

A. INTRODUCTION

The Proposed Project includes open space and streetscape improvements along Allen and Pike Streets between Delancey and South Streets. In the fall of 2009, the New York City Department of Transportation (NYCDOT) implemented temporary improvements including the removal of one traffic lane in each direction to provide for bike lanes adjacent to the malls and the closure of four intersections—Stanton, Broome, Hester, and Monroe Streets—to extend the mall through these intersections. This chapter assesses the existing traffic conditions at the three above-mentioned intersections—Broome, Hester, and Madison Streets—that would be incorporated into the Proposed Project. It also assesses Stanton Street for informational purposes. This assessment is followed by a discussion of an alternative under which traffic conditions are evaluated qualitatively if the intersection closures were removed. In addition, pedestrian and bicycle safety conditions for existing and alternative conditions were compared.

PRINCIPAL CONCLUSIONS

The analysis of existing conditions concludes that the four study locations operate at acceptable levels of service during the weekday AM, midday, and PM peak hours. The qualitative evaluation of the study locations under the alternative conditions, which would involve removal of the temporary improvements except the reconfiguration of bike lanes, concludes that the levels of service and pedestrian and bicycle safety would be potentially adversely affected during the weekday AM, midday, and PM peak hours. Accordingly, the Proposed Project is preferred because it improves both bicycle and pedestrian safety as compared to the alternative condition (e.g., no Proposed Project and the NYCDOT Interim Plan substantially removed). Overall, the Proposed Project would not result in any significant adverse impacts to traffic or parking or pedestrian/bicycle circulation.

B. EXISTING CONDITIONS**ROADWAY NETWORK AND TRAFFIC STUDY AREA**

The traffic study area consists of four intersections as shown in **Figure 2E-1**. These study locations are four-legged, signalized intersections, and operate similar to one another in terms of the lane movements, except the intersection of Pike Street and Monroe Street, which is a three-legged, unsignalized intersection.

Before the temporary improvements were implemented, Pike and Allen Streets were two-way north-south streets with on-street parking on both sides, northbound and southbound bike lanes adjacent to the parking lanes, and three travel lanes per direction. The temporary improvements implemented in September and October 2009 resulted in re-configuration of the bike lanes, which are now striped adjacent to the medians, removal of one travel lane in each direction on Pike and Allen Streets, and prohibition of traffic through the median breaks at Stanton, Broome,



- Signalized Intersection
- + Unsignalized Intersection

Traffic Study Locations

Figure 2E-1

The Reconstruction of the Allen and Pike Street Malls

Hester, and Monroe Streets using concrete planters, colored pavement markings, signage, and benches. Thus, in the existing conditions, Pike and Allen Street at its intersections with Stanton, Broome, Hester and Monroe Streets, is a two-way north-south street separated by a raised median, and includes two travel lanes, and a bike lane adjacent to the raised median in each direction with parking along the east side and west side. Stanton, Broome, Hester, and Monroe Streets intersecting Pike and Allen Street are oriented in the east-west direction with one travel lane in the eastbound direction. Parking is allowed on the north side of Stanton and Broome Streets, both sides of Hester Street, and the south side of Monroe Street.

EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE

Traffic data were collected in November 2009, which included manual intersection turning movement counts, 24-hour Automatic Traffic Recorder (ATR) machine counts, physical inventory, signal timings, and level of service observations. Traffic counts were conducted during the weekday AM, midday and PM peak periods. The weekday AM, midday, and PM peak hours were selected to be 7:45-8:45 AM, 12-1 PM, and 4:15-5:15 PM, respectively.

Analyses of traffic conditions in urban areas are based on critical conditions at intersections and are defined in terms of levels of service. According to the *Highway Capacity Manual 2000* (HCM) that was used for these analyses, levels of service (LOS) at signalized intersections are defined in terms of the average control delay per vehicle at an intersection, as follows:

- LOS A describes operations with very low delays, i.e., 10.0 seconds or less per vehicle. This occurs when signal progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all.
- LOS B describes operations with delays in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. Again, most vehicles do not stop at the intersection.
- LOS C describes operations with delays in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with delays in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (v/c) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Delays of 45.0 seconds or greater are considered marginally unacceptable; delays under 45.0 seconds are considered marginally acceptable.
- LOS E describes operations with delays in the range of 55.1 to 80.0 seconds per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios.
- LOS F describes operations with delays in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios with cycle failures. Poor progression and long cycle lengths may also contribute to such delays. Often, vehicles do not pass through the intersection in one signal cycle.

Levels of service A, B, and C are considered acceptable; LOS D is generally considered marginally acceptable up to mid-LOS D (45 seconds of delay for signalized intersections), and is considered unacceptable above mid-LOS D. LOS E and F are considered unacceptable.

