

+selectbus service

M15 on First and Second Avenues: Progress Report



New York City Transit



Existing Condition

Executive Summary

The M15 bus route along First Avenue and Second Avenue provides a critical transportation service in Manhattan, connecting many neighborhoods which are a long walk from the nearest subway station. However, M15 speeds were very slow and unreliable, due to heavy traffic congestion and high passenger boardings. Improving M15 service meant balancing transit priority with improved pedestrian safety and cycling facilities, as well as maintaining traffic flow on these busy streets. On October 10, 2010, MTA New York City Transit (NYCT) and New York City Department of Transportation (NYCDOT) implemented the M15 Select Bus Service (SBS) along this route.

The M15 SBS improved bus speed and reliability through the use of proof-of-payment fare collection, new bus lanes, and improved bus lane treatments, including use of "offset" bus lanes (next to the parking lane). Passenger comfort was also enhanced through route simplification, new buses, improved scheduling, enhanced stations, and better customer information.

SBS generated a significant improvement in transit service in this constrained corridor, created space for safe bicycling facilities and pedestrian safety improvements, all while maintaining general traffic flow along the corridor. Results have included:

- 15-18% improvement in travel time for the M15 service,
- 9% increase in M15 ridership,
- 21% reduction in traffic injuries in sections where full treatments were used,
- Maintenance of traffic speeds and volume,
- 18-177% increase in cycling.

These gains were achieved through extensive outreach and coordination with all area stakeholders, and careful use of different priority treatments on different parts of the corridor, as well as the strong working partnership between NYCDOT and NYCT.

Previous Condition



Introduction

The M15 route, which operates primarily on First and Second Avenues, suffered from significant delays and unreliability due to heavy traffic congestion, and high volumes of passengers. As one of the busiest bus routes in New York City, the time required to board the bus regularly took several minutes at many stops during peak hours. Virtually the entire route is fronted by highly active retail, the majority is surrounded by high-density housing or offices, and the route interacts with several busy river crossings. As a result, the M15 battles congestion for much of its length.

As shown in Figure 1, the M15 route extends along the East Side between South Ferry in Lower Manhattan and 125th Street in Harlem. While the route skirts the edge of Midtown, it directly serves Lower Manhattan and a number of other key employment destinations, including the United Nations and seven health care institutions spread over the route. Over half a million people live within a quarter-mile of this route, over 75% of whom do not own a car. Furthermore, while much of Manhattan is well-served by the subway system, many East Side residents have a long walk to the nearest subway station. Construction on the most critical segment of the Second Avenue Subway (SAS) is underway, with a planned 2016 completion date; even this segment would serve only a portion of Second Avenue. Improving the M15 route provided an opportunity to significantly improve transit service in these neighborhoods on much shorter timeframe than new subway construction, and these improvements will have utility even when the subway construction is complete.



Figure 1: Phase I New York City BRT program and M15 SBS corridor

Project Background

New York City has the largest bus system in North America. Over the last three years, subway ridership has increased, but bus ridership has been essentially flat. One cause of the stagnation of bus ridership is the fact that bus speeds in New York City are slower than in other large North American cities, and bus speeds have fallen over the past decade. These slower speeds have multiple causes, including long dwell times due to high passenger boardings and heavy traffic congestion.

In 2004, NYCDOT, NYCT, and the New York State Department of Transportation (NYSDOT) launched a series of initiatives to reverse the decline in bus speeds and improve the reliability and comfort of bus service, including a joint study of how Bus Rapid Transit (BRT) could be implemented in New York City. The study identified candidate corridors for BRT leading to the selection of five pilot projects citywide (see Figure 1), which were branded as Select Bus Service (SBS). In 2008 the first SBS project was launched successfully on the Bx12 Fordham Road/Pelham Parkway corridor in the Bronx and northern Manhattan. The M15 route on First and Second Avenues was also selected for SBS upgrades based on this study, and major design work on the corridor began in 2009.

In 2007, New York City Mayor Michael R. Bloomberg released PlaNYC 2030, A Greener, Greater New York, New York City's Long-Term Sustainability Plan. This plan, updated regularly, is aimed at accommodating the city's expected growth of one million more residents, while strengthening the economy, combating climate change, and enhancing the quality of life for all New Yorkers. PlaNYC brought together over 25 City agencies to work toward the vision of a more sustainable city. Among the most noteworthy of the Plan's objectives were those focused on transportation, including implementing the BRT corridors identified in the joint study.

Project Planning

The M15 was selected for improvements based on high ridership, the slow speed of the route, and the high level of community support for the project. Development of the specific elements to be included in the project included both detailed study of traffic and parking conditions along the corridor, as well as significant public input from a Community Advisory Committee and other stakeholders. Together this produced a project that would deliver a major transit improvement while being sensitive to community concerns.

Traffic Planning

Implementation of M15 SBS involved significant changes to the operation of First Avenue and Second Avenue, particularly in locations where offset bus lanes and/or separated bike lanes were being implemented, resulting in reductions in travel lanes in certain locations. In other locations, parking was restricted through the use of curbside bus lanes. Implementing these changes required detailed analysis of traffic conditions and mitigation measures to ensure maintenance of traffic flow and curbside access needs.

Based on data collected and analyzed for this project, it became clear that the key elements required to successfully manage traffic were to accommodate turning vehicles and minimize the impact of on-street loading, particularly double-parked commercial vehicles. Turning vehicles are a particular source of interference in Manhattan, because they must wait for large volumes of pedestrians to cross the street before they can turn. The bus lane design allows for right-turning vehicles to enter the bus lane to turn right, while left turning vehicles are provided with a dedicated left-turn lane that allows for a safe crossing of the bike lane. In this manner, the turning vehicle conflicts are removed from the main travel lanes, thereby improving the efficiency of those travel lanes and compensating for the reductions in travel lanes. Similarly, the plan accommodated deliveries through Delivery Windows and increased enforcement, to decrease double parking blockages.

Station Locations

Along the M15 SBS route, there are 20 stations in each direction spaced about ½ mile (800M) apart serving communities along the route. There are five stations south of Houston Street at major activity centers. North of Houston Street, the remaining 15 stations are spaced about ten blocks apart (along each Avenue), aligned with connections to subways and most crosstown bus services and major destinations.

Community input was essential to deciding the final station locations. Since SBS makes fewer stops than the M15 Limited service which it replaced, riders were sensitive to station placement. During the planning process, additional stations were added at both 28th Street and 50th Street on First and Second Avenues to alleviate concerns about the potential lack of access to major hospitals and other community facilities. In general, SBS and Local stops were located along the same blockfronts at separate locations, but in some cases local land uses and CAC input showed that the SBS would need to be placed on an adjacent blockfront to the Local bus.

Data Collection/Analysis

While working with the public, DOT and NYCT also collected significant information about how buses, traffic, and cyclists use the M15 route, as well as on parking conditions and needs along the corridor. This information was carefully analyzed to ensure that the street changes would result in improved conditions for bus riders and cyclists, maintenance of traffic flow for all other vehicles on the street, and appropriate curb access along the corridor. Additional detail on the project elements are described below. The project plan went through environmental review through both the local (CEQR) and federal (NEPA) processes, qualifying as a Type II action and as a Categorical Exclusion with Documentation respectively.

Public Outreach Efforts

NYCDOT and NYCT established a Community Advisory Committee (CAC) for the M15 SBS, co-sponsored by the Office of Manhattan Borough President Scott Stringer. The CAC comprised all of the Community Boards (CBs) along the route, as well as all of the local, state, and federal elected officials and other key stakeholders such as medical institutions and independent community groups. CAC meetings were open to the public and were often attended by local advocacy groups and other stakeholders.

