C** routes in revenue service under Fulton Street could be affected in Lower Manhattan by the construction of the Second Avenue Subway. It would be necessary to underpin or otherwise protect this existing subway structure before tunnel excavation in soil under the existing structure, so as to provide the structure with sufficient support to prevent damage. This preparatory work could affect **A C** service on selected nights and weekends for up to 2 years. During these periods, service could be single-tracked through the affected areas or rerouted via the **F** route. In addition, speed restrictions could also be required at other times to reduce vibrations during construction. These speed restrictions would be over a relatively short distance, but they would increase travel time.

The Second Avenue Subway would also pass under the Broadway-Seventh Avenue Line located beneath Hanover Square and Old Slip, which carries the **2 3** routes. Because this subway line crossing would be deep in rock, it would not be necessary to comprehensively underpin this existing subway structure before tunnel excavation. However, because the Second Avenue Subway would have three tracks at this location, special precautions would be necessary to support this existing subway structure. In addition, rock bolts could be required in selected areas due to the presence of slip planes in the rock. Speed restrictions could be required on the affected **2 3** services, to reduce vibrations for a few weeks during excavation work. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

D. PERMANENT IMPACTS OF THE PROJECT ALTERNATIVES

Chapter 2, “Project Alternatives,” describes the new transportation service proposed by the project alternatives. This section evaluates the subway impacts of the proposed Second Avenue Subway as compared with the No Build Alternative. Ridership, operational changes, equipment, and infrastructure modifications are evaluated and assessed below.

EVALUATION METHODOLOGY

NYCT’s Transit Demand Forecasting Model (TDFM) and the mode-choice component of MTA’s Regional Transit Forecasting Model (RTFM) were used to estimate changes in AM peak hour transit trip-making based on the Second Avenue Subway as compared with the No Build condition (for more information on the modeling conducted, see Chapter 5A, “Ridership Modeling,” and Appendix D.1). The outputs from the model provide volume information on subway links, station on/off and transfer activities, and summary statistics on passenger hours and miles traveled by transit. These data were used to compare ridership changes and service operations. Potential changes in service conditions were compared in such terms as leave-load volumes and subway car loading v/c ratios.

SERVICE CHARACTERISTICS

SERVICE CHANGES TO SUBWAY LINES

Table 5B-7 shows the expected number of train arrivals on a typical day at selected stations for the Lexington Avenue Line for the AM peak hour under existing, No Build, and Build conditions. Table 5B-8 presents similar information for selected stations on the Broadway and 63rd Street Lines. These changes are described below.

No Build Alternative

Under the No Build Alternative, no changes would occur to the subway system as a result of the Second Avenue Subway. The changes anticipated in the future in any case (described above under “Future Conditions Common to All Alternatives”) would occur. On the southbound Lexington Avenue 4 5 express services, the number of departing trains per hour during the peak period would not change in 2020, because crowding will continue to create long dwell times. On the 6 local service, the number of departing trains is projected to increase from 21 to 25 trains per hour to accommodate expected ridership growth. This is the maximum number of trains that can be operated on the 6 route through the Brooklyn Bridge loop. On the southbound Broadway Line, there will be a total of 35 local and express trains. At 34th Street/Herald Square, for example, there are expected to be 19 Q N express trains and 16 R W local trains.

Total transit ridership into the Manhattan CBD during the AM peak hour is expected to increase from about 401,300 under the 2000 existing conditions to about 477,800 under the 2020 No Build conditions—an increase of 19 percent. Transit ridership across the 60th Street screenline into the Manhattan CBD during the AM peak hour is expected to increase by approximately 25 percent from about 134,100 under the 2000 existing conditions to about 168,100 under the 2020 No Build conditions. Southbound ridership on the Lexington Avenue Line at the 60th Street screenline is expected to increase by approximately 10 percent from about 55,900 under the 2000 existing conditions to about 62,300 under the 2020 No Build conditions.

Table 5B-7
Southbound AM Peak Hour Departing Trains, Lexington Avenue Line

Station	Existing		No Build		Build	
	Express 4 5	Local 6	Express 4 5	Local 6	Express 4 5	Local 6
125 St	28	21	28	25	29	20
116 St		21		25		20
110 St		21		25		20
103 St		21		25		20
96 St		21		25		20
86 St	26	21	26	25	28	20
77 St		21		25		20
68 St		21		25		20
59 St	26	21	26	25	28	20
51 St		21		25		20
Grand Central	25	21	25	25	28	20
33 St		21		25		20
28 St		21		25		20
23 St		21		25		20
Union Square	25	21	25	25	27	20
Astor Pl		21		25		20
Bleecker St		21		25		20
Spring St		21		25		20
Canal St		21		25		20
Brooklyn Bridge	25	21	25	25	27	20
Fulton St	25		25		27	
Wall St	25		25		27	
Bowling Green	25		25		27	

Source: New York City Transit.

Table 5B-8
Southbound AM Peak Hour Arriving Trains for the 63rd Street and Broadway Lines, 2020

Station Location	No Build		Build	
	Express Service	Local Service	Express Service	Local Service
63 St-Lexington Ave		15	12	15
57 St	10	25	12	25
49 St		25		25
Times Sq-42nd St	10	25	12	25
34 St-Herald Sq	19 ¹	16	21 ¹	16
28 St		16		16
23 St		16		16
14 St-Union Sq	19	16	21	16
8 St		16		16
Prince St		16		16
Canal St	19	16	21	16
City Hall		16		16
Cortlandt St		16		16
Rector St		16		16
Whitehall St		16		16

Note: ¹ The southbound N service switches to the express track between Times Sq-42nd St and 34 St-Herald Sq.
Source: New York City Transit.

Second Avenue Subway SDEIS

The number of riders boarding and alighting from the 4 5 6 routes on Lexington Avenue Line at the Grand Central-42nd Street Station during the AM peak hour is expected to increase by about 36 percent and 9 percent, respectively, under the 2020 No Build condition compared with the 2000 existing conditions. Increases in the number of boarding passengers are expected to exceed increases in the number of alighting passengers primarily due to the completion of the LIRR East Side Access Project, which will bring LIRR passengers into Grand Central Terminal. About 3,300 of these passengers will transfer to the connecting crosstown, uptown and downtown subway services, especially the Lexington Avenue Local Line, during the AM peak hour.

