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.

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 route at 57th Street. The R W routes make all stops between 57th Street and Whitehall Street, where service extends into Brooklyn via the Montague Street Tunnel. The N Q routes make 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 Broadway Line N R W routes to travel between Manhattan and Queens each day in 2001, about 30 percent of the passengers traveling between those two boroughs daily. More than 320,000 riders used the Broadway Line N R Q W routes to travel between Brooklyn and Manhattan on a typical weekday in 2001, accommodating about 25 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 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)	
		Per Car	Per Train	Per Car	Per Train
A	51	38-44	376-440	110	1,110
B	60	50	500	145	1,450
	75	70-74	560-592	175	1,400

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, alignment and terminal 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 per track for an hourly throughput of 30 trains per track. However, schedules are also limited by dwell times, as described below.

Station dwell times are dependent on ridership levels, train crowding, 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 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 per track 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 Q W 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	26	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. This 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.

Another important element in station crowding is the growth in subway ridership. Table 5B-3 shows the average weekday station entry volumes on the Lexington Avenue Line for the years 1990 to 2002. At station complexes serving two or more subway lines, the total station entry volume for all subway routes are included. For example, at the 59th Street/Lexington Avenue Station the entry volumes shown in the table include those for the 4 5 6 routes on the Lexington Avenue Line as well as those for the N R W routes on the Broadway Line.

System-wide the average weekday subway ridership increased 32.4 percent from 1990 to 2002. As shown in right-most column of Table 5B-3, the percentage growth in station entries at Lexington Avenue Line Stations from 1990 to 2002 was typically much higher. Of the 23 stations on the Lexington Avenue Line, 14 stations had growth exceeding the system-wide average. Six key stations, which are recognized for their crowded conditions, experienced above average growth in station entry volumes from 1990 to 2002:

- 125th Street Station—161.3 percent growth
- 96th Street Station—47.8 percent growth
- 86th Street Station—34.0 percent growth
- 77th Street Station—38.8 percent growth
- 68th Street/Hunter College Station—34.2 percent growth
- Union Square Station—63.6 percent growth

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-4 presents the criteria used to determine the Level of Service (LOS) of station platforms and stairways. LOS is a performance measure indicating efficiency and passenger comfort. The performance level of the fare zones was 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

1990-2002 Average Weekday Entry Volumes by Station Lexington Avenue Line

Lexington Avenue Line Stations	Subway Service	Average Weekday Station Entry Volumes by Year													Percent Growth 1990 to 2002
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
125 St	4 5 6	8,093	10,176	10,741	11,205	11,902	12,276	12,261	12,823	16,126	16,654	17,900	19,357	21,151	161.3%
116 St	6	5,961	6,208	6,549	6,747	7,224	7,367	7,266	7,402	8,751	9,439	10,532	11,079	11,306	89.7%
110 St	6	5,450	5,592	6,207	6,108	6,507	6,285	6,462	6,765	7,822	7,644	8,053	8,716	8,934	63.9%
103 St	6	7,747	7,616	8,439	8,779	9,266	9,320	9,331	9,625	10,428	11,128	11,727	11,682	11,676	50.7%
96 St	6	14,015	13,604	14,427	15,452	16,380	17,141	17,274	17,391	18,558	19,459	20,601	20,764	20,716	47.8%
86 St	4 5 6	39,106	38,102	39,139	41,584	44,939	46,087	46,848	47,376	48,917	51,199	53,183	53,300	52,411	34.0%
77 St	6	22,209	22,441	22,481	23,595	25,067	25,502	26,296	26,618	28,409	29,584	31,684	31,153	30,828	38.8%
68 St.-Hunter College	6	24,183	24,268	24,147	25,401	27,618	27,829	27,849	27,970	30,099	31,926	32,625	32,870	32,450	34.2%
59 St./Lexington Av	4 5 6 N R W	44,664	40,927	37,506	38,121	39,713	40,373	43,734	44,346	48,637	50,394	53,676	55,166	52,227	16.9%
Lexington Ave. 53 St/51 St.	6 E V	61,292	56,517	54,736	54,790	57,177	58,137	56,561	59,067	65,561	68,525	71,990	69,107	65,922	7.6%
Grand Central-42 St	4 5 6 7 S	118,789	110,012	106,255	109,270	114,040	113,980	115,669	115,444	122,221	128,305	139,966	142,426	139,913	17.8%
33 St	6	19,716	18,296	17,700	18,611	19,366	18,673	18,680	19,535	22,459	24,823	27,209	27,241	27,467	39.3%
28 St	6	18,081	16,532	15,980	16,449	17,137	17,055	17,248	17,591	18,784	20,037	21,581	21,706	20,963	15.9%
23 St	6	23,568	21,465	20,675	21,053	21,435	21,168	21,231	22,170	24,142	25,749	27,295	29,475	29,578	25.5%
14 St - Union Square	4 5 6 L N Q R W	51,592	48,025	46,014	47,619	50,480	52,456	52,955	54,498	61,028	67,627	73,970	80,020	84,409	63.6%
Astor Place	6	15,085	13,691	13,431	13,750	13,956	13,852	13,871	14,063	14,819	16,153	17,326	19,664	18,244	20.9%
Bway-Lafayette St/Bleecker St	6 F S V	14,069	13,774	13,882	14,894	15,670	15,389	16,429	17,600	20,555	24,028	26,997	27,729	22,734	61.6%
Spring St	6	4,682	4,402	4,483	4,650	4,992	5,173	5,398	5,807	6,423	7,147	7,929	8,941	9,286	98.3%
Canal St [2]	6 J M N Q R W Z	25,890	24,448	23,481	23,884	23,496	23,918	22,222	22,732	25,327	26,937	30,329	38,720	50,451	94.9%
Chambers St/Brooklyn Bridge	4 5 6 J M Z	33,978	31,779	31,120	32,721	31,893	30,522	30,172	30,768	31,915	31,055	31,368	33,030	34,539	1.7%
Fulton St/Bway-Nassau St	2 3 4 5 A C J M Z	52,863	49,282	48,081	49,891	50,857	49,734	49,250	50,889	54,579	60,142	62,176	61,498	59,275	12.1%
Wall St	4 5	20,282	17,798	17,212	17,832	18,183	17,574	17,787	18,385	20,149	21,742	23,471	22,792	22,504	11.0%
Bowling Green	4 5	20,891	18,452	17,820	18,170	18,079	17,569	17,819	19,029	21,711	23,184	25,063	29,674[3]	30,466[3]	45.8%

Notes:

[1] Station entry volumes do not include students or transfer movements.

[2] Significant increase in year **2001/**2002 station entries at Canal Street due to temporary rerouting of all Manhattan Bridge subway service to Broadway Line.

[3] **Due to closure of South Ferry Station.**

Table 5B-4
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	5.1 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 5	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 = (number of persons descending and ascending stairway during 5-minute period x 12)/
(width of stairway – width of obstruction x 0.9 (friction factor) x 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 street entries 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-Hunter College (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 and a separate area for the 42nd Street Shuttle (S). The middle level contains four tracks and two center platforms for the Lexington Avenue Line (4 5 6). 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 a 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 2025), 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 signal system will be upgraded on selected subway lines, and new technology cars will have replaced most of the 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

In this chapter, subway ridership has been forecasted to the year 2025 instead of the year 2020 analysis year used in the SDEIS. This was done to maintain a 20-year forecast period and so that the transit forecasts in the SDEIS, which are from NYCT's Transit Demand Forecasting Model (TDFM), would be reasonably consistent with the 2025 forecasts included in NYMTC regional forecasts, for the Long Range Planning Framework analysis protocol, as well as with the forecasts from the MTA's Regional Transit Forecasting Model (RTFM). These two ridership models are discussed in Chapter 5A and Appendix D.1.

Over the long term, the city's subway ridership is expected to grow annually by 0.4 to 0.8 percent, according to MTA analysis of NYMTC projections. These percentages translate each year to an increase in ridership on a typical weekday of 24,000 to 48,000 daily passengers. During the AM peak hour, subway ridership is expected to grow annually by about 0.6 percent according to NYMTC projections. This translates into an annual increase in AM peak hour ridership on a typical weekday of about 2,400 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 2025 No Build conditions, as shown in Table 5B-5. Southbound ridership will grow by about 11 percent with about 57 percent 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 about 16 percent, with about 70 percent of the growth on the local service.

Table 5B-5
AM Peak Hour Lexington Avenue Line Ridership in Manhattan
Comparing 2000 Existing and 2025 No Build Conditions

	Southbound				Northbound			
Route	2000 Existing	2025 No Build	Change	%	2000 Existing	2025 No Build	Change	%
4 5 Express	54,700	59,600	4,900	9.0%	38,000	41,800	3,800	10.0%
6 Local	47,600	54,200	6,600	13.9%	19,800	26,400	6,600	33.3%
Total	102,300	113,800	11,500	11.2%	57,800	68,200	10,400	18.0%

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, June 2003.