During the course of project planning, the CAC convened six times, on topics that generally followed the sequence of project planning, focusing first on introducing the concepts, then adding more detail about station locations, street design, and parking regulations. CAC meetings were also held focusing on use of the new fare collection system, and presenting initial project results.

In addition to the CAC meetings, four open houses were held along the corridor, a pair each uptown and downtown. The first set of open houses (March 2010) provided an opportunity for general public input into the plan, while the second set of open houses (September 2010) were more focused on explaining the service to riders, particularly in terms of how to pay their fares. Beyond these formally organized outreach efforts, the project team participated in a number of other outreach efforts, including presentations to CBs, and direct outreach to businesses and local institutions (such as hospitals), for a total of 37 community meetings between May 2009 and June 2011.

List of Community Advisory Committee Meetings

CAC Meeting 1: Project Introduction (May 2009)

CAC Meeting 2: Proposed Station Locations (September 2009)

CAC Meeting 3: Proposed Street Design (January 2010)

CAC Meeting 4: Proposed Parking and Curb Regulations (April 29, 2010)

CAC Meeting 5: Construction Update, and How To Ride SBS (September 2010)

CAC Meeting 6: Performance Update, Traffic, Bicycle and Pedestrian Data After Implementation (April 2011)

Project Timeline



2006: NYC BRT study selects First and Second Avenues as one of five BRT corridors for further development

2007: PlaNYC, New York City's Sustainability Plan, advocates improvements to the bus network focusing on BRT

2008: First and Second Avenues identified as next SBS corridor for implementation

2009:

- May 2009:** Community Advisory Committee meeting #1
- June 2009:** Tour of Fordham Road SBS for CAC members
- September 2009:** Community Advisory Committee meeting #2
- December 2009:** Meeting with Community Board 1



2010:

- January 2010:** Community Advisory Committee meeting #3
- February-March 2010:** Meetings with Community Boards 3, 6, 8, and 11
- March 2010:** Public Open Houses
- April 2010:** Community Advisory Committee meeting #4
- June 2010:** Road resurfacing begins, additional meetings with Community Boards 6, 8, and 11
- Spring-Summer 2010** - Door to door outreach to businesses along the corridor to understand loading needs
- September 2010:** Second round of Public Open Houses, Community Advisory Committee meeting #5
- October 2010:** Current Street Design complete
- October 10, 2010:** M15 Select Bus Service launch

2011:

- April 2011:** Community Advisory Committee meeting #6

2011-2012: Installation of bus bulbs, transit signal priority and additional pedestrian and bike improvements; continued community outreach through Community Advisory Committee meetings, Community Board presentations, and public open houses.

M15 Select Bus Service Elements

Transit Improvements

Bus Lanes

For the M15 SBS, two types of bus lanes were implemented: offset bus lanes and curbside bus lanes (locations shown in Figure 2). Bus lanes are painted terra cotta red, and are identified with overhead gantry-mounted signs, as well as supplementary signs mounted on signal mast arms and at the side of the road.

Offset bus lanes are located in the second lane from the right curb of each avenue and are in effect at all times. This arrangement preserves curbside parking or loading activity on the right side of the street, but requires reserving a travel lane exclusively for buses.

Curbside bus lanes are typically in effect from 7:00am-10:00am and 2:00pm-7:00pm; the 10:00am-2:00pm period is reserved for commercial vehicle loading in most locations. This arrangement restricts curb activity, but does not require a reduction in travel lanes.

For both types of lanes, non-bus vehicles are typically allowed to enter bus lanes to make the next available right-turn, to quickly pick-up/dropoff passengers, or to access a parking spot or driveway.



Figure 2: Photo of First Avenue, showing parking-protected bicycle lane, pedestrian refuge island, three general traffic lanes, and offset bus lane maintaining curbside parking

Off-Board Fare Collection

On the M15 Limited that SBS replaced, 23% of travel time was devoted to passengers boarding and alighting from the bus. This time could be particularly frustrating to passengers, as boarding passengers could only use the front door single file, and therefore needed to wait as others would dip their MetroCard or count out their change. The success of the off-board fare collection pilot on the Bx12 SBS showed that this change significantly reduces the amount of dwell time on busy routes, like the M15.

Under the proof-of-payment system, riders pay their fare before boarding, using MetroCard or coin fare machines located at each station to obtain a receipt. A typical station has two fare machines that accept MetroCards, as well as one fare machine that accepts only coins. When the bus arrives, riders can then board the bus through any of the three doors, and do not need to interact with the bus operator while boarding. The bus can therefore load and leave significantly faster. Overall, dwell time on the M15 SBS was reduced by 40% thanks to the new payment system.

Enforcement of the payment system is performed by NYCT security personnel, known as the "Eagle Team". These employees, who are not peace officers, are a dedicated force devoted to fare inspection. The fare inspectors patrol the SBS route—usually in teams—and ask riders to show their proof of payment receipt. Any rider without a receipt is subject to the standard \$100 fare evasion fine. As with any proof-of-payment system, inspectors are strategically deployed in a way that makes the potential penalty real to riders. As of Oct 1, 2011, NYCT Security had issued 11,662 summonses on M15 SBS, as well



Bus Lane Improvements

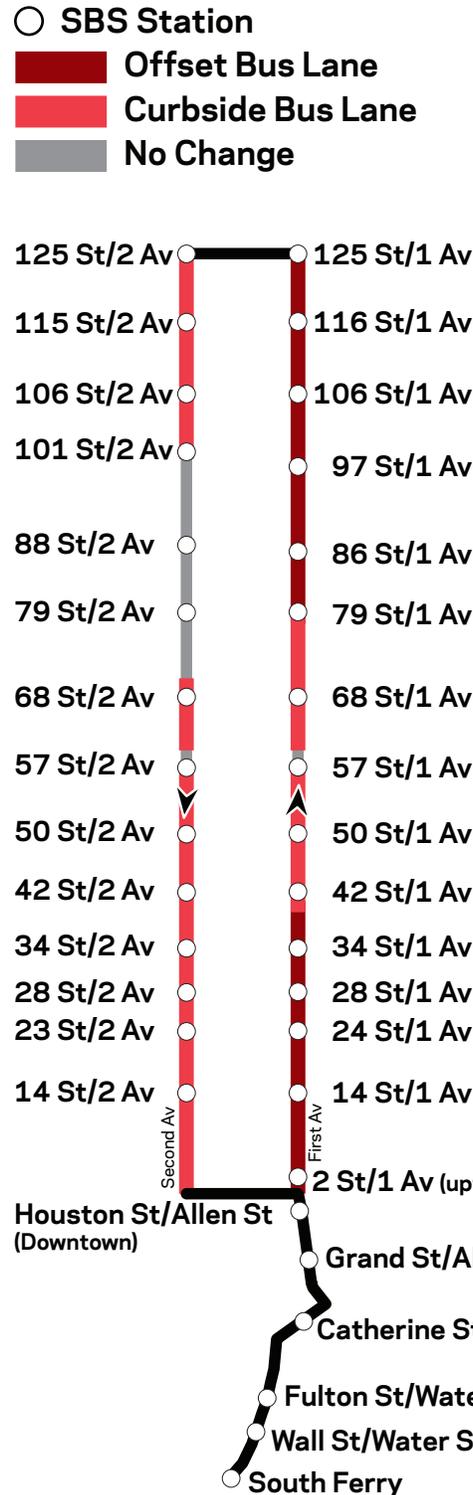


Figure 3: Bus Lane Improvements along First and Second Avenues



as 10,129 warnings—in addition to 70,000 instances where they provided assistance to help riders better understand the system.