At the Broadway-Lafayette/Bleecker Street Station, the new transfer connection between the northbound 6 route on the Lexington Avenue Line and the B D F V routes on the Sixth Avenue Line in the No Build Alternative will result in about 2,850 AM peak hour passengers transferring from the Sixth Avenue Line to Lexington Avenue Local Line.

Second Avenue Subway

For purposes of this analysis, the full-length Second Avenue Subway service from 125th Street to Hanover Square is designated as the T route. It is assumed that the Second Avenue Subway service via the Broadway Line's express tracks would be an extension of the Q route, which currently terminates at 57th Street-Seventh Avenue in the north. The new Second Avenue Subway between 125th Street and Hanover Square would add 16 new subway stations, greatly improving transit access for and providing links between communities on the far East Side, from East Harlem to the Financial District. In addition, the proposed extension of the Broadway Line Q service via the Second Avenue Line would create for the first time a one-seat ride from East Harlem and the Upper East Side to West Midtown.

Second Avenue T Service. The new subway's T route would operate along Second Avenue from 125th Street to Hanover Square, stopping at all 16 new Second Avenue Subway stations. During the 2020 AM peak period, the new T service would be scheduled to run 12 trains per hour on the new Second Avenue Line. (The Q service is described below.) Because service would be provided along an entirely new subway corridor located several blocks farther east than the existing Lexington Avenue Line, the new T service would benefit residents, workers and visitors to Manhattan's Far East Side by reducing the time needed to travel to the existing Lexington Avenue Line. Corresponding improvements to some existing subway lines (including congestion relief on the 4 5 6 Lines, additional service on the Broadway Line in Manhattan, and improved subway transfers) would also result, as described below.

Second Avenue Q Service. The new extended Q service from Harlem and the Upper East Side via the Second Avenue Line would operate from 125th Street under Second Avenue, then along 63rd Street and down Broadway to the Manhattan Bridge, with a southern terminal in Brighton Beach. The newly extended Q route would operate on the express tracks of the Broadway Line and cross the East River over the Manhattan Bridge. During the 2020 AM peak period, the new Second Avenue Line would be scheduled to run 12 trains per hour on the extended Q service (in addition to the 12 trains per hour running as part of the full-length T service).

Additional Service Changes Due to Second Avenue Q T Service. Together, the new Q T services are expected to attract a significant number of existing riders from the Lexington Avenue Line and north-south bus routes. The Lexington Avenue 4 5 express services would continue to be scheduled at 29 trains per hour with 27 trains passing south of 14th Street-Union Square Station. On the Lexington Avenue 6 6 local, per NYCT loading guidelines, scheduled

service would be reduced from the current level of 21 trains per hour to 20 trains per hour (rather than 25 trains per hour in the No Build Alternative), due to a shift of East Harlem and Upper East Side riders to the new Second Avenue **Q** **T** services and the majority of riders remaining on the Lexington Avenue Line preferring the **4** **5** express services.

With the Second Avenue Subway, many **4** **5** **6** riders would opt to use the **Q** **T** routes instead. It is projected that approximately 50,500 AM peak hour northbound and southbound Lexington Avenue riders would shift to the new Second Avenue Subway line in 2020, or approximately 26 percent of the total number of riders projected on the Lexington Avenue Line in 2020 during the AM peak hour. The resulting decrease in Lexington Avenue **4** **5** **6** crowding would reduce the long dwell times experienced in the No Build condition, resulting in shorter travel times, and an increase in the number of departing trains at 125th Street, 86th Street and Grand Central-42nd Street Stations. For example, at Grand Central-42nd Street Station, the number of departing **4** **5** express trains would be expected to increase from 25 to 28 trains per hour between the No Build and Build conditions. This outcome satisfies a chief project goal. Nevertheless, it should be noted that the slow speeds and extended dwell times associated with the moving platform at the 14th Street/Union Square Station would become the capacity constraint on the Lexington Avenue Line, which would limit the number of departing express trains at this station and southward to 27 trains per hour.

In the 2020 No Build condition, 10 **Q** trains per hour would operate on the Broadway Line. With the proposed extension of the **Q** service onto the Second Avenue Line, service frequency would be increased to 12 trains per hour to serve the additional demand, resulting in an increase in number of local and express trains operating on the Broadway Line from 35 to 37 trains per hour. At the 34th Street/Herald Square Station, for example, there are expected to be 21 **Q** **N** express trains and 16 **R** **W** local trains during the AM peak hour.

Overall, with implementation of the new Second Avenue Subway service, the incidence of “crush conditions” on existing Lexington Avenue Line service—which are expected to become more severe under the No Build condition—would be substantially reduced. Based on average conditions in the AM peak hour, approximately 61,800 southbound **4** **5** riders would no longer experience crowding in 2020 on the Lexington Avenue Line with the addition of the Second Avenue Subway Line. The number of trains serving the East Side of Manhattan would increase. Finally, passengers needing to travel between East Harlem and Upper East Side and West Midtown or points south would also benefit from a one-seat ride via the new **Q** service.

RIDERSHIP

As shown in Table 5B-9, the new Second Avenue Subway would attract a large number of riders. The ridership model demonstrates that in the 2020 AM peak hour, the full-length **T** and extended **Q** services would carry 70,200 AM peak hour riders and approximately 591,000 daily riders on the Second Avenue Subway.

The introduction of the new Second Avenue Subway service would attract riders who currently ride the Lexington Avenue Line, thereby substantially reducing the number of passengers on the Lexington Avenue Line in Manhattan, as shown in Table 5B-10. Overall, the Lexington Avenue Line would carry nearly 29 percent fewer riders southbound and 16 percent fewer riders northbound with the proposed Second Avenue Subway.

**Table 5B-9
Predicted Second Avenue Line Ridership, 2020 AM Peak Hour**

Route	Passengers		
	Southbound	Northbound	Total
Extended Broadway Line (Q) Service	22,600	5,000	27,600
Full-Length Second Avenue (T) Service	28,100	14,500	42,600
Total Riders on Second Avenue Subway	50,700	19,500	70,200
Notes: Southbound volumes based on passenger boardings between 125th Street and Lexington Av-63rd Street for the Q and 125th Street and Hanover Square for the T. Northbound volumes based on leave loads from 57th Street-Seventh Av for the Q or Hanover Square for the T and passenger boardings north to 125th Street for both the Q and T. Source: New York City Transit Model Outputs.			