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, the New York City Department of Transportation (NYCDOT) has completed its two-decade reconstruction of the subway portions of the Manhattan Bridge. Table 5B-6 summarizes the 2025 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 estimated 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

Table 5B-6
2025 Future No Build Peak Hour Service Plan for the Subway System

Route	North Terminal	Route Description	South Terminal	Scheduled AM Peak Trains per Hour	
				SB	NB
1 9	242 St	Broadway –7 Av Local	South Ferry	19	14
2	241 St	White Plains Local, Broadway-7 Av Express, Clark St Tunnel, Eastern Pkwy Local, Nostrand Av Local	Flatbush Av	13	10
3	148 St	Lenox Av Local, Broadway-7 Av Express, Clark St Tunnel, Eastern Pkwy Local	New Lots Av	11	9
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	9
6	Parkchester/ E 177 St	Pelham Local, Lexington Av Local	Brooklyn Bridge	12	8
7	Main St	Flushing Local, Steinway Tunnel	Times Square	13	24
7	Main St	Flushing Express, Steinway Tunnel	Times Square	14	-
A	207 St	Central Park West Express, 8 Av Express, Cranberry St Tunnel, Fulton Street Express	Lefferts Blvd / Rockaways	10	18
B	Bedford Park Blvd	Concourse/Central Park West Local, 6 Av Express, Manhattan Bridge (stop at DeKalb), Brighton Express	Brighton Beach	7	12
C	168 St	Central Park West Local, 8 Av Local, Cranberry St Tunnel, Fulton Street Local	Euclid Av	6	8
D	205 St	Concourse/Central Park West Express, 6 Av Express, Manhattan Bridge (skip DeKalb), 4 Av Express, West End Local	Coney Island	8	11
E	Jamaica Center	Queens Blvd Express, 53 St Tunnel, 8 Av Local	World Trade Center	12	12
E	179 St	Queens Blvd Express, 53 St Tunnel, 8 Av Local	World Trade Center	3	3

Table 5B-6 (cont'd)
2025 Future No Build Peak Hour Service Plan for the Subway System

Route	North Terminal	Route Description	South Terminal	Scheduled AM Peak Trains per Hour	
				SB	NB
F	179 St	Hillside Av Local, Queens Blvd Express, 63 St Tunnel, 6 Av Local, Rutgers Street Tunnel, Culver Local	Coney Island	15	15
G	Court Sq	Crosstown local	Smith-9 St	9	9
J Z	Jamaica Center	Jamaica Skip-Stop, Williamsburg Bridge, Nassau St Express	Broad St	12	12
L	8 Av	14 St Local, 14 St Tunnel, Canarsie Local	Rockaway Parkway	15	15
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 (stop at 49 St), Manhattan Bridge (skip DeKalb), 4 Av Express, Sea Beach Local	Coney Island	8	11
Q	57 St / 7 Av	Broadway Express, Manhattan Bridge (stop at DeKalb), Brighton Local	Coney Island	8	12
R	Continental Avenue	Queens Blvd Local, 60 St Tunnel, Broadway Local, Montague St Tunnel, 4 Av Local	95 St / 4 Av	10	10
V	Continental Avenue	Queens Blvd Local, 53 St Tunnel, 6 Av Local	Second Av / Houston St	10	10
W	Ditmars Blvd	Astoria Local, 60 St Tunnel, Broadway Local	Whitehall St	6	6

Source: New York City Transit.

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 for a new subway line.

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 protect these existing subway or rail structures during construction of the Second Avenue Subway. These factors include geological conditions, the vertical and horizontal separation between the rail lines, whether the Second Avenue Subway would pass over or under the existing subway or commuter line structure, the type of construction, and the condition of the existing structure. 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 in excavated in soil.

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-7 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."

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 could 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 have a connection 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 (❹❺❻ 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 ❹❺❻ routes by bringing escalators and stairs from the new mezzanine up through the lower level Lexington Avenue Line station platforms, and by building escalators from the new mezzanine to the upper level of the Lexington Avenue Line station. As much of this construction would be immediately under existing, active tracks,

Table 5B-7
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 and Rock	Passes Below	124 feet
4 5 6	Lexington Avenue Line Lexington Av and 125th St	Soil and Rock	Passes Below	55 feet
F	63rd Street Line 63rd St and Second Av	Rock	Passes Above	25 feet
LIRR	LIRR 63rd Street Tunnel 63rd St and Second Av	Rock	Passes Above	80 feet
N R W	60th Street Line 60th St and Second Av	Rock	Passes Above Passes Below[1]	25 feet 25 feet
E V	53rd Street Line 53rd St and Second Av	Rock	Passes Above	20 feet
7	Flushing Line 42nd St and Second Av	Rock	Passes Above	25 feet
LIRR, Amtrak, NJ Transit	LIRR Mainline Tunnel 33rd St/32nd St and Second Av	Rock	Passes Above	25 feet
L	Canarsie Line 14th St and Second Av	Rock	Passes Below	80 feet
F V	Sixth Avenue Line Houston St and Second Av	Soil	Passes Below	35 feet
Non-Revenue	IND "BJ" Tracks near Stanton St and Chrystie St or near Rivington St and Forsyth St.	Soil	Passes Below	35 feet
J M Z	Nassau Street Line at Delancey St and Chrystie St or at Delancey and Forsyth St.	Soil	Passes Below	35 feet
B D	Sixth Avenue Line along Chrystie Street between Stanton and Canal Sts	Soil	Passes Below	45 feet
N Q	Broadway Line Manhattan Bridge Approach	Soil	Passes Below	70 feet
A C	Eighth Avenue Line Fulton St and Water St	Soil	Passes Below	35 feet
2 3	Broadway-Seventh Av Line Old Slip and Water St	Rock	Passes Below	80 feet
M	Nassau Street Line Broad St and Water St	Rock	Passes Below	60 feet
N R W[2]	Broadway Line Whitehall St and Water St	Rock	Passes Below	60 feet
4 5[2]	Lexington Avenue Line Peter Minuit Plaza	Rock	Passes Below	70 feet
1 9[2]	South Ferry Loop Both sides of Peter Minuit Plaza	Rock	Passes Below	95 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 These subway services would only be affected if storage tracks were to be constructed south of the Hanover Square Station.

service disruptions would occur. Track outages would occur for mining related work, the demolition and reconstruction of the tunnel invert on the Lexington Avenue Line, as well as escalator construction between the Second Avenue and Lexington Avenue lines. Limited platform areas would be impacted for short periods while support columns are installed along the existing Lexington Avenue Line platforms during construction work. Based upon the location of the top of the bedrock line in this area (which is being investigated during Preliminary Engineering), protective measures would be required. Work at this station would affect service on the Lexington Avenue Line on selected nights and weekends for approximately 2 years.

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, including entrances on Third Avenue; signal work; and tunnel lighting.

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. 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. Appropriate protective measures would be taken so that 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 protect this existing subway structure before tunnel excavation, although rock reinforcement may be required in selected areas. 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. It would be necessary to install remote monitoring equipment to measure stresses on the existing tunnel structure; this would require brief, nighttime service interruptions. It would also be necessary to design the new subway tunnel structure so as to ensure that the Second Avenue tunnel can safely bridge the existing 60th Street tunnel structure 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 stations would be located above these subway and railroad structures, 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. This may require the installation of protection and monitoring measures, resulting in brief nighttime service interruptions. Non-explosive excavation methods would be required to allow excavation close to the existing tunnels, which could affect existing subway and rail services during late night and weekend periods.

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 platform level of the existing Lexington Avenue/53rd Street Station. The connection to the Flushing Line at 42nd Street would be made from the existing station's lower mezzanine on the eastern side of the platform. Constructing these transfer connections would require temporarily closing a portion of each station's platform for several nights and weekends over a 6-month period, and the installation of protective measures to allow passengers to use the platforms during construction.

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 may be necessary to carry out some protective measures such as rock reinforcement, before tunnel excavation near the existing structure. Temporary speed restrictions could be required on L service 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 may temporarily 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 soil 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);
- Sixth Avenue Line on the approach to the Manhattan Bridge (B D routes);

- Broadway Line on the approach to the Manhattan Bridge (NQ routes); and
- IND "BJ" Tracks under Sara D. Roosevelt Park between Houston Street and Delancey 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 protect these existing subway structures before tunnel excavation, so as to provide the structures with sufficient support and prevent damage to them. This 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, 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 during construction. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

It will be necessary to rebuild the existing Grand Street Station serving the BD routes because the existing platforms are too narrow to accommodate the additional riders who would use this station once the Second Avenue Subway is constructed. The selected Deep Chrystie Option would also affect BD 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 BD routes would be suspended through the Grand Street Station and between Sixth Avenue and Brooklyn on most nights and weekends over a 1- to 2-year period. Minor impacts to the FV routes are anticipated, including possible track outages on nights and weekends to allow ground treatment and other proactive measures to be undertaken to permit the tunnels for the Second Avenue Subway to pass under the Lower East Side and Second Avenue lines.