Observations made on M15 buses prior to implementation indicated that 6.7% of all riders were evading the fare. When post-implementation fare evasion studies were conducted in spring 2011 it was found that the M15 SBS has a fare evasion rate of 4.2%, showing that the proof-of-payment system has improved payment compliance.

Simplified Service Pattern

SBS service operates uniformly between East 126th Street in Harlem and South Ferry, with the exception of a limited number of bus trips that attend their trip at Houston Street, primarily to maintain frequent and dependable northbound service through the morning peak period.



Bus Lane Cameras

In the summer of 2010, the New York State Legislature authorized NYCDOT and NYCT to begin using video cameras to help enforce bus lanes along SBS routes. Previously, bus lane enforcement could only be performed by the NYPD, which has multiple critical priorities even within its Traffic Enforcement division, and is not always able to focus on keeping bus lanes clear. The authorizing legislation allows cameras both in fixed locations and on mobile units. Beginning shortly after SBS service began, NYCDOT began installing cameras at fixed locations along First and Second Avenues. Over the first several months, cameras were adjusted to be able to see more of the block, and by June 2011 more than 7,000 summonses per month were being issued by the camera system.

NYCT has piloted cameras for bus lane enforcement using both bus-mounted cameras, and mobile cameras mounted on cars. NYC traffic rules allow expeditious pickups and dropoffs of passengers in bus lanes, so the mobile cameras need to observe the same vehicle in the same location multiple times to issue a violation. The combination of static pole-mounted cameras, cameras on buses and cameras in mobile units have issued over 30,000 violations as of July 2011. This automated enforcement helps reinforce the clear message that bus lanes should be kept clear for buses.

Enhanced Stations

At launch, SBS stations featured new Cemusa bus shelters and on-street MetroCard and coin machines. Informational materials in both English and Spanish have subsequently been installed on the shelters and machines to aid in wayfinding and the off-board fare payment process. In Chinatown, information on how to use the SBS is provided in Mandarin.

As a forthcoming part of the project, bus stations will be installed that extend the sidewalk out to meet the offset bus lane at twelve locations (known as bus bulbs). Shelters and fare machines may be relocated to the bulbs, providing additional waiting space for passengers waiting for SBS, and reducing conflicts between bus riders and other sidewalk users. The stations will also convey a sense of permanence to Select Bus Service. Because of the complexity involved in widening sidewalks while ensuring proper drainage, it was not possible to build these sidewalk extensions as part of the initial SBS implementation. Installation of bus bulbs is expected to be completed in 2012 at all twelve locations.



New Buses

For the M15 SBS, NYCT purchased new low-floor articulated buses. These were not only the first low-floor articulated buses used in New York City, but were also the first buses to include a third set of doors to help speed passenger flows. These buses are also quieter, provide a smoother ride, and get 20% better fuel mileage than the older articulated buses that they replaced.

Branding

The development of BRT in NYC led to the creation of the distinct SBS brand. This unique brand initially developed for the Bx12 SBS was carried over to the M15 SBS in Manhattan. All branded elements including stations, bus interiors/exterior, fare machinery, bus stops and customer information carried the unique SBS brand with unifying colors and logos. A particular success from the Bx12 SBS repeated on the M15 SBS was the inclusion of flashing blue LED lights on the front of the buses, which allow the buses to be seen from a long distance. This strong brand identity helps riders to be readily able to identify and use M15 SBS service in Manhattan.

Improved Customer Service Information

Customer service improvements are one of the chief methods used to differentiate SBS from other NYCT bus services. Currently comprehensive fixed bus information is available at every SBS station including first and last bus arrival times, simple strip maps, and information on how to use the proof-of-payment system. Additionally, NYCT is developing BusTime, a real time bus information system, which will offer web-based and SMS-based on-demand bus location information. Once this service is fully tested, it will be implemented on the M15 SBS.

Transit Signal Priority

First Avenue and Second Avenue are both one-way streets, which allows a strong signal progression or "green wave" that allows the bus to continually have green lights as long as it keeps up with traffic, helped by the bus lanes. This passive priority is fully pre-timed, and is unrelated to the presence of buses. At a number of locations, more time was allocated to First Avenue and Second Avenue by removing left turn phases from crosstown streets (and banning those turns, which is also expected to improve pedestrian safety). South of Houston Street, where strong signal progression is not possible, active transit signal priority technology will allow buses to communicate with upcoming traffic signals to shorten red or extend green signals to keep buses moving. This enhancement is expected to be implemented by early 2012 using a new wireless system.

Complete Streets Elements

In addition to the elements designed to improve the speed and reliability of buses, implementation of the M15 SBS included a number of elements designed to improve conditions for other users, as well as to complement the Select Bus Service.

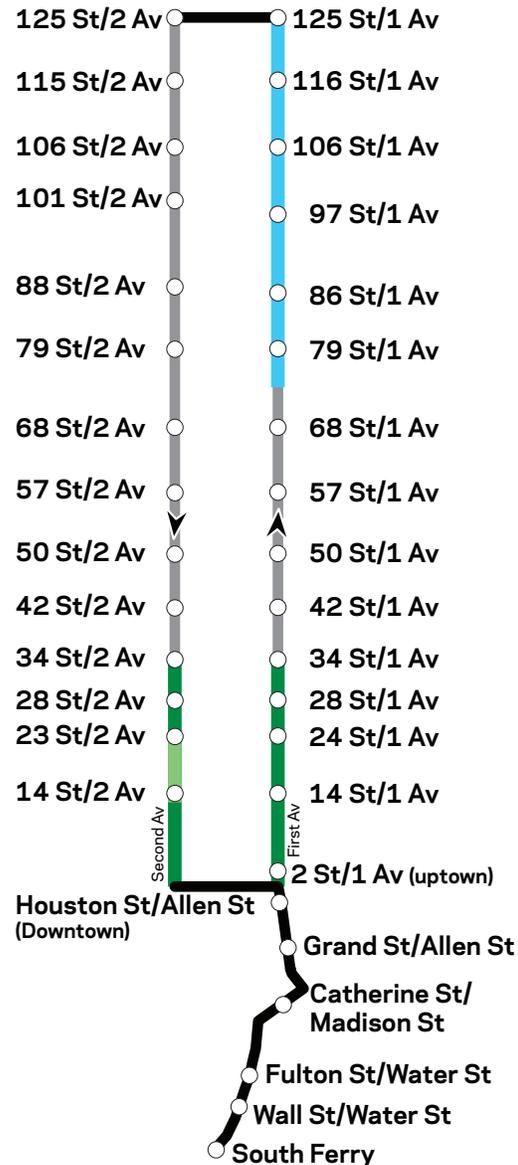
Bicycle Routes

A key element of SBS implementation was to add bicycle paths and lanes to First Avenue and Second Avenue, as part of the overall expansion of the bicycle network. Over half of the bicycle lanes implemented on the SBS corridor in the fall of 2010 were parking protected bicycle paths, where the bicycle facility is located on the left side of the street, between parked cars and the sidewalk. This “floating” parking lane creates a physical barrier between the moving lanes of traffic and the bicycle lane, providing a much more comfortable riding environment. At intersections where left turns are allowed, a “mixing zone” is created, where parking is restricted to provide visibility between bicycles and turning vehicles and where left turning vehicles and bicycles come together at a low speed to cross each other as necessary. The mixing zone also removes those left turns from the flow of traffic. This configuration was installed on First Avenue from 1st Street to 34th Street, and on Second Avenue between 34th and 23rd Streets, and between 14th and Houston Streets. In other locations, buffered bike lanes were installed or enhanced along both avenues (see Figure 3).