**Table 5B-10
2020 AM Peak Hour Lexington Avenue Line Ridership in Manhattan
Comparing Build vs. No Build Conditions**

Route	Southbound				Northbound			
	No Build	Build	Change	%	No Build	Build	Change	%
4 5 Express	63,100	53,700	-9,400	-15%	44,100	38,700	-5,400	-12%
6 Local	55,400	31,000	-24,400	-44%	30,100	23,500	-6,600	-22%
Total	118,500	84,700	-33,800	-29%	74,200	62,200	-12,000	-16%
Notes: Southbound based upon leave load volume at 125th Street and passenger boardings south to Bowling Green for the 4 5 or Brooklyn Bridge for the 6. Northbound based upon leave load volumes at Borough Hall and passenger boardings north to 86th Street for the 4 5 or passenger boardings between Brooklyn Bridge and 116th Street for the 6. (125th Street boardings are not included northbound.) Source: NYCT Transit Model Outputs.								

The extended Q service via 63rd Street and Second Avenue would substantially increase subway ridership on the Broadway Line. As discussed below, the Broadway Line NQ express services would carry a total of 18,300 more riders southbound and 3,800 more riders northbound under the Build Alternative in the 2020 AM peak hour. This is an increase of about 79 percent and 13 percent, respectively, compared with the No Build Alternative. During the AM peak hour, the Broadway Line RW local services would carry 300 fewer riders southbound and 700 more riders northbound under the Build Alternative. This is a reduction of about 1 percent and an increase of 5 percent, respectively, compared with the No Build condition. Overall, the four subway lines encompassing the Broadway Line (NQRW) would carry nearly 40 percent more riders southbound and 10 percent more riders northbound with the proposed Second Avenue Subway.

TRAIN CROWDING

Lexington Avenue Line 4 5 6

The new Second Avenue Subway would result in substantial reductions in crowding on the Lexington Avenue 4 5 express. For example, the southbound 4 5 express trains leaving the 86th Street Station would carry about 4,000 (or 12 percent) fewer riders during the 2020 AM

peak hour (see Table 5B-11) with the Second Avenue Subway than with the No Build Alternative. On the 6 local trains, improvements in crowding would be even more significant (see Table 5B-12), with that route carrying more than 15,000 (or 68 percent) fewer riders. The southbound Q T services on the Second Avenue Line would carry over 29,000 riders, when it leaves 86th Street during the 2020 AM peak hour (these are shown in Table 5B-14, later in this chapter).

Table 5B-11
Loading Conditions for Southbound Lexington Avenue Express 4 5 Trains
2020 AM Peak Hour

Station	Trains per Hour		Leave Load (V)		Capacity (C)		Average Volume/Capacity (V/C) Ratio		
	No Build	Build	No Build	Build	No Build	Build	No Build	Build	% Change
125 St	28	29	34,300	29,700	30,800	31,900	1.11	0.93	-16%
86 St	26	28	33,600	29,600	28,600	30,800	1.18	0.96	-19%
59 St	26	28	30,800	28,600	28,600	30,800	1.08	0.93	-14%
42 St / GCT	25	28	36,000	29,900	27,500	30,800	1.31	0.97	-26%
Union Sq	25	27	30,800	25,100	27,500	29,700	1.12	0.85	-25%
Brooklyn Br	25	27	26,200	20,900	27,500	29,700	0.95	0.70	-26%

Source: Vollmer Associates based on NYCT Model Outputs.

Table 5B-12
Loading Conditions for Southbound Lexington Avenue Local 6 Trains
2020 AM Peak Hour

Station	Trains per Hour		Leave Load (V)		Capacity (C)		Average Volume/Capacity (V/C) Ratio		
	No Build	Build	No Build	Build	No Build	Build	No Build	Build	% Change
125 St	25	20	7,700	3,500	27,500	22,000	0.28	0.16	-43%
86 St	25	20	22,300	7,200	27,500	22,000	0.81	0.33	-59%
77 St	25	20	27,900	9,600	27,500	22,000	1.01	0.43	-57%
68 St	25	20	28,600	9,600	27,500	22,000	1.04	0.44	-58%
59 St	25	20	29,200	12,200	27,500	22,000	1.06	0.56	-47%
51 St	25	20	24,500	9,400	27,500	22,000	0.89	0.43	-52%
42 St / GCT	25	20	20,300	13,100	27,500	22,000	0.74	0.60	-19%
Union Sq	25	20	8,100	5,000	27,500	22,000	0.29	0.23	-21%

Source: Vollmer Associates based on NYCT Model Outputs.

Based on future subway link volumes from transit model outputs and the existing train throughput distribution along the Lexington Avenue Line, 2020 AM peak hour leave-load levels were estimated for southbound 4 5 express and southbound 6 local services at key stations. Under No Build conditions, NYCT subway car passenger loading guidelines would be exceeded on the 4 5 express services at five of the six express stations between 125th Street and Brooklyn Bridge. On trains leaving the 86th Street Station, average subway car crowding levels would equal those experienced on trains leaving Grand Central-42nd Street Station under existing conditions (v/c ratio of 1.18). As expected, trains leaving Grand Central-42nd Street Station under No Build conditions would become more severely crowded with an average v/c ratio of 1.31. The 6 local trains leaving the 77th Street, 68th Street, and 59th Street Stations would exceed NYCT loading guidelines under No Build conditions.

With the Second Avenue Subway, the 4 5 express services and 6 local service would all meet NYCT’s subway car passenger loading guidelines. This is shown in Tables 5B-11 and 5B-12, respectively. The peak load point on the 4 5 express services would continue to be at Grand

Central-42nd Street Station where the v/c ratio would improve to 0.97 during the 2020 AM peak hour compared with a v/c ratio of 1.31 under No Build conditions. Comparable reductions in leave-load volumes with better v/c ratios are also expected at the 125th Street and 86th Street Stations. The 6 local service would continue to have its peak load point at the 59th Street Station, but the average v/c ratio would improve to 0.56 compared with 1.06 under the No Build conditions.