For unsignalized intersections, delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line: LOS A describes operations with very low delay, i.e., 10.0 seconds or less per vehicle; LOS B describes operations with delays in the range of 10.1 to 15.0 seconds; LOS C has delays in the range of 15.1 to 25.0 seconds; LOS D, 25.1 to 35.0 seconds per vehicle; and LOS E, 35.1 to 50.0 seconds per vehicle, which is considered to be the limit of acceptable delay. LOS F describes operation with delays in excess of 50.0 seconds per vehicle, which is considered unacceptable to most drivers. This condition exists when there are insufficient gaps of suitable size to allow side street traffic to cross safely through a major vehicular traffic stream.

Figures 2E-2, 2E-3, and 2E-4 show the existing peak hour traffic volumes. During the AM, midday, and PM peak hours, southbound Pike and Allen Street carries approximately 255 to 365 vehicles per hour (vph) at Stanton Street and Monroe Street, and approximately 625 to 760 vph at Broome, Hester, and Canal Streets. Northbound Pike and Allen Street carries approximately 390 to 525 vph at Monroe and Canal Streets, and approximately 615 to 835 vph at Hester, Broome, and Stanton Streets. The east-west cross streets at all the study locations are traveled by about 55 to 130 vph during the AM, midday, and PM peak hours.

During the AM peak hour, the number of pedestrians conflicting with the northbound and eastbound right turns at each of the study intersections is about 50 to 90 pedestrians per hour (ped/hr), and about 135 to 205 ped/hr, respectively. During the midday peak hour, the number of pedestrians conflicting with the northbound and eastbound right turns at Allen Street at Broome and Hester Streets is about 185 to 225 and 305 to 320 ped/hr, respectively. At Allen Street and Stanton Street, the number of pedestrians conflicting with the northbound and eastbound right turns is about 135 to 160 ped/hr during the midday peak hour. During the PM peak hour, the number of pedestrians conflicting with the northbound and eastbound right turns at each of the study intersections is about 155 to 230 ped/hr.

Table 2E-1 summarizes the existing LOS. During the weekday peak hours, the signalized intersections operate at overall level of service (LOS) B (the “overall” LOS is a weighted average of all of the individual traffic movements), and individual movements operate at LOS C or better. The unsignalized intersection of Pike Street and Monroe Street operates at LOS A.

C. ALTERNATIVE CONDITIONS

The alternative conditions involve the removal of all temporary improvements except the reconfiguration of bike lanes along Pike and Allen Street between Houston and South Streets. Under the alternative conditions, Pike and Allen Street would have three travel lanes, curbside parking, and the bike lanes adjacent to the raised median in each direction. Removal of pedestrian space between the medians along Pike and Allen Street would allow vehicles to travel through and/or turn left onto northbound Pike and Allen Street from eastbound Stanton, Broome, Hester, and Monroe Streets as they did before the temporary improvements were implemented in September and October 2009. Also, vehicles would be able to make left turns from southbound Pike and Allen Street onto eastbound Stanton, Broome, and Hester Streets.



2009 Existing Traffic Volumes
AM Peak Hour
Figure 2E-2



2009 Existing Traffic Volumes
 Midday Peak Hour
 Figure 2E-3



2009 Existing Traffic Volumes
PM Peak Hour
Figure 2E-4

The Reconstruction of the Allen and Pike Street Malls

**Table 2E-1
2009 Existing Conditions Level of Service Summary**

Intersection & Approach		7:45-8:45 AM Peak Hour				12-1 PM Midday Peak Hour				4:15-5:15 PM Peak Hour			
		Mvt.	v/c	Control Delay	LOS	Mvt.	v/c	Control Delay	LOS	Mvt.	v/c	Control Delay	LOS
Allen Street @ Stanton Street													
Allen Street	NB	TR	0.81	18.6	B	TR	0.69	16.5	B	TR	0.66	16.5	B
	SB	T	0.24	11.1	B	T	0.28	11.4	B	T	0.28	11.5	B
Stanton Street	EB	R	0.19	22.1	C	R	0.27	23.3	C	R	0.29	23.2	C
Overall Intersection		-	0.55	17.1	B	-	0.52	15.7	B	-	0.52	15.6	B
Allen Street @ Broome Street													
Allen Street	NB	TR	0.58	14.5	B	TR	0.57	14.3	B	TR	0.58	14.4	B
	SB	T	0.56	14.0	B	T	0.58	14.2	B	T	0.61	14.7	B
Broome	EB	R	0.32	25.4	C	R	0.33	25.7	C	R	0.22	23.1	C
Overall Intersection		-	0.48	15.0	B	-	0.48	15.0	B	-	0.46	14.9	B
Allen @ Hester Street													
Allen Street	NB	TR	0.59	14.7	B	TR	0.52	13.8	B	TR	0.55	14.1	B
	SB	T	0.52	13.7	B	T	0.49	13.2	B	T	0.49	13.2	B
Hester Street	EB	R	0.24	23.1	C	R	0.31	24.9	C	R	0.22	22.9	C
Overall Intersection		-	0.46	14.8	B	-	0.44	14.3	B	-	0.42	14.1	B
Pike Street @ Monroe Street													
Monroe Street (Unsignalized)	EB	R	-	9.9	A	R	-	9.9	A	R	-	9.7	A
Overall Intersection		-	-	9.9	A	-	-	9.9	A	-	-	9.7	A