As part of the project development, bicycle routes were planned for the full length of First and Second Avenues. In the summer of 2011, bicycle improvements were extended as far uptown as 59th Street on both avenues, with new protected facilities on First Avenue between 34th and 46th Streets. The remainder of the bicycle facilities on both avenues—primarily consisting of additional protected lanes—will be constructed in forthcoming years.



2010 Bicycle Lane Improvements



- Protected Bike Path
- Buffered Bike Lane
- Curbside Bike Lane
- No Change

Bicycle Lane Improvements along First and Second Avenues in 2010

Pedestrian Islands

Implementation of the protected bicycle lanes also creates an opportunity to construct pedestrian safety islands, in line with the “floating” parking lane. These islands improve pedestrian safety by reducing the crossing distance of these wide avenues, and also create a location to plant trees. Pedestrian islands were constructed at intersections along First Avenue from Houston Street to 34th Street, and also on Second Avenue from 34th Street to 23rd Street, where street width allows.



Delivery Windows

Many businesses in Manhattan do not have loading docks and must get deliveries through their front door. One of the advantages of offset bus lanes is that they maintain space at the curb for loading and parking throughout the day; however, this is not possible where bus lanes are located at the curb. Based on experience with the initial Bx12 SBS in the Bronx, as well as discussions with businesses in Manhattan, Delivery windows were implemented in locations with curb bus lanes where curb delivery is required. Under this system, the bus lanes are in effect from 7:00am-10:00am and 2:00pm-7:00pm on weekdays, with the curb lane reserved for commercial loading from 10:00am-2:00pm. This system creates dedicated loading space over a span of time sufficient to allow most loading activities to take place. This is also during the time when traffic volumes and transit ridership are relatively lower, between the morning peak period and the beginning of after-school travel. This system creates a balance between the need to improve bus mobility and the need to maintain curb access for local businesses.

Project Launch

Although the Bx12 SBS had been operational for over two years when M15 SBS was implemented, most riders in Manhattan were unfamiliar with the Bronx route and had never ridden on SBS. Therefore it was crucial that comprehensive rider outreach be done prior to initiating service. Having both riders as well as NYCT employees understand the service was the key to a successful launch.

Customer Ambassadors

The Customer Ambassador program consisted of a team of NYCT and NYCDOT employees stationed at each SBS station for the first three weeks of service. These ambassadors assisted riders in all aspects of using the service, with a focus on explaining the new fare payment system to riders.

Initial Enforcement

At the start of the service, it was essential that riders fully understood all phases of the off-board fare collection system. To accomplish this, NYCT Security worked to educate customers and during the first weeks, only warnings were issued to M15 SBS riders who boarded without paying the fare.

Since bus lane cameras were not yet operational, NYPD was initially responsible for bus lane enforcement; NYPD conducted an enforcement blitz for the first month of service, and repeated the blitz in January 2011. NYPD aggressively issued both parking and moving violations to establish the clear bus lane, and to make sure that private vehicles would leave the bus lane clear for the SBS service.

As a result of these initial enforcement activities, both SBS riders and vehicle operators have been made aware of how the system operates, and compliance rates have remained high.

Service Adjustments

Over the first two weeks of service, NYCT closely monitored service frequency, reliability, and crowding along the M15 SBS route. NYCT was able to quickly respond to the service issues that occurred as part of the initial launch through measures like adding additional buses to the route, and having some rush hour trips end at Houston Street southbound, to provide more service through Midtown. NYCT continues to closely monitor both SBS and local service along the route, and adjusts service to meet ridership demands.

Project Results

A wide variety of measures show the positive outcomes from the launch of SBS on First and Second Avenues in October 2010, based on data from the first nine months of service.

Ridership

Over the first several months of M15 SBS, ridership steadily increased, showing an increase of nearly 12% in overall M15 ridership as of July 2011 compared to July 2010. While there was a brief decrease in ridership due to heavy snow storms in January, ridership continued to grow in the successive months. M15 SBS weekday ridership is now averaging over 35,000, 42% more riders than on the previous Limited service a year previous. Increases in total M15 ridership continued while overall Manhattan bus ridership declined 5-8% in Spring-Summer 2011 compared to Spring-Summer 2010 (March-July 2010 and 2011).

M15 local ridership has been dropping as some riders transition to the SBS. M15 Local and Limited services had roughly equal ridership totals, but now 62% of all M15 riders choose the SBS.

Average Weekday M15 Ridership

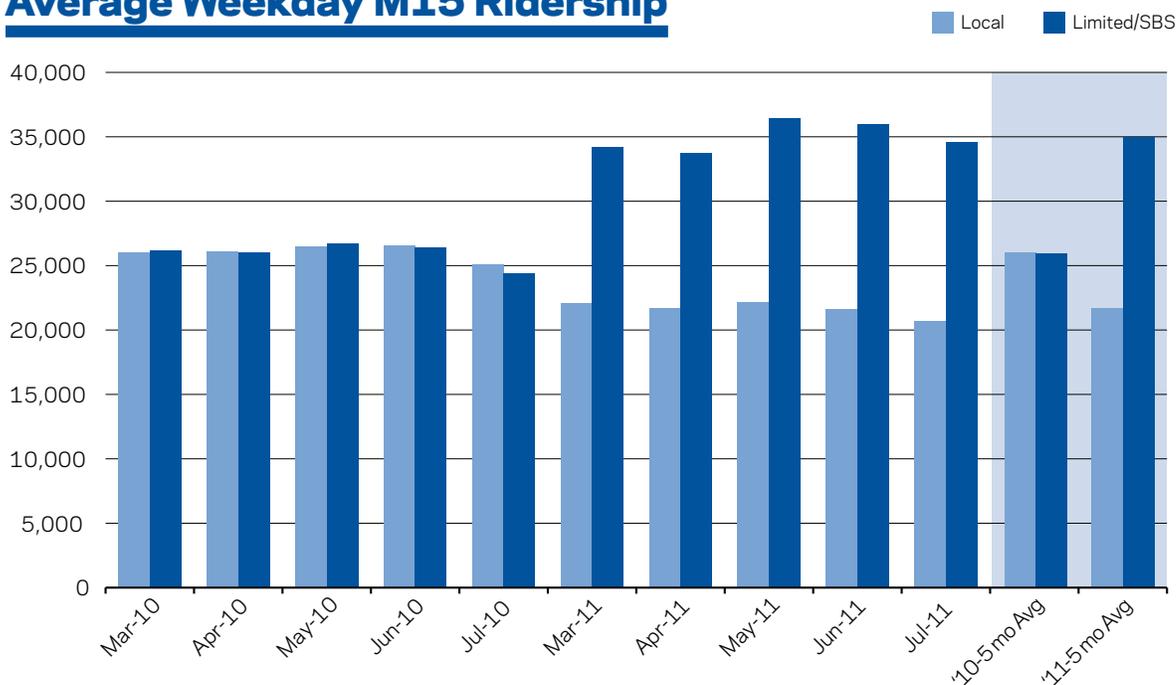
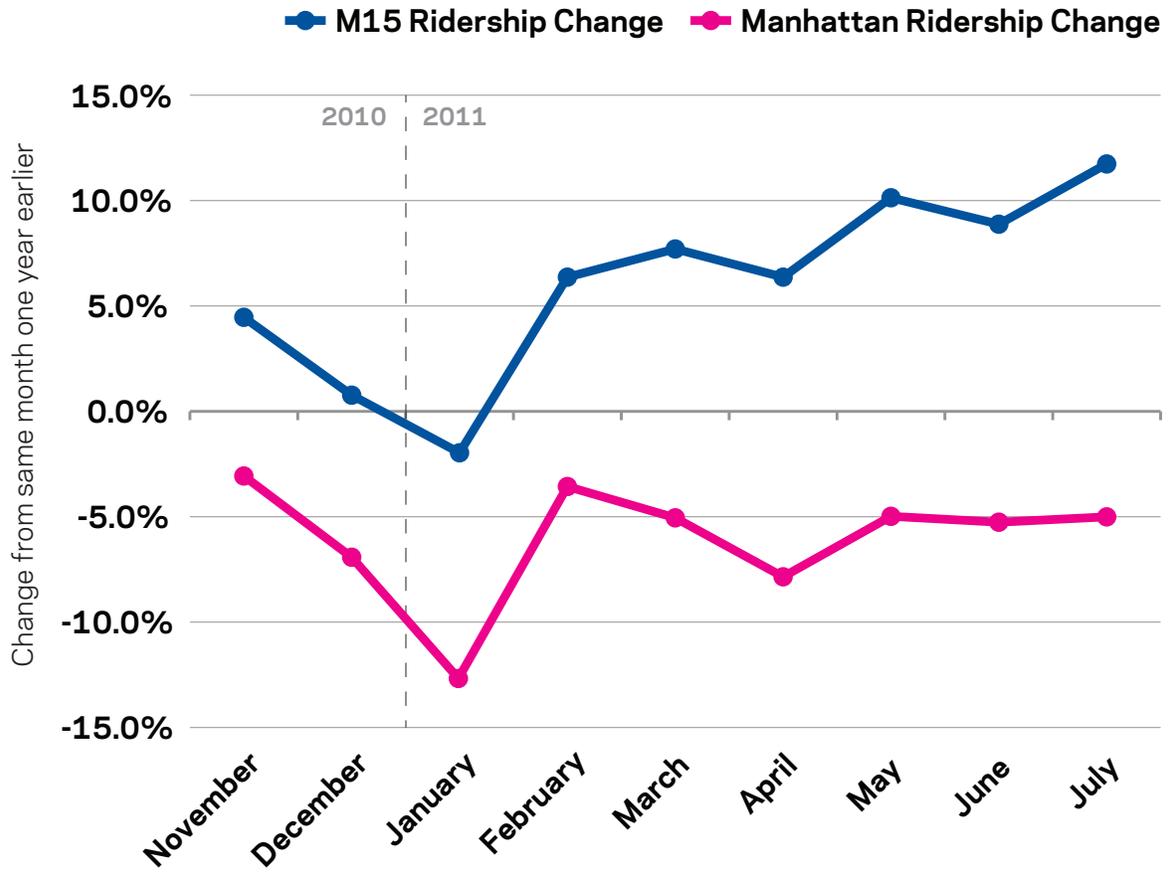