Extended Q Service on the 63rd Street and Broadway Lines

The extended Q service on the Second Avenue Line would connect with the Broadway Line via the 63rd Street Line. This would bring new riders to the Broadway Line. Table 5B-13 compares future ridership on the Broadway Line with and without the extended Q service on the Second Avenue Line.

**Table 5B-13
2020 AM Peak Hour Broadway Line Ridership in Manhattan
Comparing Build vs. No Build Conditions**

Route	Southbound				Northbound			
	No Build	Build	Change	%	No Build	Build	Change	%
N Q Express	23,300	38,200	14,900	63.9%	30,700	29,900	-800	-2.6%
R W Local	22,100	22,600	500	2.3%	14,200	14,900	700	4.9%
Total	45,400	60,800	15,400	33.9%	44,900	44,800	-100	-0.2%

Notes:
 Southbound volume based upon leave-load volumes from Queens on the N R W (or Lexington-63 St on the Q) and passenger boardings south to Broadway-Canal on the N Q or Whitehall Street on the R W.
 Northbound volume based on leave load volumes from Brooklyn on the N Q R or Whitehall St on the W and passenger boardings north to Lexington Av on the N R W or 57 St on the Q.
Source: Vollmer Associates based upon NYCT Model Outputs.

Table 5B-14 shows the usage levels predicted by the NYCT model at key stations along the 63rd Street and Broadway Lines for the Q N express services and the R W local services. The extended Q service would make one stop on the 63rd Street Line at the Lexington Avenue/63rd Street Station.

Extended Q Service and Full-Length T Service on the Second Avenue Line

The extended Q service and the full-length T service would make all stops on the Second Avenue Line between 125th Street and 72nd Street. The T service would continue on the Second Avenue Line south of the 63rd Street connector, making all stops between the 57th Street and Hanover Square Stations. The projected volumes and v/c ratios for the Second Avenue Subway are presented in Table 5B-15. The peak load point for the combined Q T services north of 63rd Street would occur at 72nd Street Station, where the scheduled 24 trains per hour are projected to have an average v/c ratio of 0.94 in the 2020 AM peak hour. South of 63rd Street, the projected peak load point for the T service would be at 34th Street, where the scheduled 12 trains per hour are projected to have an average v/c ratio of 0.98 in the 2020 AM peak hour. The Second Avenue Line would be designed to handle up to 30 trains per hour over its entire length, and additional service could be added to accommodate ridership growth.

Table 5B-14
AM Peak Hour Line-Haul Volumes
for Southbound 63rd Street Line and Broadway Line Services

Station	No Build					Build				
	Train Service	Trains per Hour	Leave Load	Capacity	V/C	Train Service	Trains per Hour	Leave Load	Capacity	V/C
Lexington/ 63rd St	F	15	19,200	21,000	0.91	F Q	27	33,500	38,400	0.87
57th St	Q	10	1,200	14,500	0.08	Q	12	13,900	17,400	0.80
	N R W	25	6,900	35,400	0.19	N R W	25	9,100	35,400	0.26
Times Sq	Q	10	3,100	14,500	0.21	N Q	12	9,500	17,400	0.54
	N R W	25	7,600	35,400	0.21	R W	25	9,400	35,400	0.27
34th St	N Q	18	8,300	26,100	0.32	N Q	20	14,400	29,000	0.50
	R W	17	3,400	23,800	0.14	R W	17	2,800	23,800	0.12
Union Sq	N Q	18	7,500	26,100	0.29	N Q	20	9,300	29,000	0.32
	R W	17	4,300	23,800	0.18	R W	17	5,100	23,800	0.22

Source: Vollmer Associates based on NYCT Model Outputs.

Table 5B-15
AM Peak Hour Line-Haul Volumes for
Southbound Second Avenue Q T Trains

Station	Trains Per Hour	Peak Hour Leave Load	Capacity	V/C Ratio
125 St	24	13,300	34,800	0.38
116 St	24	15,100	34,800	0.43
106 St	24	16,300	34,800	0.47
96 St	24	23,500	34,800	0.67
86 St	24	30,100	34,800	0.86
72 St	24 ¹	32,800	34,800	0.94
57 St	12	16,800	17,400	0.97
42 St	12	16,700	17,400	0.96
34 St	12	17,000	17,400	0.98
23 St	12	15,300	17,400	0.88
14 St	12	14,900	17,400	0.85
Houston St	12	12,100	17,400	0.70
Grand St	12	11,500	17,400	0.66
Chatham Sq	12	10,300	17,400	0.59
Seaport	12	7,900	17,400	0.45
Hanover Sq	12	0	17,400	0.00

Note: ¹ The Q service would run on the Second Avenue Line north of 63rd St.
Source: NYCT Model Outputs.

STATION CROWDING

Future pedestrian circulation at existing subway stations on the Lexington Avenue Line and Broadway Line would be expected to exhibit noticeable changes in transit usage and in pedestrian movements. Conditions at the Lexington Avenue Line are expected to improve, due to lower volumes and less crowding. Station entry/exit movements and subway-to-subway transfer volumes obtained from model outputs were examined to evaluate these changes.

Station Entry/Exit Movements

Lexington Avenue Line. The Second Avenue Subway would lead to a dramatic improvement at all Lexington Avenue express and local stations. Station entry/exit volumes are expected to decrease at all Lexington Avenue Line stations, as shown in Table 5B-16. The largest volume decreases would occur at the existing 96th Street, 86th Street and Grand Central Stations. Other notable percentage reductions would occur at the 116th Street, 77th Street, 68th Street and 28th Street Stations. The volume reduction at Union Square would be small, because the Lexington Avenue and Broadway Lines meet at that point.

The change at the north end of the Grand Central-42nd Street Station on the Lexington Avenue Line is a good example of the crowding reduction that could be expected with the Second Avenue Subway. Table 5B-17 compares the level of service of pedestrian circulation elements at this location for the 2000 existing, 2020 No Build, and 2020 Build conditions during AM and PM peak 15-minute periods. The No Build and Build conditions reflect the ridership increases expected from the completion of the LIRR East Side Access Project. As shown, stairways that are projected to operate at LOS E or F conditions under the No Build Alternative would improve to LOS C or D conditions with the Second Avenue Subway.