Lower Manhattan

The subway structure that carries the AC routes in revenue service under Fulton Street in Lower Manhattan could be affected by the construction of the Second Avenue Subway. It would be necessary to 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 work could affect AC 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 23 routes. Because this subway line crossing would be deep in rock, it would not be necessary to protect this existing subway structure during tunnel excavation. However, because this is the location of the proposed Hanover Square Station, special precautions would be necessary to support this existing subway structure during station construction. In addition, rock reinforcement could be required in selected areas to stabilize the openings for station entrances and other ancillary facilities. Speed restrictions could be required on the affected 23 services for a few weeks during excavation work. These speed restrictions would be over a relatively short distance, but they would marginally increase travel time.

The tail track option that extends south from Hanover Square Station would pass under a number of existing NYCT subway tunnels:

- Nassau Street Line on Broad Street at Water Street (M route);
- Broadway Line on Whitehall Street at Water Street (N R W routes);
- Lexington Avenue Line under Peter Minuit Plaza (4 5 routes);
- South Ferry Station of the Broadway-Seventh Avenue Line under Peter Minuit Plaza (1 9 routes)

Because the Second Avenue tracks pass well below these existing routes in rock, it would not be necessary to protect these existing subway structures before tunnel excavation. However, rock reinforcement would be installed to support the actual excavation. Temporary speed restrictions could be required on these services for a few weeks during the excavation work in the vicinity of each line. These speed restrictions would be over a relatively short distance and would marginally increase travel time.

PHASED IMPLEMENTATION OF SECOND AVENUE SUBWAY OPERATIONS

The options for sequencing the construction of the project are described in Chapter 3, "Description of Construction Methods and Activities." The selected construction sequencing option would build the first phase of the alignment to take advantage of the 63rd Street connector tunnel. With this approach, the first construction contract would excavate the tunnels between 105th Street and 62nd Street, as well as the connector tunnels needed to access the Broadway Line at 63rd Street. The connector to the 63rd Street Line is essential for meeting the project objective of operating a segment of the Second Avenue Subway as soon as possible following commencement of construction in 2004.

Current plans call for the Second Avenue Subway to be put into operation in four phases over a period of years, as described below:

- *Phase 1:* At the completion of Phase 1 of the project, the existing Q service would be extended from its current northern terminus at the 57th Street-Seventh Avenue Station to the 96th Street Station. The Q trains would stop at four additional stations: 96th Street, 86th Street, 72nd Street, and Lexington Avenue-63rd Street in the Upper East Side and East Harlem neighborhoods. An across-the-platform transfer connection would be provided with the F route at the Lexington Avenue-63rd Street Station. The Q service would continue south on the express tracks of the Broadway Line, crossing the Manhattan Bridge and serving southcentral Brooklyn along the Brighton Line. A one-seat ride would be provided on the Q service from the Upper East Side to West Midtown area, including Times Square and Herald Square, with connecting Broadway Line local R W services to Lower Manhattan. It is forecasted that the Second Avenue Subway would carry 202,000 riders on average weekday at the completion of Phase 1 of the project.

- *Phase 2:* In Phase 2, the Q service would be further extended northward to the 125th Street Station at completion of Phase 2 of the project. This subway service would stop at three additional stations: 125th Street, 116th Street, and 106th Street, serving East Harlem. Transfer connections would be provided at the 125th Street Station with the 4 5 6 routes on the Lexington Avenue Line and with the Metro-North Railroad at Park Avenue. The Second Avenue Subway is forecast to carry 303,000 riders on average weekday at the completion of Phase 2 of the project.

- *Phase 3:* At the completion of Phase 3 of the project, subway service would extend along Second Avenue south to the Houston Street Station and introduce a second subway service—tentatively identified as the T route—to the Second Avenue Line. Six additional subway stations would be opened: 55th Street, 42nd Street, 34th Street, 23rd Street, 14th Street, and Houston Street. These stations serve the East Midtown, Gramercy Park/Union Square, East Village, and Lower East Side neighborhoods. In this phase, the T route would provide service at 11 station stops between and including the 125th Street and Houston Street Stations. Transfer connections may be provided with the E V routes at 55th Street, the 7 route at 42nd Street, the L route at 14th Street, and the F V routes at Houston Street. The extended Q service would operate as described above under Phases 1 and 2. The transit model forecasts that the Second Avenue Subway would carry 456,000 riders on an average weekday at the completion of Phase 3 of the project.
- *Phase 4:* With the completion of construction in Phase 4 and with the extension of subway service between the Houston Street and Hanover Square Stations, the full-length Second Avenue Line would be complete. Four additional subway stations would be opened: Grand Street, Chatham Square, Seaport, and Hanover Square, serving the Lower East Side, Chinatown, and Lower Manhattan neighborhoods. Additional transfer connections would be provided with the B D routes at Grand Street. At the completion of this phase, the T route would stop at 16 station stops along the Second Avenue corridor between and including 125th Street and Hanover Square Stations. The extended Q service would stop at seven stations along the Second Avenue corridor between and including 125th Street and the Lexington Avenue-63rd Street, before continuing along the express tracks of the Broadway Line, as described above under Phases 1 and 2. The Second Avenue Subway is forecast to carry 560,000 riders on average weekday at the completion of the project in Phase 4.

Table 5B-8 presents for each construction phase the average weekday ridership, the frequency of service, and the loading conditions for southbound Second Avenue Q T trains at key stations. Table 5B-9 shows that the Second Avenue Subway will relieve severe overcrowding on the Lexington Avenue Express 4 5 trains beginning with the completion of Phase 1 and that additional crowding reduction will occur as each phase of the project's construction is completed. Express trains departing 86th Street and Grand Central-42nd Street Stations are the most overcrowded on the Lexington Avenue Line. In Tables 5B-8 and 5B-9, a v/c ratio of 1.00 or less indicated that NYCT service guidelines would be met.

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. The estimates were based on the Second Avenue Subway as compared with the No Build condition. (For more information on the modeling conducted, see Chapter 5A,

Table 5B-8
Loading Conditions for Southbound Second Avenue Q T Trains During Phased Implementation of the Project AM Peak Hour

Station	Southbound Trains per Hour		Average Southbound Volume/Capacity (V/C) Ratio		Average Weekday Ridership
	Q	T	Q	T	
Phase I – 96 St to 63rd St					202,000
72 St	14	--	0.88	--	
Lex Av / 63 St	14	--	0.91	--	
55 St	--	--	--	--	
34 St	--	--	--	--	
Phase 2 – 125 St to 63rd St					303,000
72 St	19	--	0.95	--	
Lex Av / 63 St	19	--	0.98	--	
55 St	--	--	--		
34 St	--	--	--	--	
Phase 3 – 125 St to Houston St					456,000
72 St	14	14	0.80	0.80	
Lex Av / 63 St	14	--	0.97	--	
55 St	--	14	--	0.64	
34 St	--	14	--	0.47	
Phase 4 – 125 St to Hanover Sq					560,000
72 St	14	14	0.86	0.80	
Lex Av / 63 St	14	--	0.91	--	
55 St	--	14	--	0.96	
34 St	--	14	--	0.94	

Note: This table is new for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – November 2003

Table 5B-9
Loading Conditions for Southbound Lexington Avenue Express 4 5 Trains During Phased Implementation of the Project AM Peak Hour

Station	Southbound 4 5 Trains per Hour		Average Southbound Volume/Capacity (V/C) Ratio		
	No Build	Build Phase	No Build	Build Phase	% Change
Phase I – 96 St to 63rd St					
86 St	26	27	1.13	0.99	-12.4%
42 St / GCT	25	26	1.27	1.14	-10.2%
Phase 2 – 125 St to 63rd St					
86 St	26	28	1.13	0.87	-23.0%
42 St / GCT	25	27	1.27	1.07	-15.7%
Phase 3 – 125 St to Houston St					
86 St	26	28	1.13	0.82	-27.4%
42 St / GCT	25	27	1.27	1.06	-16.5%
Phase 4 – 125 St to Hanover Sq					
86 St	26	28	1.13	0.80	-29.2%
42 St / GCT	25	28	1.27	0.94	-26.0%

Note: This table is new for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – June 2003.

"Ridership Modeling," and Appendix D.1). The outputs from the model provide passenger 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 volume-to-capacity (v/c) ratios.

The AM peak hour has been selected to analyze the impacts of the Second Avenue Subway as compared with the No Build condition, because AM peak hour volumes are consistently higher than PM peak hour volumes. Station and train counts collected over the years by NYCT have shown that AM peak hour volumes are about 18 percent higher than PM peak hour volumes in business areas and about 54 percent higher in residential areas.