Figure 4 - M15 local, limited and SBS ridership March to July 2010 and 2011.

Manhattan Ridership



	Year	M15 Local	M15 Limited	M15 SBS	M15 Total	Change from LTD to SBS	Overall Change in M15 Ridership	Total Manhattan Bus Ridership	Change in Manhattan Bus Ridership
November	2009	25,779	26,027		51,806			528,818	
	2010	23,468		30,650	54,118	17.8%	4.5%	512,607	-3.1%
December	2009	24,403	24,218		48,621			496,182	
	2010	20,572		28,423	48,995	17.4%	0.8%	461,850	-6.9%
January	2010	24,840	25,352		50,192			509,001	
	2011	20,053		29,153	49,206	15.0%	-2.0%	444,501	-12.7%
February	2010	25,747	23,310		49,057			497,580	
	2011	20,830		31,350	52,180	34.5%	6.4%	479,844	-3.6%
March	2010	26,016	26,165		52,181			534,872	
	2011	22,036		34,166	56,202	30.6%	7.7%	507,856	-5.1%
April	2010	26,061	26,027		52,088			539,671	
	2011	21,684		33,721	55,405	29.6%	6.4%	497,319	-7.8%
May	2010	26,472	26,720		53,192			546,866	
	2011	22,143		36,440	58,583	36.4%	10.1%	519,495	-5.0%
June	2010	26,553	26,363		52,916			532,066	
	2011	21,642		35,973	57,615	36.5%	8.9%	504,093	-5.3%
July	2010	25,068	24,358		49,426			505,318	
	2011	20,672		34,556	55,228	41.9%	11.7%	480,161	-5.0%

Figure 5 - M15 Year-over-year Ridership

Bus Travel Times

SBS operates 15% faster than the M15 Limited service it replaced, reducing a one-way trip from about 81 minutes on the Limited to about 69 minutes on the SBS. During the peaks, when boardings are heavier and all bus lanes are in effect the travel time savings are approximately 18%. Figure 6 depicts the results of data collection observing travel time on M15 Limited (from April and May 2010) and SBS buses (from January and February 2011) from end-to-end in both directions.

Buses are slowed down due to a variety of operational challenges, and the **Speed and Reliability Elements** of SBS discussed above are each intended to address specific challenges. For example, the improved and extended bus lanes help to reduce in-motion time by nearly five minutes per trip (see Figure 6). Likewise, off-board fare collection helps to save almost seven minutes per trip. It is anticipated that the rollout of Transit Signal Priority in early 2012 will contribute to reductions in time spent at red lights as well.

There are notable differences in running time between M15 service heading uptown on First Avenue and downtown on Second Avenue. As shown in Figure 6, uptown running time is about 10 minutes faster than downtown running time, both before and after SBS. This variation is attributable to a variety of factors, including congestion within the Second Avenue Subway construction zone on Second Avenue (where there are no bus lanes at present) and the fact that First Avenue is generally wider than Second Avenue.

Overall, SBS has led to marked improvements in reliability relative to the Limited service it replaced. NYCT measures service reliability by conducting a wait assessment twice each year. As shown in Figure 8, implementation of SBS led to an improvement in reliability of over 10 percentage points. The wait assessment results refer to the percentage of the observed intervals between buses which are no more than the scheduled interval plus 3 minutes during peak (7 AM - 9 AM, 4 PM - 7 PM) and plus 5 minutes during off-peak (9 AM - 4 PM, 7 PM - 12 AM). Thus, the first half of 2011, 87% of the observed M15 SBS trips arrived within this interval.