Broadway Line. Entry/exit volumes at Broadway Line express stops are generally expected to increase due to the extended **C** service to East Harlem and the Upper East Side via the Second Avenue Line, as shown in Table 5B-18. The exception is the Lexington Avenue-59th Street Station serving the **N** **R** **W** routes, where the entry exit volume would be reduced by over 45 percent. This is due to the extended **C** service, which would stop at the nearby Lexington Avenue-63rd Street Station on the 63rd Street Line.

The increased entry/exit volume of more than 1,200 passengers at the Times Square-42nd Street Station would be handled by the vertical circulation improvements currently being built in phases at this station complex in conjunction with the ongoing redevelopment of the area. At the 34th Street-Herald Square Station, the increased entry/exit volume of over 700 passengers would be distributed among several entrance locations, but the increased volume at the northeast corner of Sixth Avenue and 32nd Street could have a negative impact on operating conditions on the street stairs. As noted earlier, further analysis would be required to determine the extent of the impact and feasibility of mitigation required.

Table 5B-16
Station Entry/Exit Volumes on the Lexington Avenue Line,
2020 AM Peak Hour

Station	Route	No Build			Build			Total Change	
		Entry	Exit	Total	Entry	Exit	Total	Volume	Percent
125 St ¹	4 5 6	2,450	1,650	4,100	1,350	1,270	2,620	-1,480	-36%
116 St	6	2,250	810	3,060	1,120	470	1,590	-1,470	-48%
110 St	6	820	490	1,300	430	300	720	-580	-44%
103 St	6	1,620	1,290	2,910	770	1,070	1,840	-1,070	-37%
96 St	6	7,980	1,260	9,240	1,850	540	2,390	-6,850	-74%
86 St	4 5 6	7,140	6,340	13,490	3,780	4,920	8,690	-4,800	-36%
77 St	6	6,880	4,440	11,310	3,280	3,000	6,260	-5,050	-45%
68 St	6	2,460	5,000	7,470	820	2,720	3,540	-3,930	-53%
59 St	4 5 6	1,440	6,660	8,100	490	4,500	4,990	-3,110	-38%
51 St	6	800	12,960	13,760	480	9,710	10,190	-3,570	-26%
Grand Central	4 5 6	18,080	38,400	56,470	17,210	33,360	50,580	-5,890	-10%
33 St	6	3,120	9,430	12,560	2,240	8,440	10,680	-1,880	-15%
28 St	6	1,180	630	1,810	530	170	690	-1,120	-62%
23 St	6	1,390	9,750	11,140	1,080	8,180	9,260	-1,880	-17%
14 St	4 5 6	1,810	6,080	7,900	1,600	5,910	7,510	-390	-5%
Astor Pl	6	1,310	2,770	4,080	1,080	2,430	3,510	-570	-14%
Bleecker St	6	380	1,130	1,510	320	1,060	1,380	-130	-8%
Spring St	6	680	2,950	3,630	550	1,970	2,520	-1,110	-31%
Canal St	6	170	2,480	2,650	130	1,480	1,610	-1,040	-39%
Brooklyn Bridge	4 5 6	220	2,300	2,520	120	1,720	1,840	-680	-27%

Note: ¹ Entry/exit volumes at the existing 125th Street Station on the Lexington Avenue Line are expected to decrease with the Second Avenue Subway, due to the new 125th Street Station on the Second Avenue Line, which includes a new entrance at Park Ave. and 125th St.

Source: Vollmer Associates based on NYCT Model Outputs.

Table 5B-17
Comparative Level of Service Conditions North End of
42nd Street/Grand Central Station on Lexington Avenue Line

Pedestrian Circulation Element	Existing		No Build		Build	
	AM	PM	AM	PM	AM	PM
Fare Control Area (IRT #240)	C/D or better					
Stairway: Entry/Exit to Lexington Av/42 St	E	C	E	C	C	B
Stairway: Entry/Exit to Hyatt Passageway	C	C	D	C	C	B
Stairway P20: Southbound Platform	B	B	C	B	A	A
Stairway P22: Southbound Platform	D	D	E	D	C	B
Stairway P21: Northbound Platform	C	B	C	B	B	B
Stairway P23: Northbound Platform	E	D	F	E	D	D

Source: Eng-Wong, Taub & Associates

Table 5B-18
Entry/Exit Volumes at Express Stops on the Broadway Line,
2020 AM Peak Hour

	No Build			Build			Total Change	
	Entry	Exit	Total	Entry	Exit	Total	Volume	Percent
Lexington Ave-63rd St	440	1,700	2,140	400	1,570	1,960	-180	-9%
Lexington Ave-59 St	1,780	3,620	5,400	1,080	3,130	4,210	-1,190	-22%
57 St	1,020	7,680	8,700	1,200	9,560	10,770	2,070	24%
Times Sq-42 St	1,260	12,730	13,990	1,180	14,060	15,240	1,250	9%
34 St-Herald Sq	1,130	11,860	12,990	1,080	12,640	13,720	730	6%
14 St-Union Sq	1,500	12,550	14,050	1,470	13,060	14,530	480	3%
Broadway-Canal St	300	5,210	5,500	300	6,270	6,570	1,070	-19%
Source: Vollmer Associates based on NYCT Model Outputs.								

Second Avenue Line. The station entry/exit volumes on the Second Avenue Line are shown in Table 5B-19, where the four busiest stations in the AM peak hour would be at 96th, 86th, 72nd, and 42nd Streets. The highest exit volumes would occur at 42nd Street Station, located near the United Nations, and at Hanover Square Station, located in the Financial District. The stairs, escalators, and fare control areas would be designed for LOS C or better conditions in the design year. This level of service should be achievable in most, if not all, locations.