SERVICE CHARACTERISTICS

SERVICE CHANGES TO SUBWAY LINES

Table 5B-10 shows the expected number of train departures 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-11 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. As shown in Table 5B-10, the number of departing trains during the AM peak hour on the southbound Lexington Avenue 4 5 express services would not change in 2025 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, as shown in Table 5B-11, there will be a total of 32 local and express trains. At 34th Street/Herald Square, for example, there are expected to be 16 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 430,800 under the 2000 existing conditions to about 489,200 under the 2025 No Build conditions—an increase of 14 percent. Transit ridership across the 60th Street screenline into the Manhattan CBD during the AM peak hour is expected to increase by approximately 18 percent from about 134,700 under the 2000 existing conditions to about 158,900 under the 2025 No Build conditions. Southbound ridership on the Lexington Avenue Line at the 60th Street screenline is expected to increase by approximately 9 percent from about 56,500 under the 2000 existing conditions to about 61,600 under the 2025 No Build conditions.

The number of passengers entering and exiting the station or making an interline transfer to and from the 4 5 6 routes Grand Central-42nd Street Station is expected to increase by about 14 percent and 3 percent, respectively. This is based on a comparison of 2025 AM peak hour No Build conditions with 2000 AM peak hour existing conditions. Increases in the number of boarding passengers are expected to exceed increases in the number of alighting passengers

Table 5B-10
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	25
116 St		21		25		25
110 St		21		25		25
103 St		21		25		25
96 St		21		25		25
86 St	26	21	26	25	28	25
77 St		21		25		25
68 St		21		25		25
59 St	26	21	26	25	28	25
51 St		21		25		25
Grand Central	25	21	25	25	28	25
33 St		21		25		25
28 St		21		25		25
23 St		21		25		25
Union Square	25	21	25	25	27	25
Astor Pl		21		25		25
Bleecker St		21		25		25
Spring St		21		25		25
Canal St		21		25		25
Brooklyn Bridge	25	21	25	25	27	25
Fulton St	25		25		27	
Wall St	25		25		27	
Bowling Green	25		25		27	

Source: New York City Transit.

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 6 local, during the AM peak hour.

Table 5B-11
Southbound AM Peak Hour Arriving Trains
for the 63rd Street and Broadway Lines, 2025

Station Location	No Build		Build	
	Express Service	Local Service	Express Service	Local Service
63 St-Lexington Ave		15	14	15
57 St	8	24	14	24
49 St		24		24
Times Sq-42nd St	8	24	14	24
34 St-Herald Sq	16[1]	16	22[1]	16
28 St		16		16
23 St		16		16
14 St-Union Sq	16	16	22	16
8 St		16		16
Prince St		16		16
Canal St	16	16	22	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.

At the Broadway-Lafayette/Bleecker Street Station, a new transfer connection is assumed to be built between the northbound 6 route on the Lexington Avenue Line and the B D F V routes on the Sixth Avenue Line. Including this transfer, as part of the No Build Alternative, will result in about 2,900 AM peak hour passengers transferring from the Sixth Avenue Line to the northbound Lexington Avenue 6 local.

Second Avenue Subway

Description of the New Second Avenue Subway Services. The Second Avenue Subway would carry two subway services when fully operational. A new full-length subway service would run along the Second Avenue corridor from 125th Street to Hanover Square. Although a route letter has not been assigned, this service is designated as the T route for the purpose of this FEIS analysis. The other Second Avenue subway service would be an extension of the Q route that currently has its northern terminus at the 57th Street-Seventh Avenue Station and operates via the Broadway Line's express tracks. The T and Q services are described in more detail below:

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 2025 AM peak period, the new T service would be scheduled to run 14 trains per hour southbound and 14 trains per hour northbound on the new Second Avenue Line.

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, and cross the East River over the Manhattan Bridge, with a southern terminus in Brighton Beach. The newly extended Q route would operate on the express tracks of the Broadway Line. During the 2025 AM peak period, the extended Q service would be scheduled to run 14 trains per hour southbound and 12 trains per hour running northbound.

Additional Service Changes With the Second Avenue Subway. 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. During the AM peak hour, 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, which is two more trains per hour compared to the No Build condition. Each additional train would contribute further to the reduction in crowding on the Lexington Avenue Line. The 6 6 local services on this line would continue to be scheduled at 25 trains per hour, which is the same as the No Build.

The proposed extension of the Q service onto the Second Avenue Line would increase ridership on this route. In order to meet NYCT service guidelines, service frequency would be increased in the southbound direction from 8 trains per hour in the No Build to 14 trains per hour with the Second Avenue Subway. This would result in an increase in number of local and express trains operating on the Broadway Line from 32 to 38 trains per hour. At the 34th Street/Herald Square Station, for example, there are expected to be 22 Q N express trains and 16 R W local trains during the AM peak hour.

Benefits of the New Second Avenue Subway. 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. The Second Avenue Subway would also be NYCT's first fully ADA accessible subway line.

The Q T routes would operate along an entirely new subway corridor, located several blocks farther east than the existing Lexington Avenue Line. Hence, this new 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.

Once the Second Avenue Subway is operating, many 4 5 6 riders would opt to use the new Q T services instead. As a result, it is projected that Lexington Avenue ridership in Manhattan would decline by approximately 27,000 southbound and 9,000 northbound riders in the 2025 AM peak hour, or 24 and 13 percent, respectively.

The resulting decrease in Lexington Avenue 4 5 6 ridership would significantly reduce or eliminate the incidence of "crush conditions" on existing Lexington Avenue Line service—which are expected to become more severe under the No Build condition. Based on average conditions in the 2025 AM peak hour, approximately 49,500 southbound 4 5 riders would no longer experience crowding on the Lexington Avenue Line with the addition of the Second Avenue Subway Line.

This reduction in subway car crowding during the AM peak hour would help reduce or eliminate 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, capacity on the Lexington Avenue Line would continue to be constrained by the slow speeds and extended dwell times associated with the moving platform at the 14th Street/Union Square Station. This capacity constraint would limit the number of departing express trains at this station and southward to 27 trains per hour.

As shown in Table 5B-12, the new Second Avenue Subway would attract a large number of riders. The ridership model forecasts that in the 2025 AM peak hour, the full-length T and extended Q services would carry 77,900 AM peak hour riders and approximately 560,000 daily riders on the Second Avenue Subway. These ridership forecasts are lower than in SDEIS, because as engineering progressed, more accurate station entrance times were incorporated into the model. In many cases, stations would be deeper than originally projected to reduce surface construction impacts and entrance times are longer, making the new line slightly less attractive to some riders.

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-13. Overall, the Lexington Avenue Line would carry 24 percent fewer riders southbound and nearly 13 percent fewer riders northbound with the proposed Second Avenue Subway.

Table 5B-12
Predicted Second Avenue Line Ridership, 2025 AM Peak Hour

Route and Station Stop	Boarding Passengers		
	Southbound[1]	Northbound[2]	Total
Extended Broadway Line Q Service			
125 Street	5,810		
116 Street	1,000	10	
106 Street	940	50	
96 Street	4,580	120	
86 Street	3,700	40	
72 Street	3,300	100	
Lexington / Third Avenue	3,330	2,330	
57 Street / Seventh Avenue		1,860	
Total	22,660	4,510	27,170
Full-Length Second Avenue T Service			
125 Street	7,760	0	
116 Street	650	10	
106 Street	830	40	
96 Street	3,690	130	
86 Street	3,220	30	
72 Street	2,010	120	
55 Street	6,300	760	
42 Street	2,770	270	
34 Street	1,720	500	
23 Street	810	730	
14 Street	1,130	2,400	
Houston Street	370	5,945	
Grand Street	1,150	5,740	
Chatham Square	100	585	
Seaport	0	410	
Hanover Square	0	530	
Total	32,510	18,200	50,710
Total Riders on Second Avenue Subway	55,170	22,710	77,880

Notes:

1 Southbound volumes are based on the number of passengers boarding at stations between 125 Street and Lexington Av-63 Street for the Q and between 125 Street and Hanover Square for the T.

2 Northbound volumes are based on the number of passengers on-board trains leaving the 57 Street-Seventh Av Station for the Q or Hanover Square Station for the T and the number of passengers boarding at stations north to 125 Street for both the Q T

3 Volume leaving 57 Street-Seventh Av Station.

This table is new for the FEIS.

Source: New York City Transit Model Outputs – May 2003.

Table 5B-13
2025 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	59,600	49,300	-10,300	-17.3%	41,800	37,300	-4,500	-10.9%
6 Local	54,200	37,200	-17,000	-31.4%	26,400	22,200	-4,200	-15.9%
Total	113,800	86,500	-27,300	-24.0%	68,200	59,500	-8,700	-12.8%

Notes:
Southbound volumes are based upon the number of passengers on-board trains departing the 125th Street Station and the number of passengers boarding at stations south to Wall Street for the 4 5 or Brooklyn Bridge for the 6.