M15 Limited vs. M15 SBS

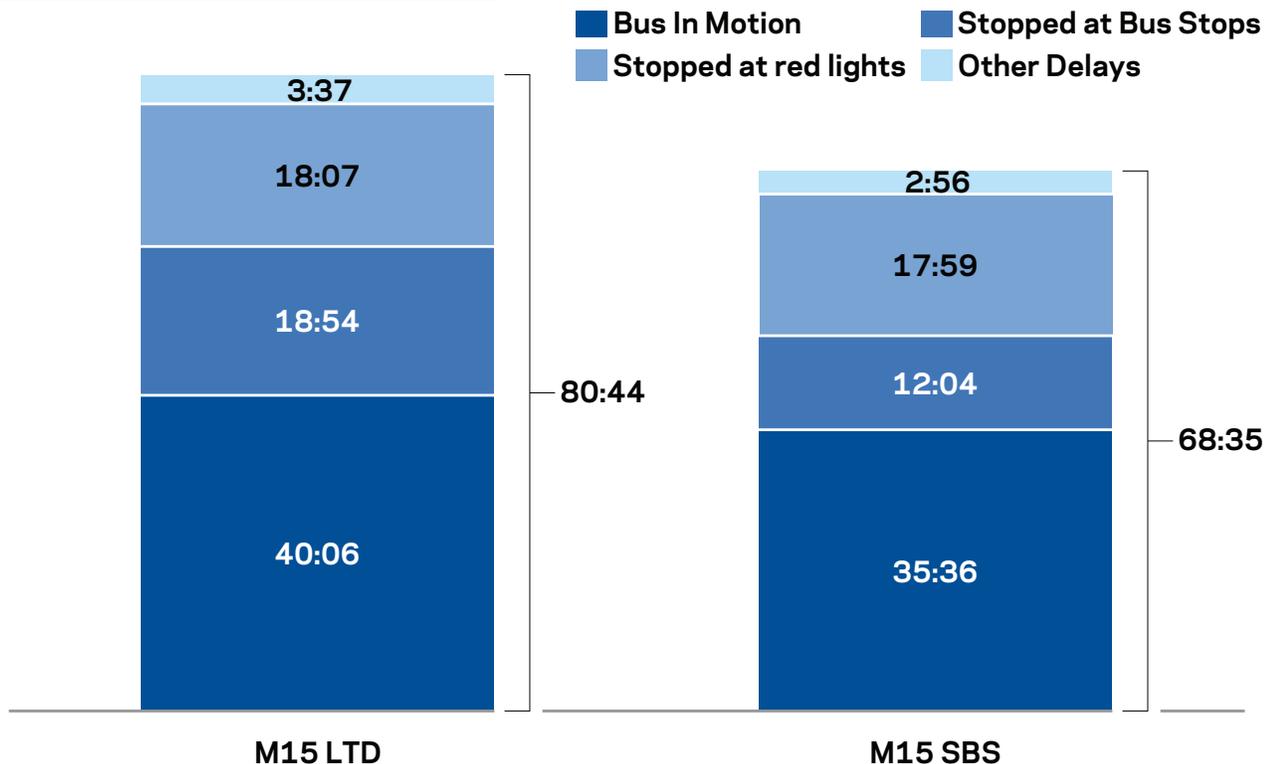


Figure 6 - Before and after comparison of M15 Limited/SBS all day running time average, showing decreases in components of overall running time. Data collected in Spring 2010, Winter 2011

M15 Limited vs. SBS Northbound and Southbound

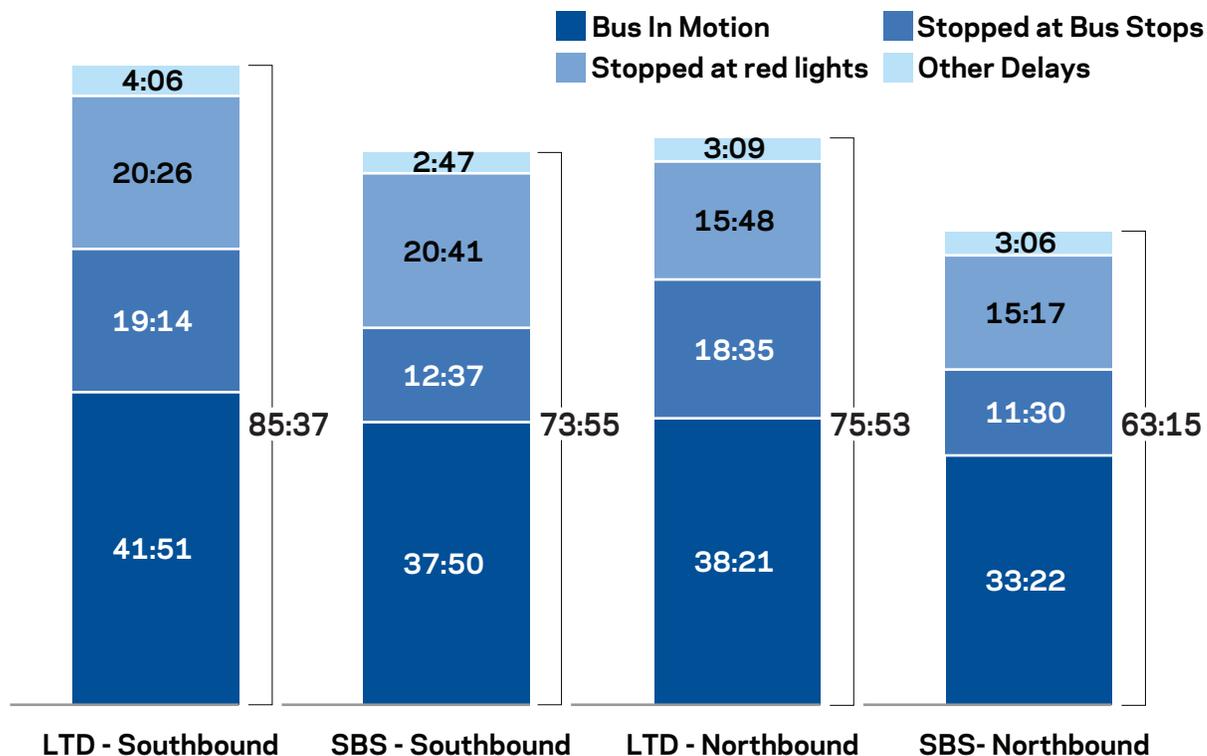


Figure 7 - Before and after comparison of M15 Limited/SBS all day running time average by direction. Data collected in Spring 2010, Winter 2011

Route	2009	2010		2011	Change from 2009 to 2011
	2nd Half	1st Half	2nd Half	1st Half	
Manhattan	81.5%	82.2%	81.0%	81.1%	-0.4%
M15 Limited	76.3%	78.9%	--	--	10.7%
SBS15	N/A	N/A	78.0%	87.0%	

Figure 8: Wait assessment data for all Manhattan buses, M15 Limited and SBS

Fare Collection

For the M15 SBS, new purpose-built weatherproof MetroCard Fare Collection machines and solar-powered coin fare collectors were installed at each SBS station. Two MetroCard machines and one coin machine were installed at most stations, but additional machines were installed at high volume stations (First Avenue/14th Street has five MetroCard machines). Both types of fare machines have been operating with great success on the M15 SBS. The availability of this machinery has been strong, with approximately 97% for MetroCard Fare Collectors, and 99% for Coin Fare Collectors available through May 2011. These machines also have wireless communications to report malfunctions and generate work orders for maintenance staff.

In response to rider demand after the launch of SBS, changes were made at selected locations to improve access to fare machines. Two additional MetroCard machines were installed at 14th Street and First Avenue, the busiest stations on the route. Also, the position of the machines on Second Avenue at 14th Street and 34th Street were reversed to face the buildings rather than the street, so riders queuing for the machines can wait safely away from the curb.