Table 5B-19
AM Peak Hour Entry/Exit Volumes at
Stations on the Second Avenue Line

Station	Entry	Exit	Total
125 St	1,680	1,150	2,830
116 St	2,120	400	2,520
106 St	1,580	530	2,110
96 St	7,900	1,100	9,010
86 St	7,090	2,130	9,220
72 St	4,590	6,070	10,650
57 St	1,410	4,090	5,500
42 St	2,170	7,880	10,050
34 St	2,040	1,460	3,500
23 St	1,630	3,280	4,910
14 St	1,670	1,370	3,050
Houston St	620	500	1,110
Grand St	170	770	940
Chatham Sq	740	1,260	2,010
Seaport	520	2,720	3,240
Hanover Sq	140	8,380	8,520
Source: NYCT Model Output.			

Subway-to-Subway Transfer Movements

Primary Study Area. Table 5B-20 shows a qualitative assessment of 2020 AM peak hour transfer activities at key stations in the primary study area. In this table, transfer volumes for the Second Avenue Subway were compared with those in the No Build Alternative. The ratings were determined by assessing conditions observed under existing conditions at the associated transfer elements (i.e., stairways, corridors, and platforms, etc.) and comparing these volumes with the volumes expected under the No Build and Build conditions. For the Second Avenue Subway, transfer volumes at existing facilities would be lower than those in the No Build Alternative.

A marked improvement would be expected with the Second Avenue Subway at the transfer connection between the Sixth Avenue **E V** services at the Lexington Avenue-53rd Street Station and the Lexington Avenue **6** local service at the 51st Street Station. This extremely crowded transfer movement in the No Build condition would be improved to satisfactory conditions with occasional momentary congestion in the Build condition. The reduction in crowding would occur because the proposed transfer connection between the **E V** services and the **T** service would shift passengers to the Second Avenue Line at the 57th Street Station.

At Union Square, the transfer volume between the **4 5 6** and **N R W Q** routes would decrease between the No Build Alternative and the Second Avenue Subway, but transfers between the **L** and the **4 5 6** and the **N R W Q** routes would remain essentially unchanged.

Table 5B-20 also shows the movement volumes at potential transfer connections to the proposed Second Avenue Line. Transfer connections are being evaluated at the following locations:

- 125th Street-Lexington Avenue between **4 5 6** and **Q T** services.
- Lexington Avenue-63rd Street between **F** and **Q** services.
- 57th Street-Second Avenue between **E V** and **T** services.
- 42nd Street-Second Avenue between **7** and **T** services.
- 14th Street-Second Avenue between **L** and **T** services.
- Houston Street-Second Avenue between **F V** and **T** services.
- Grand Street-Forsyth Street between **B D** and **T** services.

The highest volume transfer movement on the Second Avenue Line would occur at the 125th Street Station, where a total of about 14,000 passengers would transfer between the **4 5 6** and **Q T** routes during the 2020 AM peak hour. Two other high volume transfer locations would be at 57th Street and Second Avenue, and Houston Street and Second Avenue. At 57th Street and Second Avenue, over 8,900 passengers would transfer between the **E V** and **T** routes during the AM peak hour. Similarly, at Houston Street and Second Avenue, nearly 8,600 passengers would transfer between the **F V** and **T** services during the AM peak hour.

Transfer connections on the new Second Avenue Line would be designed to achieve satisfactory conditions. However, one possible exception may be the transfer movement at the new 125th Street Station complex, where there would be a high AM peak hour transfer between the southbound **4 5 6** and **Q T** routes of over 11,400 people per hour. The constraints of the existing Lexington Avenue Line platform width, stair layout, and uneven bi-directional flow may make it difficult to achieve better than borderline satisfactory conditions, although the transfer will be made as attractive as possible.

Table 5B-20
Qualitative Evaluation of 2020 AM Peak Hour Transfer Activities

Station	Route (A)	Route (B)	No Build Alternative				Build Alternative			
			Forward (Route A to Route B)		Reverse (Route B to Route A)		Forward (Route A to Route B)		Reverse (Route B to Route A)	
			Volume	Rating	Volume	Rating	Volume	Rating	Volume	Rating
125th St-Lexington Av	4 5 6	C T					11,670	3	2,640	3
86th St-Lexington Av	6	4 5	370	4	4,850	4	400	3	3,690	3
Lexington Av-63rd St	Q SB	F NB					1,210	2	-	-
	Q SB	F SB					1,870	2	3,900	2
	Q NB	F NB					420	1	40	1
	Q NB	F SB					-	-	2,610	2
59th St-Lexington Av	4 5	N R W	2,980	5	3,110	5	2,210	3	3,410	3
	6	4 5	10	4	1,720	4	10	4	2,420	4
	6	N R W	970	5	2,940	5	330	3	2,320	3
Lexington Av-53rd St/ 51st St-Lexington Av	6	E V	1,280	5	4,960	5	980	3	1,470	3
57th St-Second Av/ Lexington Av-53rd St	E V	T					5,020	2	3,910	2
Grand Central-42nd St	4 5 6	S	3,560	4	1,350	4	1,010	3	1,070	3
	4 5 6	7	1,660	5	11,620	5	1,210	5	10,770	5
	7	T					1,790	2	280	2
14th St-Union Sq	N R Q W	L	3,220	4	4,320	4	3,550	4	4,880	4
	N R Q W	4 5 6	8,360	4	3,000	4	8,670	4	2,670	4
	L	4 5 6	7,060	4	3,370	4	6,010	4	3,010	4
14th St-Second Av	L	T					2,130	2	960	2
Bleecker St/ Broadway-Lafayette St	6 NB	B D F Q	2	3	3,010	3	10	2	1,630	2
	6 SB	B D F Q	1,420	3	110	3	820	2	110	2
Houston St-Second Av	F V	T					6,000	2	2,820	2
Grand St	B D	T					3,060	2	450	2
Canal St	R	6	-	-	-	-	-	-	-	-
	6	J M Z	50	3	775	3	-	-	720	3
Brooklyn Br/ Chambers St	4 5 6	J M Z	310	3	777	3	290	3	590	3
Fulton St/ Broadway-Nassau	4 5	J M Z	-	-	1,430	4	-	-	1,460	4
	4 5	A C	2,820	4	11,801	4	2,030	4	10,840	4

Notes:
Ratings were made as follows: 1 = Good operating condition; 2 = Satisfactory condition; 3 = Borderline satisfactory condition; 4 = Moderate crowding; condition; 5 = Severe crowding condition; 6 = Extreme crowding condition. Volumes between 1 and 10 were rounded to 10.