POTENTIAL IMPACTS FOR PEDESTRIANS AND BICYCLISTS

Under the alternative conditions, the potential safety impacts for the pedestrians and bicyclists are discussed below.

- In the existing conditions, bicyclists can travel along northbound and southbound Pike and Allen Street in a protected bicycle lane, which is striped adjacent to the raised median with a buffer lane separating the bicyclists from the vehicles. Under the existing lane configuration, there are no conflict points between bicyclists and vehicles while traveling in the northbound or southbound direction along Pike and Allen Street at the study locations. Under the alternative conditions the pedestrian space between the medians would be removed, but the bike lanes which are striped adjacent to the raised median along Pike and Allen Street would remain similar to the existing conditions. As a result, it would be potentially dangerous for bicyclists to travel along Pike and Allen Street as they would lose buffered bike lanes and special signal phasing, and would conflict with vehicles turning left from northbound and southbound Pike and Allen Street—potentially at the same time—with limited sight distance.
- In the existing conditions, pedestrians can use the space between the medians to travel across the cross streets without any conflict from vehicles. Similarly, there are fewer conflicting turns with pedestrians crossing the north crosswalk on northbound Pike and Allen Street, and east crosswalks at the study locations. Under the alternative conditions, the pedestrian space between the medians along Pike and Allen Street would be removed, which

would make it less safe for pedestrians to travel between the medians, and would allow vehicular traffic to travel through and queue between the medians waiting to make left turns. As a result, pedestrians would be less likely to cross between the medians if the improvements were removed, and would use the crosswalks across Pike and Allen Street, and the cross streets. This would increase the number of conflicts between the pedestrians and vehicles. Also, under the alternative conditions there would be one additional travel lane in each direction along Pike and Allen Street, which would increase the crossing distance and time for pedestrians.

POTENTIAL IMPACTS FOR VEHICULAR TRAFFIC

Under the alternative conditions, the potential impacts on vehicular traffic are discussed below.

- Removal of the pedestrian space would allow vehicular traffic to travel through and make left turns from the medians. As a result, the number of conflicts at the study intersections, i.e. conflicts between southbound left turns and northbound through vehicles, would increase and would potentially adversely affect intersection levels of service and make it less safe.
- Removal of the pedestrian space between the medians would shift more pedestrians to the crosswalks across Pike and Allen Street, and the cross streets. As a result, the levels of service of eastbound left and right turns, and northbound right turns, which would have to yield to the increased number of pedestrians in the crosswalks, would be potentially adversely affected at the study intersections under the alternative conditions.

POTENTIAL SAFETY IMPACTS

Historical accident data (i.e., data representing conditions before the temporary improvements were implemented) were reviewed to determine if there were unsafe intersections in the study area, which is defined in the *CEQR Technical Manual* as an intersection with five or more pedestrian accidents (including bicyclist accidents) in a one-year period. Accident data were received from NYCDOT, which included the latest three year period (January 2006 through December 2008) along Pike and Allen Street between Houston and South Streets. Although it is too early to assess the temporary improvements in terms of safety and accidents quantitatively, the existing conditions will most likely result in fewer pedestrian and bicyclist accidents.

Table 2E-2 summarizes the intersection accidents at the study locations for which the data were available. The segment accidents along Pike and Allen Street for the latest three year period are summarized in **Table 2E-3**. The intersection of Allen Street at Delancey Street is considered a high pedestrian accident location. **Table 2E-4** details accident data for this location. The majority of the accidents along Pike and Allen Street occurred with pedestrians crossing the roadway with the signal, and bicyclists traveling along the roadway with vehicular traffic. Also, only two accidents were attributable to pedestrian error or confusion, while most of the remaining accidents occurred when vehicles were either going straight ahead or making turns from Pike and Allen Street.