Fare Machine Availability November 2010 To April 2011

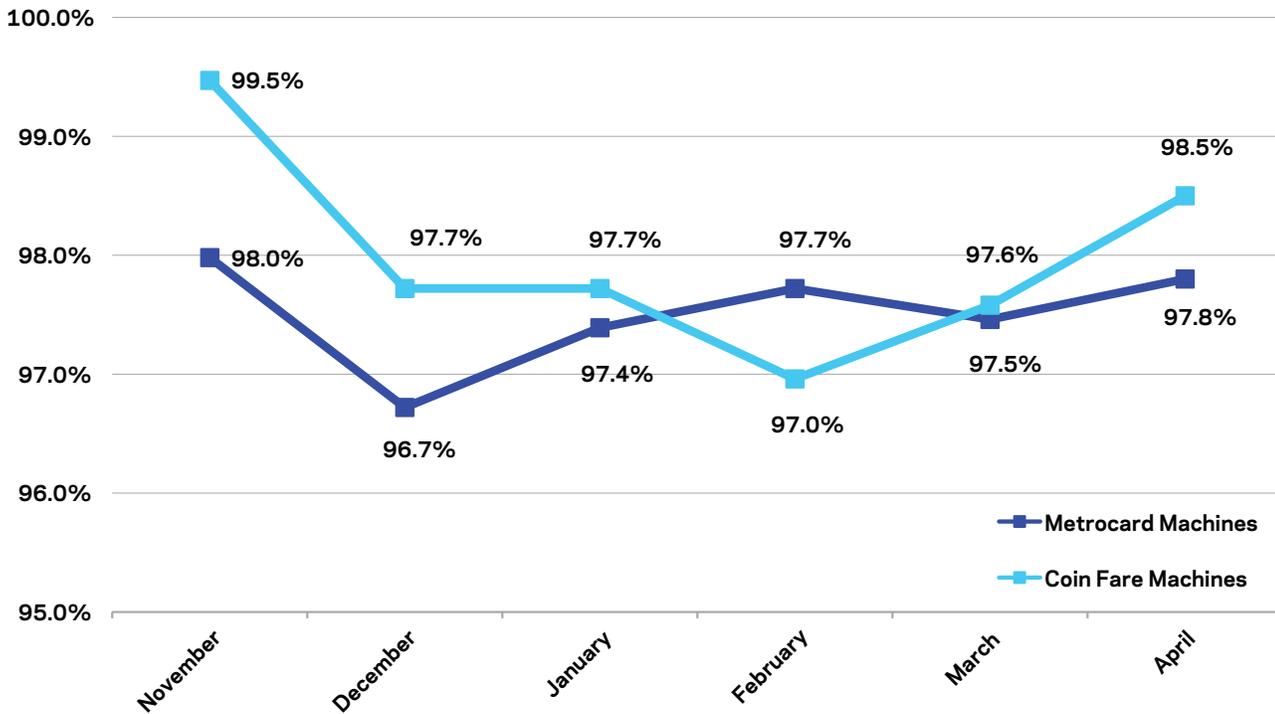


Figure 9: Fare Machine Availability November '10 to April '11

Customer Satisfaction

M15 SBS ridership has been growing and overall customer satisfaction has been very high. Customer Satisfaction studies were conducted both prior to the implementation of SBS and after its implementation to gauge and compare overall rider satisfaction. Riders who were interviewed on the SBS overwhelmingly liked the service and felt service had improved over the prior Limited stop service, while Local M15 riders were evenly divided.

Those who favored the M15 SBS cited faster rides and shorter waits. Among those interviewed on the SBS, 99% are "satisfied" or "very satisfied"; among M15 Local bus riders, this figure is 90%.

Bus Lanes

Painted bus lanes and gantry-mounted overhead are intended to clearly differentiate between general travel lanes and bus-only lanes. A comparison of sample block faces before and after red paint installation (but before the beginning of SBS service) showed that the number of vehicles driving illegally in the bus lane declined by 55%. The number of vehicles standing—the principal cause of bus lane blockage—also declined by 35%. Since the SBS launch, increased NYPD and camera enforcement has further improved adherence to bus lane rules. The result is lanes clear enough to provide real transit priority.

The terra-cotta bus lane paint has been most durable when installed on a newly-paved street. Where paint was installed on older asphalt or concrete roadways, heavy use has reduced the visibility of the paint. NYCDOT will refresh marking in most locations as needed; however the red markings will not be restored on the concrete sections of the route, where the red material adhered very poorly.

Traffic Impacts

Two data sources measure changes in traffic speed and throughput on First and Second Avenues. GPS receivers installed on every yellow cab in New York City provide a robust data set for measuring travel speeds on Manhattan avenues, since taxis comprise as much as 40% of the traffic in Midtown Manhattan. Automatic Traffic Recorder (ATR) counts were also collected before and after implementation at selected intersections to monitor traffic volumes. Taxi GPS data from November 2009 and November 2010 showed minimal change on both avenues, with the most significant speed gains arising on First Avenue between Houston and 34th Streets, where offset bus lanes and protected bicycle facilities were installed (see Figures 12 and 13). ATR counts from June 2009 and April 2011 showed little significant change in traffic levels at most intersections. Traffic flow was maintained despite the reduction of moving lanes along many stretches due to better traffic organization, including reducing illegal parking, and providing turn lanes in the bus and bike lane designs.