Northbound volumes are based upon the number passengers on-board trains departing the Bowling Green Station and the number of passengers boarding at stations north to 86th Street Station for the 4 5 or the number of passengers boarding between Brooklyn Bridge and 116th Street Stations for the 6. (Passengers boarding at the 125th Street Station are not included in the northbound volumes.)

This table has been revised for the FEIS.

Source: NYCT Transit Model Outputs – May 2003.

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-14 compares future ridership on the Broadway Line with and without the extended Q service on the Second Avenue Line.

As shown in Table 5B-14, the Broadway Line N Q express services under the Build Alternative would carry a total of 17,500 more riders southbound and 3,850 fewer riders northbound than under the No Build Alternative in the 2025 AM peak hour. This is an increase of about 105 percent and a decrease of 0.4 percent, respectively, compared with the No Build Alternative. During the AM peak hour, the Broadway Line R W local services would carry 1,200 fewer riders southbound and 3,700 fewer riders northbound under the Build Alternative. This is a reduction of about 5 percent and 20 percent, respectively, compared with the No Build condition. Overall, the four subway lines encompassing the Broadway Line (N Q R W) would carry nearly 41 percent more riders southbound and 7 percent fewer 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. The largest reductions would occur in the southbound direction, but significant improvements are also achieved in the northbound direction. For example, the southbound 4 5 express trains leaving the 86th Street Station would carry about 7,900 (or 24 percent) fewer riders during the 2025 AM peak hour (see Table 5B-15) with the Second Avenue Subway than with the No Build Alternative. On the 6 local trains, improvements in crowding

Table 5B-14
2025 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	17,900	36,600	18,700	104.5%	35,400	35,300	-100	-0.3%
(R)(W) Local	24,800	23,700	-1,100	-4.4%	18,800	15,100	-3,700	-19.7%
Total	42,700	60,300	17,600	41.2%	54,200	50,400	-3,800	-7.0%

Notes:

Southbound volumes are based the number of passengers on-board trains leaving Queens on the (N)(R)(W) (or Lexington-63rd St Station on the (Q)) and the number of passengers boarding at stations south to Broadway-Canal on the (N)(Q) or Whitehall Street on the (R)(W).

Northbound volumes are based the number of passengers on-board trains leaving Brooklyn on the (N)(Q)(R) or the Whitehall St Station on the (W) and the number of passengers boarding at stations north to Lexington Av-63rd Street Station on the (N)(R)(W) or 57 St Station on the (Q).

This table has been revised for the FEIS.

Source: Vollmer Associates based on NYCT Model Outputs – May 2003.

Table 5B-15
Loading Conditions for Lexington Avenue Express (4)(5) Trains 2025 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
Southbound									
125 St	28	**29**	31,400	25,700	30,800	**31,900**	1.02	**0.81**	**-20.5%**
86 St	26	28	32,400	24,500	28,600	30,800	1.13	0.80	-29.8%
59 St	26	28	29,800	23,500	28,600	30,800	1.04	0.76	-26.8%
42 St / GCT	25	28	34,800	29,000	27,500	30,800	1.27	0.94	-25.6%
Union Sq	25	27	31,100	25,500	27,500	29,700	1.13	0.86	-24.1%
Brooklyn Br	25	27	26,600	21,300	27,500	29,700	0.97	0.72	-25.9%
Fulton St.	25	27	17,700	13,700	27,500	29,700	0.64	0,46	-22.6%
Wall St.	25	27	6,800	5,900	27,500	29,700	0.25	0.20	-13.2%
Northbound									
Nevins St	26	26	30,900	30,400	28,600	28,600	1.08	1.06	-1.6%
Borough Hall	26	26	21,700	20,800	28,600	28,600	0.76	0.73	-4.5%
Bowling Green	26	26	20,800	19,500	28,600	28,600	0.73	0.68	-6.3%
Wall St	26	26	21,100	19,200	28,600	28,600	0.74	0.67	-9.0%
Fulton St	26	26	23,500	20.500	28,600	28,600	0.82	0.72	-12.7%
Brooklyn Br	26	26	24,000	20,700	28,600	28,600	0.84	0.72	-13.8%
Union Sq	26	26	28,100	23,400	28,600	28,600	0.98	0.82	-16.8%
42 St / GCT	26	26	10,700	8,900	28,600	28,600	0.37	0.31	-16.1%

Note: This table is new for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – May 2003.

Table 5B-16
Loading Conditions for Lexington Avenue Local 6 Trains
2025 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
Southbound									
125 St	25	25	11,400	8,200	27,500	27,500	0.41	0.30	-28.1%
86 St	25	25	23,900	12,800	27,500	27,500	0.87	0.47	-46.4%
77 St	25	25	29,500	15,200	27,500	27,500	1.07	0.55	-48.5%
68 St	25	25	29,200	14,800	27,500	27,500	1.06	0.54	-49.3%
59 St	25	25	28,000	17,700	27,500	27,500	1.02	0.64	-36.8%
51 St	25	25	24,300	15,000	27,500	27,500	0.88	0.55	-38.3%
42 St / GCT	25	25	21,700	15,400	27,500	27,500	0.79	0.56	-29.0%
Union Sq	25	25	8,800	6,300	27,500	27,500	0.32	0.23	-28.4%
Northbound									
Brooklyn Br	17	17	600	500	18,700	18,700	0.03	0.03	-22.9%
Bleecker St	17	17	5,000	3,600	18,700	18,700	0.27	0.19	-28.3%
Astor Pl	17	17	5,600	3,800	18,700	18,700	0.30	0.20	-32.5%
Union Sq	17	17	12,300	9,700	18,700	18,700	0.66	0.52	-20.8%
23 St	17	17	10,600	7,700	18,700	18,700	0.57	0.41	-27.1%
28 St	17	17	11,000	8,000	18,700	18,700	0.59	0.43	-27.2%
33 St	17	17	8,800	5,500	18,700	18,700	0.47	0.29	-37.9%
42 St / GCT	17	17	13,000	9,800	18,700	18,700	0.70	0.52	-24.9%

Note: This table is new for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – May 2003.

would be even more significant (see Table 5B-16), with that route carrying more than 11,100 (or 46 percent) fewer southbound riders leaving the 86th Street Station. The southbound Q T services on the Second Avenue Line would carry over 31,300 riders, when it leaves 86th Street during the 2025 AM peak hour (this is shown in Table 5B-18, later in this chapter).

Based on future subway link volumes from transit model outputs and the existing train throughput distribution along the Lexington Avenue Line, 2025 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 worsen from a v/c ratio of 1.06 under existing conditions to a v/c ratio of 1.13 under No Build Conditions. 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 1.27. The 6 local trains leaving the 77th Street, 68th Street, and 59th Street Stations would exceed NYCT loading guidelines under No Build conditions. Northbound 4 5 express and northbound 6 local services within Manhattan would operate within NYCT's subway car loading guidelines under 2025 AM 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-13 and 5B-14, 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 0.94 during the 2025 AM peak hour compared with a v/c ratio of 1.27 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 0.64 compared with 1.02 under the No Build conditions.

Extended Q Service on the 63rd Street and Broadway Lines

Table 5B-17 shows the usage levels predicted by the NYCT model at key stations along the 63rd Street and Broadway Lines for the QN express services and the RW local services. The extended Q service would make one stop on the 63rd Street Line at the Lexington Avenue/63rd Street Station, which would be the peak load point on the southbound Q service at an average v/c ratio of 0.91 during the AM peak hour.

Table 5B-17
2025 AM Peak Hour Line-Haul Volumes
for Southbound 63rd Street Line and Broadway Line Services

	No Build					Build				
Station	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	19,900	21,000	0.95	F	15	18,000	21,000	0.86
						Q	14	18,500	20,300	0.91
57th St	Q	8	400	11,600	0.03	Q	14	15,000	20,300	0.74
	NRW	24	9,900	34,800	0.28	NRW	24	7,400	34,800	0.21
Times Sq	Q	8	700	11,600	0.06	Q	14	13,700	20,300	0.67
	NRW	24	10,500	34,800	0.30	NRW	24	3,900	34,800	0.17
34th St	NQ	16	6,800	23,200	0.29	NQ	22	12,900	31,800	0.41
	RW	16	5,500	23,200	0.24	RW	16	4,100	23,200	0.18
Union Sq	NQ	16	5,600	23,200	0.24	NQ	22	7,600	31,900	0.24
	RW	16	4,700	23,200	0.20	RW	16	4,100	23,200	0.18

Note: This table has been revised for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – May 2003

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-18.