Source: Vollmer Associates based upon NYCT Model Outputs. Ratings by Vollmer Associates

As described in Chapter 2 (“Project Alternatives”), three alignment options were evaluated for the Second Avenue Subway in the vicinity of the Grand Street Station on the Sixth Avenue Line. Table 5B-21 compares transfer movement volumes for these three alignment options between the **T** service at the Grand Street Station on the Second Avenue Line and **B D** services at existing Grand Street Station on the Sixth Avenue Line. Although the Shallow Chrystie Option with an across-the-platform transfer would have the highest transfer movement volumes, it is no longer under consideration, as it would result in more significant adverse impacts during construction than the other two options. The Deep Chrystie Option with a vertical transfer would rank next, and the Forsyth Street Option with a 200-foot horizontal transfer would have the lowest transfer movement volume.

Table 5B-21
Comparison of Grand Street Station Transfer Volumes
2020 AM Peak Hour

Alignment Option	Transfer Volumes		
	B D to T	T to B D	Total
Shallow Chrystie Option	7,709	1,302	9,011
Deep Chrystie Option	5,483	775	6,258
Forsyth Street Option	3,058	445	3,503

Secondary Study Area. In the secondary study area, the West Side neighborhood zone, subway-to-subway transfer patterns are expected to change at the Times Square-42nd Street and 34th Street/Herald Square subway station complexes. Many riders who would arrive at the Times Square/42nd Street Station complex on the 42nd Street Shuttle **S** and the Flushing Line **7** services under existing and No Build conditions would be expected to arrive on the extended **Q** route, which serves East Harlem and the Upper East Side via Second Avenue Subway. According to the NYCT model outputs for the AM peak hour, this shift in travel patterns between No Build and Build conditions is expected to reduce the transfer movement from the **S** shuttle and **7** services to the Seventh Avenue **1 2 3 9** services by a total of nearly 2,800 people. Correspondingly, the transfer movement from the extended **Q** service to these Seventh Avenue services would increase by nearly 2,900 people. In addition, the transfer from the Broadway Line **Q R N W** services to the **S** shuttle would increase by nearly 1,100 people, but there would be a decrease of nearly 600 people transferring from the Seventh Avenue services to the Shuttle.

The shift in travel patterns at the Times Square-42nd Street Station, due to the extended **Q** service on the Second Avenue Line, would increase volumes substantially on the Broadway Line platform stairs serving the 41st/42nd Street mezzanine areas. These cumulative entry/exit and transfer volumes could negatively impact operating conditions on those stairs. Further analysis would be required to determine the extent of the impact and feasibility of mitigation required.

At the 34th Street/Herald Square Station complex, the transfer volume from the Sixth Avenue **B D F V** services to the Broadway Line **Q R N W** services is projected to decrease by over 1,000 people during the 2020 AM peak hour between the No Build and Build conditions. In addition, nearly 1,500 more people will use the Broadway Line to exit at the station complex. This would be partially offset by the nearly 800 fewer people arriving via the Sixth Avenue Line services. These increases and decreases partially offset each other at Broadway Line platform

Second Avenue Subway SDEIS

stairs, resulting in only a moderate net increase on the platform stairs that could be satisfactorily accommodated without mitigation.

ACCESS FOR PERSONS WITH DISABILITIES

Because the new Second Avenue Subway **T** service along the Second Avenue corridor would be entirely new, all stations along this corridor would be significantly more advanced in terms of providing access for persons with disabilities than is possible with the existing system. Each of the 16 new stations would comply fully with the regulations of the Americans with Disabilities Act (ADA). Each station would have at least two elevators: one providing convenient access between the fare control area and the street, and another one between the fare control area and the platform(s). All station areas would meet ADA standards for elevations and grades for wheelchair access. In addition, required safety provisions would be implemented, including ADA-compliant “truncated dome” warning strips at platform edges and adequate-size corridors and doorways. Public address systems would incorporate both visual and audio communications to be fully compliant with requirements for hearing and visually impaired passengers or employees. ADA-compliant design would also be incorporated into any employee and tenant spaces within the station complex. In addition, newly constructed transfer points between the Second Avenue Subway and existing train lines would also be ADA-accessible, unless technically infeasible, as defined by ADA. These improvements would be considered benefits over the existing system.

SYSTEMWIDE CHARACTERISTICS

TRANSIT RIDERSHIP

Upon completion of the Second Avenue Subway, 4,482,000 new riders annually (or 14,700 on an average weekday) would be expected to use the transit system in 2020, according to the MTA’s Regional Transit Forecasting Model (RTFM), compared with the No Build Alternative. These new riders would be diverted from non-transit modes, which include walk only, auto, taxi, and light truck trips.

COMMUTER RAIL RIDERSHIP

The Second Avenue Subway would also affect ridership on Metro-North Railroad and Long Island Rail Road (LIRR) as shown in Table 5B-22. According to the RTFM, Metro-North would have an increase in 2020 AM peak period arrivals at departures at the 125th Street Station due to the new transfer there to the Second Avenue Subway and a corresponding decrease in arrivals and departures at Grand Central Terminal. Systemwide, the change in ridership would be negligible. Similarly, the LIRR would have an increase in 2020 AM peak period arrivals at Grand Central Terminal, due to improved east side subway service, and a decrease in arrivals at New York Penn Station. Departures at both stations would decrease slightly. The overall change in ridership is again expected to be negligible.