Average Speeds on First Avenue

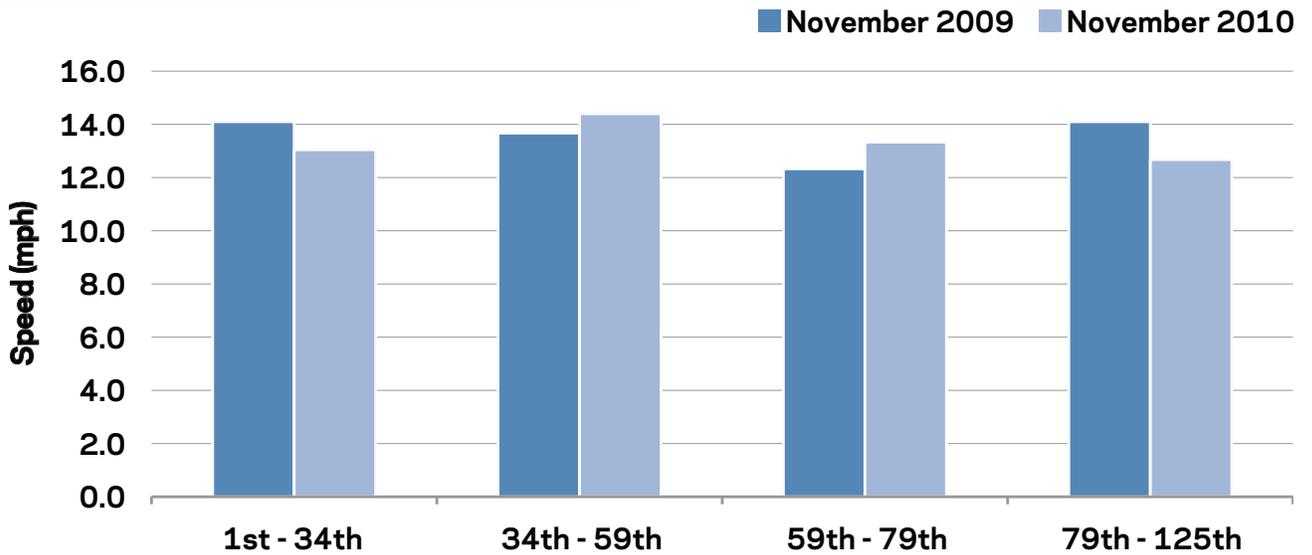


Figure 12: Average Speeds from Taxi GPS data on First Avenue

Average Speeds on Second Avenue

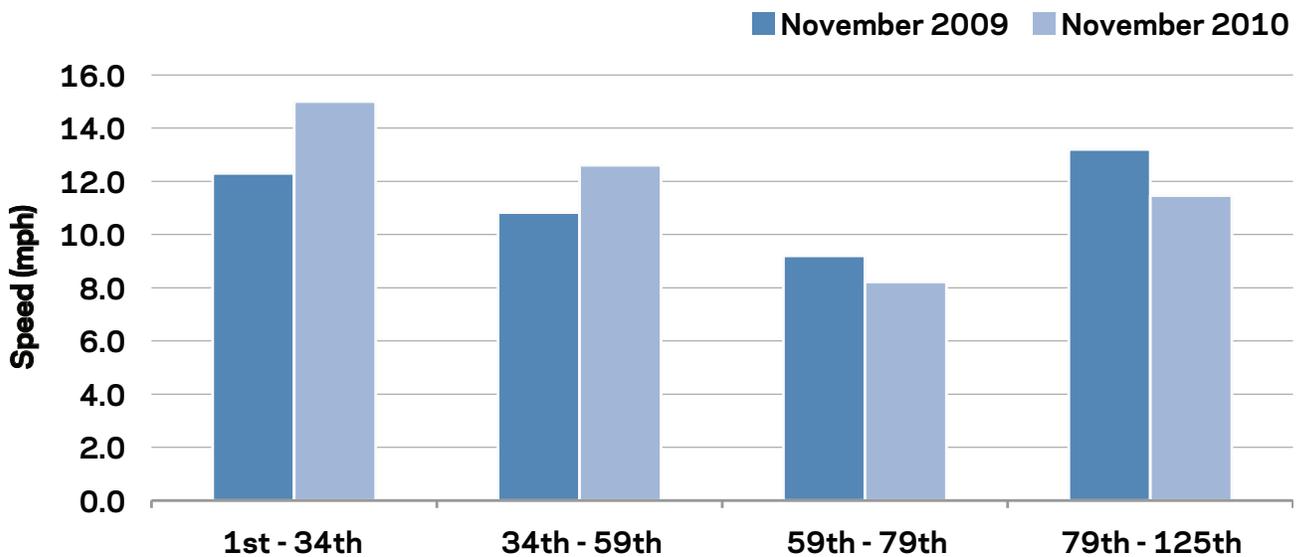


Figure 13: Average Speeds from Taxi GPS data on Second Avenue

First Avenue Traffic Volumes



Figure 14: Traffic volumes at selected locations on First Avenue

Second Avenue Traffic Volumes

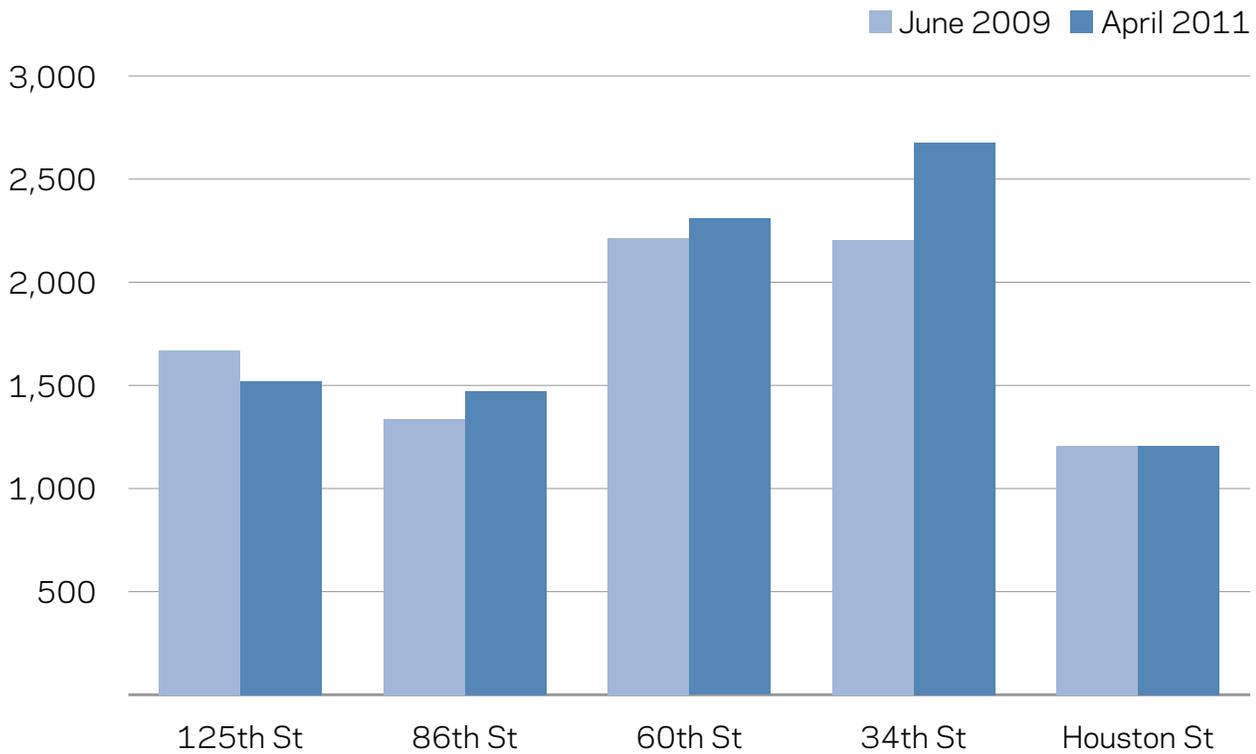


Figure 15: Traffic volumes at selected locations on Second Avenue

Road Safety

Pedestrian refuge islands were a key design component of the effort to improve safety for pedestrians, cyclists and motorists as part of the SBS project. These concrete islands were installed on blocks with protected bicycle lanes in order to define the floating parking area and shorten pedestrian crossing distances. Additionally, the protected bicycle lanes themselves helped to give cyclists a safe space to ride, minimizing their conflicts with other vehicles. Preliminary results show that these features led to marked decrease in crashes and injuries in the area where the full package of improvements was installed, comparing December 2010 through June 2011 against the same months from the three previous years. Note: construction of pedestrian refuge islands for the bicycle lane was completed in the middle of November 2010, so data for the “after” period begins in December 2010.

	Before		After (7 months)	Percent change
	Total Before	Average per 7-month period		
Crashes	2,064	688	640	-7%
Crashes with injuries	391	130	117	-10%
Total Injuries	444	148	127	-14%

Figure 11: Safety Data on First and Second Avenues from 1st Street to 34th Street
Before Period: 12/1/2007-6/30/2008, 12/1/2008-6/30/2009, 12/1/2009-6/30/2010
After Period: 12/1/2010-6/30/2011

Bicycle Ridership

The protected bicycle paths installed as part of the SBS project have stimulated significant bicycle ridership gains in the corridor. Once a month NYCDOT counts bike activity at four locations along First or Second Avenues, in areas that received protected bicycle lane upgrades in 2010. These counts are collected from 7 AM to 7 PM on a single weekday in clear weather. Calculating the average of these monthly counts from April through October 2010 and the same months in 2011, Figure 10 shows that these lanes have generated a year-over-year increase ranging from 18% on Second Avenue between East 33rd and East 34th Streets to 177% at First Avenue between St. Marks Place and East 9th Street.

Location		April to Sept. 2010 Average Bicycle Count	April to Sept. 2011 Average Bicycle Count	Percent Change
First Avenue	Between St. Marks Place and East 9th Street	787	2,183	177%
	Between 33rd and 34th Streets	740	1,004	36%
Second Avenue	Between St. Marks Place and East 9th Street	1,226	1,883	54%
	Between 33rd and 34th Streets	967	1,141	18%

Figure 10: Bicycle counts comparison: April-September 2010 to April-September 2011

1 Typically, NYCDOT does not report less than one year’s worth of safety data after the implementation of a project, due to the potential for a small sample size.

Next Steps

As described above, two important elements of the M15 SBS project are yet to be implemented. Bus bulb stations extending from the curb will be installed at twelve locations along First and Second Avenues to improve the rider convenience at these stations; these bulbs will be installed by fall 2012. Additionally, NYCDOT and NYCT will implement active TSP on the portion of the route south of Houston Street, further improving the speed and reliability of the service.

Bicycle facilities were extended farther north to 59th Street on both avenues in the summer of 2011, and further buildout of the bike lane network on these avenues is slated for upcoming years.

NYCDOT and NYCT are moving forward with additional BRT initiatives, including the remainder of the SBS program shown in Figure 1. Additionally, In 2010, DOT and NYCT released a study of additional transit needs around the city that would be well served by SBS; additional corridors will be implemented over time, further expanding the benefits of SBS treatments in New York City.

Acknowledgment

The M15 Select Bus Service project was possible only through the hard work of the operational staff at MTA New York City Transit and the New York City Department of Transportation. Additionally, the strong public input from the CAC and other groups was critical in helping find solutions to make the project a success.