The peak load point for the combined QT services north of 63rd Street would occur at 72nd Street Station, where the scheduled 28 trains per hour are projected to have an average v/c ratio of 0.86 in the 2025 AM peak hour. South of 63rd Street, the projected peak load point for the T service would be at the 55th Street Station, where the scheduled 14 trains per hour are projected to have an average v/c ratio of 0.96 in the 2025 AM peak hour. With the exception of the

Table 5B-18
2025 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	28	13,600	40,600	0.33
116 St	28	15,100	40,600	0.37
106 St	28	16,700	40,600	0.41
96 St	28	24,700	40,600	0.61
86 St	28	31,300	40,600	0.77
72 St	28[1]	34,900	40,600	0.86
55 St	14[2]	19,600	20,300	0.96
42 St	14	18,500	20,300	0.91
34 St	14	19,100	20,300	0.94
23 St	14	17,300	20,300	0.85
14 St	14	16,800	20,300	0.83
Houston St	14	13,900	20,300	0.68
Grand St	14	13,200	20,300	0.65
Chatham Sq	14	11,900	20,300	0.59
Seaport	14	8,900	20,300	0.44
Hanover Sq	14	0	20,300	0.00

Notes: 1 The Q service would run on the Second Avenue Line north of 63rd St at a frequency of 14 tph.
2 The T service would run on the Second Avenue Line between 125th St and Hanover Square at a frequency of 14 tph. The T would be the only service on the Second Avenue Line from 55th Street to Hanover Square.
This table has been revised for the FEIS.
Source: NYCT Model Outputs – May 2003

Hanover Square terminus, 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. The Hanover Square terminal station would have the capacity to process 26 trains per hour. (A possible future extension of the Second Avenue Subway into Brooklyn would permit 30 trains per hour to be handled at the Hanover Square Station.)

RUNNING TIME SAVINGS

Table 5B-19 compares the subway train running times—including station dwell times—on the Second Avenue Q T services with the existing 4 5 express and 6 local services on the existing Lexington Avenue Line. The running times are estimated using the RailSim Train Performance Calculator (TPC), which simulates train operations on any rail system.[1] For this comparison, the 16 stations on the Second Avenue Line are matched with the equivalent local or express station on the Lexington Avenue Line (not all Lexington Avenue Line stations are shown). For example, Hanover Square, Houston Street and 106th Street Stations on the Second Avenue Line correspond with the Wall Street, Bleecker Street and 103rd Street Stations, respectively, on the Lexington Avenue Line.

[1] The RAILSIM Train Performance Calculator (TPC) is part of the RAILSIM Simulation Software Suite (Operations Planning Package), which is SYSTRA Consulting's proprietary suite of rail operations analysis applications. SYSTRA Engineering is part of the SDEIS/FEIS consulting team.

Table 5B-19
Running Time Comparisons (minutes)
Second Avenue Line vs. Lexington Avenue Line

Second Avenue Line			Extended Broadway Service Q				Full Length Second Avenue Service T				Equivalent Station on Lexington Av Line (not all shown)	Lexington Av Express 4 5				Lexington Av Local 6				Running Time Savings with Second Av Line compared with Existing Lexington Av Express	
			Northbound		Southbound		Northbound		Southbound			Northbound		Southbound		Northbound		Southbound			
Stations	Miles		Time	Sum	Time	Sum	Time	Sum	Time	Sum		Time	Sum	Time	Sum	Time	Sum	Time	Sum	N/B	S/B
Hanover Sq		0.00					0.0	0.0	1.0	25.5	Wall St	0.0	0.0	1.5	30.5					0.0	5.0
Seaport		0.42					1.5	1.5	1.5	24.5	Fulton St	1.5	1.5	2.0	29.0					0.0	4.5
Chatham Sq		0.85					1.5	3.0	1.5	23.0	Brooklyn Br	2.0	3.5	5.0	27.0	0.0	0.0	3.5	33.5	0.5	4.0
Grand St		1.31					1.5	4.5	1.5	21.5	Spring St					3.0	3.0	1.5	30.0		
Houston St		1.77					2.0	6.5	1.5	20.0	Bleecker St					1.5	4.5	3.0	28.5		
14 St		2.35					1.5	8.0	1.5	18.5	14 St	4.5	8.0	5.0	22.0	3.0	7.5	1.5	25.5	0.0	3.5
23 St		2.78					1.5	9.5	1.5	17.0	23 St					1.5	9.0	3.0	24.0		
34 St		3.33					1.5	11.0	1.5	15.5	33 St					3.0	12.0	2.0	21.0		
42 St		3.80					1.5	12.5	2.0	14.0	42 St	5.0	13.0	5.0	17.0	2.0	14.0	4.0	19.0	0.5	3.0
55 St		4.34					2.0	14.5	2.5	12.0	59 St	2.5	15.5	6.0	12.0	3.0	17.0	2.0	15.0	1.0	0.0
57 St-7 Av	0.00		0.0	0.0	3.0	14.5															
Lexington Av	0.97		2.5	2.5	2.0	11.5															
72 St	1.52	5.13	2.0	4.5	2.0	9.5	2.0	16.5	2.0	9.5	68 St					1.5	18.5	4.0	13.0		
86 St	2.24	5.86	1.5	6.0	2.0	7.5	1.5	18.0	2.0	7.5	86 St	3.0	18.5	6.0	6.0	3.5	22.0	2.0	9.0	0.5	-1.5
96 St	2.81	6.43	1.5	7.5	2.0	5.5	1.5	19.5	2.0	5.5	96 St					1.5	23.5	2.0	7.0		
106 St	3.33	6.95	1.5	9.0	1.5	3.5	1.5	21.0	1.5	3.5	103 St					1.5	25.0	3.5	5.0		
116 St	3.86	7.48	1.5	10.5	2.0	2.0	1.5	22.5	2.0	2.0	116 St					3.0	28.0	1.5	1.5		
125 St	4.54	8.16	2.0	12.5	0.0	0.0	2.0	24.5	0.0	0.0	125 St	5.0	23.5	0.0	0.0	2.0	30.0	0.0	0.0	-1.0	0.0

Notes: North Terminal: 125 St-Lexington Av, Q T
South Terminals: Hanover Square T; 57 St.-Av Q (with continuing service to/from Brooklyn via the Broadway Line)

Source: SYSTRA Engineering—Running Times from Simulation Model, 03/1/02

The results of this running time comparison between the Second Avenue Q T service and Lexington Avenue 4 5 express services are shown on the two right-most columns. Very significant savings in running time are shown in southbound direction. For example, a passenger boarding the T service on the Second Avenue Line at 125th Street and traveling to Hanover Square Station could save 5.0 minutes compared with a passenger who boarded the 4 5 express services at the 125th Street Station on the Lexington Avenue Line and traveled to the Wall Street Station. The data presented in Table 5B-19 show that proposed Second Avenue Subway would be significantly faster in the southbound direction than the existing Lexington Avenue 4 5 express, despite making all station stops. The running time savings are less in the northbound direction, ranging from 1.0-minute reduction to a 1.0-minute increase, because delays on the Lexington Avenue Line are less in this direction during the AM peak hour, although many riders may still save significant station access time, depending on their destinations.

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-20. The largest volume decreases would occur at the existing 96th Street, 86th Street and 42nd Street-Grand Central Stations. Other notable percentage reductions would occur at the 116th Street, 110th Street, 77th Street, 68th Street and 28th Street Stations. (The volume decrease shown at the 125th Street Station would be offset in part by station entry/exit movements to the new Second Avenue Subway, shown in Table 5B-23.)

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-21 compares the level of service of pedestrian circulation elements at this location for the 2000 existing, 2025 No Build, and 2025 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 and F conditions under the No Build Alternative would improve to LOS D and E conditions, respectively, with the Second Avenue Subway.