After the temporary improvements were implemented, the number of conflict points between pedestrians and vehicles were reduced due to the reconfiguration of travel lanes and provision of exclusive and protected bike lanes adjacent to the medians, and pedestrian space between the medians. Also, the crossing distance for the crosswalks on Pike and Allen Street was reduced, which limits the exposure of pedestrians to vehicles. Therefore, the temporary improvements have likely reduced the number of pedestrian and bicyclist accidents.

The Reconstruction of the Allen and Pike Street Malls

**Table 2E-2
Summary of Intersection Accidents**

Intersection		Study Period (2006-2008)			2006		2007		2008	
North-South Street	East-West Street	Reportable Accidents	Total Fatalities	Total Injuries	Pedestrian Crashes	Bicyclist Crashes	Pedestrian Crashes	Bicyclist Crashes	Pedestrian Crashes	Bicyclist Crashes
Allen Street	Stanton Street	5		4	1	1	1			2
Allen Street	Rivington Street	6		7	4		1			1
Allen Street	Delancey Street	14	1	14	3	3	3	2	1	2
Allen Street	Broome Street	3		3	3					
Allen Street	Grand Street	8		10	4		2	1	1	
Allen Street	Hester Street	2		2			2			
Allen Street	Canal Street	6		7	2		2	1	1	
Allen Street	Division Street	3		3	1		1			1
Allen Street	East Broadway									
Allen Street	Henry Street	1		1	1					
Allen Street	Madison Street	5	1	4	4		1			
Allen Street	Monroe Street	1		1					1	
Allen Street	Cherry Street	4		4	3	1				
Allen Street	South Street									

Note: Shaded cells indicate an unsafe intersection according to the *CEQR Technical Manual*.

**Table 2E-3
Summary of Segment Accidents**

Segments (along Pike and Allen Street)		Year	Pedestrian	Bicyclist	Accident Class	
					Injured	Killed
Grand Street	Hester Street	2006	1		1	
Broome Street	Grand Street			1	1	
Grand Street	Hester Street		2		2	
Hester Street	Canal Street		2		1	
Henry Street	Madison Street	2007	1		1	

**Table 2E-4
Detailed Accident Data for High Accident Locations**

Intersection	Year	Date	Time	Accident Class		Vehicle		Pedestrian/Bicyclist		Apparent Cause of Accident	
				Injured	Killed	Action of Vehicle	Direction of Travel	Action of Pedestrian	Direction of Travel	Pedestrian Error/Confusion	Other
Allen Street at Delancey	2006	19-Mar	8:22 PM	1	-	Going Straight Ahead	North	Crossing along street with traffic	East	-	-
		17-Jun	5:30 PM	1	-	Making Left Turn	East	Crossing with signal	North	-	-
		25-Jul	8:52 AM	1	-	Making Right Turn	Northwest	Crossing with signal	N/A	-	-
		28-Sep	8:37 PM	1	-	Going straight ahead	West	Crossing with signal	N/A	-	-
		2-Oct	11:45 AM	1	-	Going straight ahead	South	Crossing with signal	N/A	-	-
		26-Oct	4:00 AM	1	-	Going straight ahead	North	Crossing along street with traffic	North	-	-
	2007	15-Feb	3:10 PM	1	-	Making Left Turn	South	Crossing with signal	N/A	Yes	-
		15-Feb	7:15 PM	1	-	Starting in Traffic	South	Other actions in roadway	N/A	Yes	View obstructed/pavement slippers
		26-May	8:05 PM	2	-	Going straight ahead	North	Along street against traffic	South	-	Passing or lane usage improper
		23-Jun	5:40 PM	1	-	Making Left Turn	South	Crossing with signal	N/A	-	-
25-Jul	8:40 PM	1	-	Going Straight Ahead	South	Along street with traffic	West	-	-		

As discussed earlier, under the alternative conditions the pedestrian space between the medians would be removed, but the bike lanes which are striped adjacent to the raised median along Pike and Allen Street would remain, similar to the existing conditions. The safety conditions for pedestrians and bicyclists during the alternative conditions could potentially be worse than the conditions summarized using the historical data, which represent conditions before the temporary improvements were implemented (i.e., conditions during which bike lanes were striped adjacent to the curbside parking lanes along Pike and Allen Street). In the alternative conditions, bicyclists would lose buffered bike lanes and special signal phasing and would conflict with vehicles turning left from northbound and southbound Pike and Allen Streets, potentially at the same time. For the conflict between through bicyclists and opposing left turns, there would be limited sight distance compared to the conditions before the temporary improvements were implemented, where bicyclists conflicted with vehicles turning left from only one direction, i.e., either northbound or southbound Pike and Allen Street, and with vehicles turning right from the same direction—which is typical for striped bike lanes—with the benefit of greater sight distance. *