Table 5B-22

**2020 AM Peak Period Commuter Rail Ridership
Comparing Build vs. No Build Conditions**

Station	Arrivals				Departures			
	No Build	Build	Change	%	No Build	Build	Change	%
<i>Metro-North Railroad</i>								
125th Street	1,330	1,800	470	35%	120	180	60	50%
Grand Central	96,430	95,860	-570	-1%	1,500	1,480	-20	-1%
Total	97,760	97,660	-100	0%	1,620	1,660	40	2%
<i>Long Island Rail Road</i>								
NY Penn Station	77,480	77,080	-400	-1%	1,620	1,590	-30	-2%
Grand Central	64,040	64,260	220	0%	1,350	1,340	-10	-1%
Flatbush Ave	3,620	3,580	-40	-1%	270	270	0	0%
Total	145,140	144,920	-220	0%	3,240	3,200	-40	-1%
Source: MTA Regional Transit Forecasting Model								

SUMMARY OF FINDINGS

NO BUILD CONDITIONS

Increased Overcrowding on Lexington Avenue Line

In the future, in the No Build Alternative, ridership on the Lexington Avenue Line would continue to grow between 2000 existing and 2020 No Build conditions (see Table 5B-4 above). This increase in ridership between 2000 and 2020 would exacerbate overcrowding on the Lexington Avenue 4 5 express trains in the No Build Alternative, where average passenger loads on trains leaving five of the six express stops from 125th Street to Brooklyn Bridge would exceed NYCT subway car passenger loading guidelines—at one station stop by 31 percent—during the 2020 AM peak hour (see Table 5B-11 above). The Lexington Avenue 6 local trains would also become more crowded in the No Build Alternative, where trains leaving the 77th, 68th, and 59th Street Stations on the Upper East Side and East Midtown would exceed NYCT loading guidelines (see Table 5B-12 above). The Lexington Avenue Line, which is already the most overcrowded subway line in New York City, would become even more severely overcrowded unless additional subway capacity is provided on the East Side of Manhattan.

SECOND AVENUE SUBWAY

Improved Accessibility

The new Second Avenue Subway would add 16 new subway stations between 125th Street and Hanover Square, greatly improving transit access for communities on the Far East Side, connecting them from East Harlem to the Financial District. The full-length T service would serve 27,000 riders during the AM peak hour. In addition, the proposed extension of the Broadway Line C service via the Second Avenue Line would create for the first time a one-seat ride from East Harlem and the Upper East Side to West Midtown, thereby increasing southbound ridership on the Broadway Line by more than 15,000 passengers during the 2020 AM peak hour.

Shorter Travel Times and Reduced Crowding

The shift in riders to the extended **Q** and full-length **T** services on the proposed Second Avenue Subway would reduce travel times and average subway car passenger loads on the Lexington Avenue **4 5** express and **6** local trains to within NYCT's subway car passenger loading guidelines, which call for v/c ratios of 1.00 or less. This improvement would be experienced on the entire Lexington Avenue Line in Manhattan (see Tables 5B-11 and 5B-12 above). For example, loading conditions on the **4 5** express trains departing Grand Central Station would improve from a v/c ratio of 1.31 under the No Build to 0.97 under the Build. Similarly on the **6** local trains departing 59th Street would improve from a v/c ratio of 1.04 under the No Build to 0.56 under the Build.

Less Congestion in Subway Stations

The Second Avenue Subway would lead to a dramatic improvement at all Lexington Avenue express and local stations. Station entry/exit volumes are expected to decrease at all Lexington Avenue Line stations (see Table 5B-16 above). The largest volume decreases would occur at the existing 96th Street, 86th Street and Grand Central Stations. In addition, a marked improvement would be expected with the Second Avenue Subway at the extremely crowded transfer connection between the Sixth Avenue **E V** services at the Lexington Avenue-53rd Street Station and the Lexington Avenue **6** local service at the 51st Street Station. This extremely crowded transfer movement in the No Build condition would be improved to occasional momentary congestion in the Build condition (see Table 5B-20 above).

E. SUMMARY OF SIGNIFICANT ADVERSE IMPACTS AND MITIGATION MEASURES

CONSTRUCTION PERIOD

During construction of the Second Avenue Subway, adverse impacts to existing subway and commuter rail lines would be created where the new tunnels pass under or over existing transit structures.

- Where the new tunnels pass below existing subway and commuter rail lines, it would be necessary to comprehensively underpin existing structures before tunnel excavation. This would cause service disruptions ranging from speed restrictions to subway service suspensions on selected nights and weekends. If the subway line crossing is deep in rock, it would not be necessary to comprehensively underpin this existing subway structure, although rock bolts may be required due to the presence of slip planes in the rock. The duration of these disruptions would range from 6 months to 2 years. The affected subway and commuter rail lines are as follows:
 - Metro-North Railroad – Park Avenue Viaduct, Park Avenue and 125th Street.
 - **4 5 6** subway services – Lexington Avenue Line, Lexington Avenue and 125th Street.
 - **N R W** subway services – 60th Street Line, 60th Street and Second Avenue.
 - **L** subway services – Canarsie Line, 14th Street and Second Avenue.
 - **F V** subway services – Sixth Avenue Line, Houston Street and Second Avenue.
 - **J M Z** subway services – Nassau Street Line, Delancey Street and Chrystie Street.
 - **B D** subway services – Sixth Avenue Line, Manhattan Bridge Approach
 - **Q W** subway services – Broadway Line, Manhattan Bridge Approach.

- **A C** subway services – Eighth Avenue Line, Fulton Street and Water Street.
- **2 3** subway services – Broadway-Seventh Avenue Line, Old Slip and Water Street.
- Where the new Second Avenue Subway tunnels would pass above an existing subway or commuter rail line, it would not be necessary to underpin the existing structure before tunnel excavation. However, the subway and commuter rail tunnel below would still have to be protected from the tunnel work above, and the soil pressure distribution on the tunnel would have to be maintained at current levels. This work would be done carefully to avoid affecting existing subway and future commuter rail services at the following locations:
 - **F** subway and LIRR services – 63rd Street Line, 63rd Street and Second Avenue.
 - **E V** subway services – 53rd Street Line, 53rd Street and Second Avenue.
 - **7** subway service – Flushing Line, 42nd Street and Second Avenue.
 - LIRR, NJ Transit and Amtrak services, LIRR Mainline Tunnel, 33rd/32nd Streets and Second Avenue.

Nevertheless, it is still possible that some short-term service disruptions could result. To the extent that this were to occur, these would be considered significant adverse impacts.

OPERATIONS PERIOD

- When completed, the Second Avenue Subway could have adverse impacts in the Secondary Study Area, where increased riders on the Broadway Line’s extended **C** service, which serves East Harlem and the Upper East Side via Second Avenue, would increase crowding on some platform stairs at the Times Square Station as well as crowding on some platform and street stairs at the 34th Street-Herald Square Station. Such crowding could result in a significant adverse impact. Further analysis would be required to determine the extent of these impacts and the feasibility of the mitigation required. *