Broadway Line. Entry/exit volumes at Broadway Line express stops in Midtown are expected to increase with the extension of Q service to the Second Avenue Subway, while volumes at other express stops are expected to decrease, as shown in Table 5B-22. A 20 percent increase is expected at the 57th Street Station, while less than a 2 percent increase is expected at the Times Square-42nd Street Stations. These increases are mostly due the extended Q service to East Harlem and the Upper East Side via the Second Avenue Line. A large 37 percent decrease is forecast at the congested Lexington Avenue-59th Street Station serving the N R W routes. This

Table 5B-20
Station Entry/Exit Volumes on the Lexington Avenue Line, 2025 AM Peak Hour

Station	Route	No Build			Build			Total Change	
		Entry	Exit	Total	Entry	Exit	Total	Volume	Percent
125 St[1]	4 5 6	2,370	2,000	4,370	1,280	1,550	2,830	-1,540	-35.2%
116 St	6	2,290	900	3,190	1,190	460	1,650	-1,540	-48.3%
110 St	6	830	560	1,390	420	350	770	-620	-44.6%
103 St	6	1,610	1,280	2,890	800	1,130	1,930	-960	-33.2%
96 St	6	7,420	1,310	8,730	1,790	580	2,370	-6,360	-72.9%
86 St	4 5 6	6,010	4,620	10,630	2,140	3,080	5,220	-5,410	-50.9%
77 St	6	6,870	4,590	11,460	3,490	3,070	6,560	-4,900	-42.8%
68 St	6	1,220	3,410	4,630	460	2,290	2,750	-1,880	-40.6%
59 St	4 5 6	1,140	9,040	10,180	430	6,480	6,910	-3,270	-32.1%
51 St	6	630	12,640	13,270	470	10,270	10,740	-2,530	-19.1%
Grand Central	4 5 6	15,590	34,730	50,320	13,510	28,600	42,110	-8,210	-16.3%
33 St	6	3,230	9,700	12,930	2,220	8,840	11,060	-1,870	-14.5%
28 St	6	1,000	820	1,820	610	280	890	-930	-51.1%
23 St	6	1,380	9,420	10,800	1,110	7,970	9,080	-1,720	-15.9%
14 St	4 5 6	2,560	6,120	8,680	1,410	5,370	6,780	-1,900	-21.9%
Astor Pl	6	1,310	2,580	3,890	1,180	2,660	3,840	-50	-1.3%
Bleecker St	6	450	940	1,390	300	950	1,250	-140	-10.1%
Spring St	6	710	2,850	3,560	530	1,900	2,430	-1,130	-31.7%
Canal St	6	230	2,510	2,740	100	1,900	2,000	-740	-27.0%
Brooklyn Bridge	4 5 6	730	5,740	6,470	420	5,220	5,640	-830	-12.8%

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.

This table has been revised for the FEIS.

Source: NYCT Model Outputs – May 2003

Table 5B-21
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	C/D or better	C/D or better	C/D or better	C/D or better	C/D or better
Stairway: Entry/Exit to Lexington Av/42 St	E	C	E	C	D	B
Stairway: Entry/Exit to Hyatt Passageway	C	C	D	C	D	C
Stairway P20: Southbound Platform	B	B	C	B	B	B
Stairway P22: Southbound Platform	D	D	E	D	D	D
Stairway P21: Northbound Platform	C	B	C	B	C	B
Stairway P23: Northbound Platform	E	D	F	E	E	D

Source: Eng-Wong, Taub & Associates / Vollmer Associates

is due to the extended Q service, which would stop at both the 72nd Street-Second Avenue and Lexington Avenue-63rd Street Stations. A modest 7 percent decrease is also forecast at the Lexington Avenue-63rd Street Station.

The increased entry/exit volume of about 500 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 total entry/exit volume is expected to decrease by 600 passengers, who would be distributed among several entrance locations. Since completion of the SDEIS, additional NYCT model outputs have demonstrated that the potential adverse impact on the street stairs at the 32nd Street end of the Herald Square Station reported in the SDEIS would no longer occur. In the 2025 AM peak hour, there is expected to be a net decrease of about 140 passengers in the 2025 AM peak hour entry/exit volume at this location compared with the No Build condition.

Second Avenue Line. The station entry/exit volumes on the Second Avenue Line are shown in Table 5B-23, where the five busiest stations in the AM peak hour would be at 96th Street, 86th Street, 72nd Street, 42nd Street, and Hanover Square Stations. 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-22
Entry/Exit Volumes at Express Stops on the Broadway Line, 2025 AM Peak Hour

	No Build			Build			Total Change	
	Entry	Exit	Total	Entry	Exit	Total	Volume	Percent
Lexington Ave-63rd St	520	2,750	3,270	660	2,390	3,050	-220	-6.7%
Lexington Ave-59 St	2,740	13,270	16,010	1,060	8,990	10,050	-5,960	-37.2%
57 St	1,360	8,900	10,260	1,420	10,900	12,320	2,060	20.1%
Times Sq-42 St	5,140	22,030	27,160	4,830	22,810	27,640	480	1.8%
34 St-Herald Sq	620	10,890	11,510	570	10,340	10,910	-600	-5.2%
14 St-Union Sq	3,530	12,880	16,410	2,770	13,020	15,790	-620	-3.8%
Broadway-Canal St	730	10,000	10,730	590	10,130	10,720	-10	-0.1%

Note: This table has been revised for the FEIS.
Source: NYCT Model Outputs—May 2003.

Subway-to-Subway Transfer Movements

Primary Study Area. Table 5B-24 shows a qualitative assessment of 2025 AM peak hour transfer activities at key stations in the primary study area. In this table, transfer volumes with 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. With the Second Avenue Subway, transfer volumes at existing facilities would generally be lower than those expected under the No Build Alternative.

Table 5B-23
2025 AM Peak Hour Entry/Exit Volumes
At Stations on the Second Avenue Line

Station	Entry	Exit	Total
125 St	1,780	600	2,380
116 St	1,670	400	2,070
106 St	1,860	590	2,450
96 St	8,540	1,210	9,750
86 St	6,990	1,780	8,770
72 St	5,140	5,880	11,020
55 St	1,570	6,100	7,670
42 St	1,630	9,230	10,860
34 St	2,250	2,020	4,270
23 St	1,540	3,410	4,950
14 St	1,450	1,220	2,670
Houston St	830	1,150	1,980
Grand St	270	820	1,090
Chatham Sq	680	1,460	2,140
Seaport	410	2,990	3,400
Hanover Sq	530	8,880	9,410

Note: This table has been revised for the FEIS.
Source: Vollmer Associates based on NYCT Model Outputs – May 2003

A marked improvement would be expected with the Second Avenue Subway at the transfer connection between the Broadway Line (N)(R)(W) services and the Lexington Avenue (4)(5)(6) service at the Lexington Avenue-59th Street Station. This extremely crowded transfer movement in the No Build condition would be improved to acceptable conditions with moderate crowding in the Build condition. The reduction in crowding would occur because the proposed extension of the Broadway Line (Q) service on the Second Avenue Line in East Harlem and the Upper East Side neighborhoods.

A marked improvement is also 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 severely crowded transfer movement in the No Build condition would be improved to satisfactory conditions with occasional crowding 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 55th Street Station for access to East Midtown destinations more convenient to the (T).

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. Station crowding levels would remain essentially the same.

Table 5B-24

Qualitative Evaluation of 2025 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	Q T					11,790	3	890	3
86th St-Lexington Av	6	4 5	80	3	990	3	200	3	1,510	3
Lexington Av-63rd St	Q SB	F NB					1.210	2	0	-
	Q SB	F SB					1,220	2	3,030	2
	Q NB	F NB					390	1	20	1
	Q NB	F SB					0	-	2,310	2
59th St-Lexington Av	4 5	N R W	3,770	6	5,890	6	3,180	4	6,460	4
	6	4 5	0	-	610	3	20	4	1,340	4
	6	N R W	2,330	6	4,060	6	830	3	5,140	3
Lexington Av-53rd St/ 51st St-Lexington Av	6	E V	650	4	2,910	4	310	3	2,180	3
55th St-Second Av/ Lexington Av-53rd St	E V	T					6,770	2	3,960	2
Grand Central-42nd St	4 5 6	S	2,780	4	690	4	1,310	3	1,830	3
	4 5 6	7	930	5	11,340	5	1,130	5	15,950	5
	7	T					2,240	2	270	2
14th St-Union Sq	N R Q W	L	2,430	4	4,890	4	3,240	4	4,910	4
	N R Q W	4 5 6	6,630	4	1,050	4	6,900	4	1,040	4
	L	4 5 6	4,380	4	1,410	4	4,210	4	1,320	4
14th St-Second Av	L	T					2,180	2	1,120	2
Bleecker St/ Broadway-Lafayette St	6 NB	B D F V	0	—	2,880	2	0	—	1,630	2
	6 SB	B D F V	710	3	0	3	90	2	0	-
Houston St-Second Av	F V	T					5,820	2	2,640	2
Grand St	B D	T					6,620	2	1,290	2
Canal St	6	J M Z	50	3	700	3	10	3	690	3
	N Q	R W	290	2	0	-	290	2	10	2
	N Q	6	280	2	20	2	740	2	50	4
	N Q	J M Z	880	3	1,620	3	1,630	4	1,790	3
Brooklyn Br/ Chambers St	4 5 6	J M Z	60	3	950	3	90	3	830	3
Fulton St/ Broadway-Nassau	4 5	A C	690	3	5,110	3	740	3	5,830	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

Table 5B-24 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.
- 55th 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.

One of the highest volume transfer movements on the Second Avenue Line would occur at the 125th Street Station, where a total of about 12,700 passengers would transfer between the 4 5 6 and Q T routes during the 2025 AM peak hour. Two other high volume transfer locations would be at 55th Street and Second Avenue, and Houston Street and Second Avenue. At the 55th Street Station, over 8,900 passengers would transfer between the E V and T routes during the 2025 AM peak hour. Similarly, at Houston Street Station, nearly 8,500 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 nearly 11,800 passengers would transfer from the 4 5 6 to the Q T during the 2025 AM peak 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.

As described in Chapter 2 ("Project Alternatives"), the Deep Chrystie Option with an offset vertical transfer was selected for implementation based upon preliminary engineering studies. This transfer would serve over 6,600 transfers from the B D to T routes and nearly 1,300 transfers from the T to B D routes.

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 have arrived at the Times Square/42nd Street Station complex on the 42nd Street Shuttle S or the Flushing Line 7 services, under Existing and No Build conditions, would be expected to arrive on the extended Q route under the Build condition. This route 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 900 people. Correspondingly, the transfer movement from the Broadway Line N Q R W services to the Seventh Avenue 1 2 3 9 services would increase by about 2,100 people, and the reverse movement would increase by about 2,000 people. In addition, the transfer from the Broadway Line N Q R W services to the S shuttle would increase by about 2,600 people. The shift in travel patterns at the Times Square-42nd Street Station, due to the extended service and increased frequency on the Q route of the Second Avenue Line, would increase volumes substantially on the Broadway Line platform stairs serving the 41st/42nd Street north mezzanine areas. These cumulative entry/exit and transfer volumes would result in a

significant adverse impact on operating conditions on those stairs. Table 5B-25 summarizes those impacts by comparing the Build condition with the No Build condition. The pedestrian analysis assumes the construction of the planned new stair between the southbound Broadway Line platform and the intermediate mezzanine on the Flushing Line, which would provide an alternative transfer connection between the southbound (N)(Q)(R)(W) services and the (7) and (1)(2)(3)(9) services. Additional stair capacity could be provided as mitigation for these platform and mezzanine level stairway impacts. However, if such stairs cannot be provided practicably, the significant adverse impact would remain unmitigated.

Table 5B-25
Comparative Level of Service Conditions
Times Square Station – North Mezzanine – Broadway Line (N)(Q)(R)(W)
Peak 5 Minutes During 2025 AM Peak Hour

Location	Capacity (P/5min)		Total Peak 5 Minute Volume			V/C Ratio		Level of Service	
	No Build	Build	No Build	Build	% Change	No Build	Build	No Build	Build
North Mezzanine									
Stair ML1	432	384	465	815	+75%	1.21	2.13	D	F
Stair ML2	438	438	490	850	+73%	1.11	1.94	D	E
Stair ML6	623	623	440	715	+63%	0.70	1.15	C	D
Northbound Platform									
Stair P2	220	220	195	230	+18%	0.90	1.04	C	D
Stair P4	220	220	180	205	+14%	0.81	0.93	C	C
Stair P5/P7	246	246	220	259	+14%	0.90	1.02	C	D
Stair P10	250	250	180	215	+19%	0.73	0.86	C	C
Southbound Platform									
Stair P1	220	220	75	265	+253%	0.30	1.19	A	D
Stair P3	248	248	195	460	+136%	0.88	1.86	C	F
Stair P6/P8	277	277	170	395	+132%	0.69	1.43	B	F
Stair P9	376	376	95	205	+116%	0.28	0.55	A	B
New Stair	261	281	110	275	+150%	0.40	0.98	A	C

Note: This table is new for the FEIS.
Source: Vollmer Associates based on VA Counts and NYCT Model Outputs – May 2003.

At the 34th Street/Herald Square Station complex, the transfer volume from the Broadway Line (N)(Q)(R)(W) services to the Sixth Avenue Line (B)(D)(F)(V) services is projected to increase by about 500 people during the 2025 AM peak hour between the No Build and Build conditions. The reverse transfer movement will remain essentially unchanged. In addition, nearly 800 more people will use the Broadway Line to exit at the station complex. This would be offset by the over 1,300 fewer people exiting the station from the Sixth Avenue Line services. The increased transfer and exit movements from the Broadway Line would increase volumes on platform stairs, resulting in a moderate increase that when spread over several stairs 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.

NEW TRANSIT RIDERS

Although the transit market share is already high in the area served by the Second Avenue Subway, its travel benefits are expected to attract a number of trips normally made by auto, taxi, light trucks or walking. Upon completion of the Second Avenue Subway, 3,499,500 new riders annually (or 11,400 on an average weekday) would be expected to use the transit system in 2025, according to the MTA's Regional Transit Forecasting Model (RTFM). These estimates of new riders are lower than in the SDEIS, because as Preliminary Engineering progressed, more accurate station entrance times were incorporated into the model. In many cases, stations are deeper than originally projected and entrance times are therefore longer, which made the new line slightly less attractive to some riders. In addition, the use of updated socioeconomic forecasts with slower population growth also contributed to the decrease in projected ridership.

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-26. According to the RTFM, Metro-North would have an increase in 2025 AM peak period arrivals and departures at the 125th Street Station due to the new transfer there to the Second Avenue Subway. There is expected to be a corresponding decrease in arrivals, but a small increase in departures at Grand Central Terminal. Systemwide, the change in ridership would be negligible. Similarly, the LIRR would have an increase in 2025 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-26
2025 AM Peak Period Commuter Rail Ridership
Comparing Build vs. No Build Conditions

Station	Arrivals				Departures			
	No Build	Build	Change	%	No Build	Build	Change	%
Metro-North Railroad								
125th Street	1,200	1,420	220	18%	180	220	40	22%
Grand Central	98,550	98,450	-100	0%	2,080	2,110	30	1%
Total	99,750	99,870	120	0%	2,260	2,330	70	3%
Long Island Rail Road								
NY Penn Station	78,930	78,500	-430	-1%	2,340	2,320	-20	-1%
Grand Central	63,680	63,870	190	0%	1,720	1,640	-80	-5%
Flatbush Ave	4,970	4,850	-120	-2%	500	510	10	2%
Total	147,580	147,220	-360	0%	4,560	4,470	-90	-2%

Source: MTA Regional Transit Forecasting Model – FY2005 SAS 5309 Submission (Version 8/9/03)

SUMMARY OF FINDINGS

NO BUILD CONDITIONS

Increased Overcrowding on Lexington Avenue Line

In the future, under the No Build Alternative, ridership on the Lexington Avenue Line would continue to grow between 2000 existing and 2025 No Build conditions (see Table 5B-5 above). This increase in ridership between 2000 and 2025 would exacerbate overcrowding on the Lexington Avenue 4 5 express trains in the No Build Alternative. It is expected that the 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 27 percent—during the 2025 AM peak hour (see Table 5B-15 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-16 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 50,700 riders during the AM peak hour. 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. The extension would thereby increase southbound ridership on the Broadway Line by more than 20,700 passengers during the 2025 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. The guidelines 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-13 and 5B-14 above). For example, loading conditions on the 4 5 express trains departing Grand Central Station would improve from a v/c ratio of 1.27 under the No Build to 0.94 under the Build. Similarly on the 6 local trains departing 77th Street would improve from a v/c ratio of 1.07 under the No Build to 0.55 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-20 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 severely crowded transfer movement in the No Build condition would be improved to borderline crowded conditions in the Build condition (see Table 5B-24 above).

Reduced Running Time

As shown in Table 5B-19, passengers who boarded the full-length T service on the Second Avenue Line at 125th Street, for example, could save about 5 minutes when traveling to the Financial District, compared with a passenger who boarded the Lexington Avenue 4 5 express services. Hence, during the AM peak hour, the Second Avenue Subway would be significantly faster in the southbound direction than the existing Lexington Avenue Line.

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 and other structures, it may be necessary to protect existing structures during tunnel excavation. This would cause service disruptions ranging from speed restrictions to subway service suspensions on nights and weekends. If the subway line crossing were deep in rock, it would not be necessary to protect these existing subway or commuter line structures, although rock reinforcement may be required to ensure stable openings. The duration of these disruptions would range from 2 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
  - N Q 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.
- In addition, the tail track option that extends south from Hanover Square Station would pass under a number of existing NYCT subway tunnels:
  - M subway service – Nassau Street Line, Broad Street and Water Street.
  - R W subway services – Broadway Line, Whitehall and Water Street.

  - 4 5 subway services – Lexington Avenue Line under Peter Minuit Plaza.
  - 1 9 subway services – South Ferry Station of the Broadway Line under Peter Minuit Plaza.

- Where the new Second Avenue Subway tunnels would pass above an existing subway or commuter rail line or other structures, it would not be necessary to carry out extensive protective works to the existing structures during tunnel excavation. However, the subway and commuter rail tunnel below would still have to be protected from the overhead construction, and the existing ground conditions 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 these 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. This would be due to increased ridership on the Broadway Line's extended Q service, which would increase crowding on some platform and mezzanine stairs at the Times Square Station. This increased crowding would result in a significant adverse impact. These impacts could be mitigated if additional platform stair and mezzanine stair capacity on the Broadway Line at the north end of the Times Square Station could be provided. If these stairs cannot be provided practicably, an unmitigated significant adverse impact would occur. ✷