

## *ANATOMY OF A ROUTE*



# **Reducing Delays on the B41 Bus**

Prepared for  
Transportation Alternatives  
NYPIRG Straphangers Campaign

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## Summary

The B41 Limited on Flatbush Avenue between Downtown Brooklyn and the Kings Plaza mall is one of the slowest bus routes in Brooklyn. Long travel times are produced by:

- Traffic congestion around Atlantic Terminal and the Junction and within the Kings Plaza bus terminal.
- Long dwell times at major transfer points, as numerous passengers board the bus.
- An excessive number of closely-spaced, lightly used bus stops on Livingston Street and near Kings Plaza.

The following steps address the problems on the route and would improve travel speeds and reliability of service:

- Add a bus lane on Flatbush Avenue between Livingston Street and 5th Avenue, in effect inbound between 7 a.m. and noon and outbound between noon and 7 p.m.
- Add a bus lane on Flatbush Avenue in the vicinity of the Junction, between Farragut Road and Avenue I, in effect throughout the day on both sides of the street.
- Increase bus lane enforcement throughout the route.
- Institute pre-boarding fare payment at the Atlantic Avenue and Nostrand Avenue bus stops.
- Reconfigure the bus parking area at Kings Plaza to allow buses to pull in more quickly.
- Replace the bus stops at Hoyt Street and Bond Street with a single intermediate stop at Elm Street.
- Extend limited-stop service from Kings Highway to Kings Plaza.
- Extend the length of certain bus stops so that buses do not need to wait to enter the stop.
- Better marking of bus lanes, bus stops and the Cadman Plaza terminus.

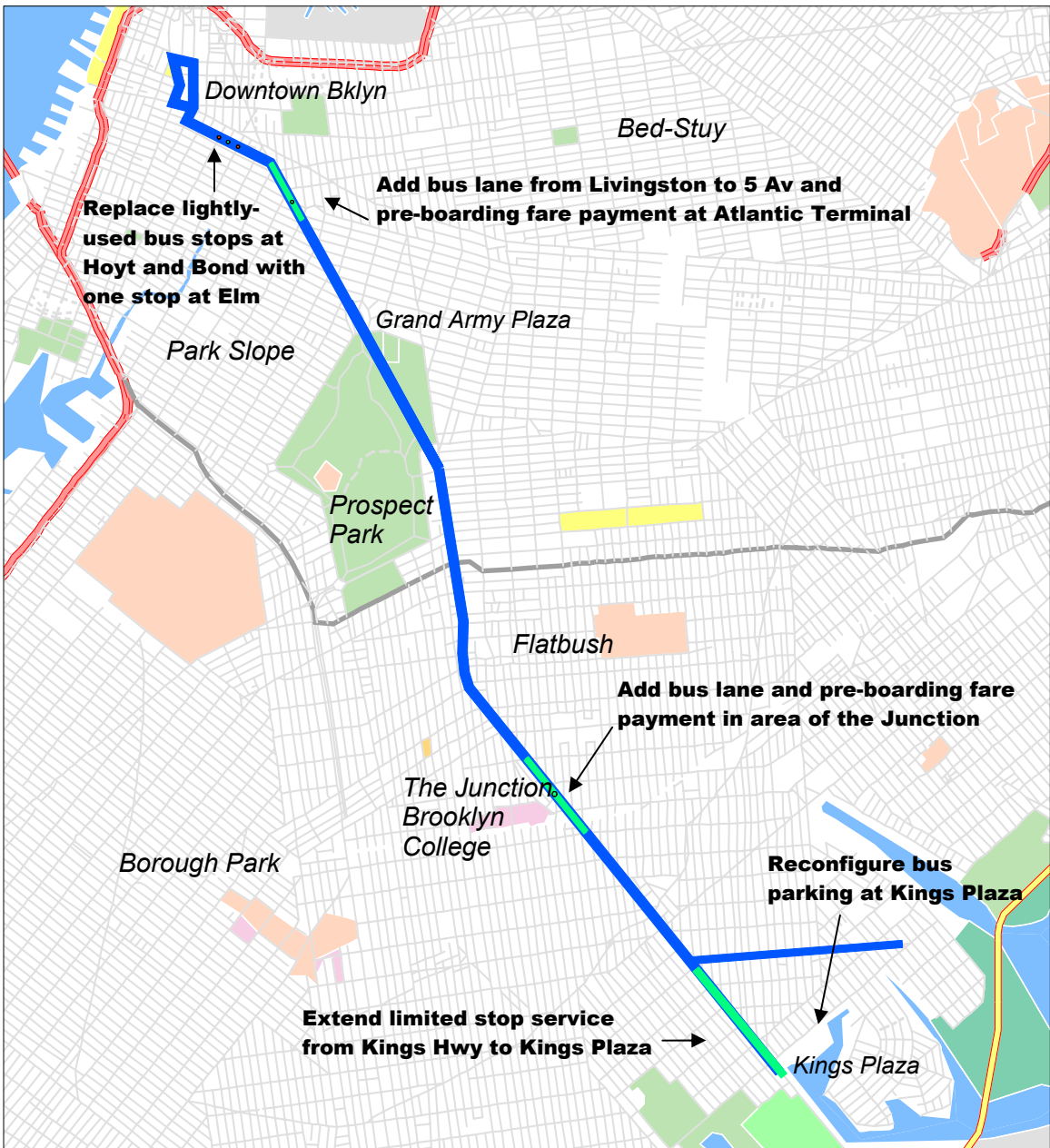
See Figure 1 on the next page.

These solutions would reduce B41 running times on the limited stop service between Downtown Brooklyn and Kings Plaza by 5-16 minutes (or 12-21%):

- Inbound travel time reduced by 5-14 minutes (from 47-69 minutes to 42-55 minutes), a reduction of 12-20%.
- Outbound travel time reduced by 7-16 minutes (from 51-74 minutes to 44-58 minutes), a reduction of 14-21%.

The variability in bus travel times would be reduced by 8-9 minutes, or by 36% to 39%.

Figure 1. Recommendations for the B41 Route



## Introduction

The B41 Flatbush Avenue bus is one of the busiest bus routes in Brooklyn and it is also one of the slowest bus routes in the borough. Local service operates at an average noontime speed of 6.3 mph. Limited-stop service is somewhat faster, but still operates at average speeds that are typically below 8 mph.

Why are B41 buses so slow? What can be done to speed them up? This report analyzes the sources of delay on the B41 and proposes solutions to address the problems.

### B41 Facts

Length of route: 7.4 miles

Peak-hour scheduled time between buses: 2 minutes overall; 4 minutes for limited bus north of Kings Highway and 8 minutes for service from Kings Plaza and Veterans Ave.

Peak hour capacity: 1,620 passengers in bound in the AM peak; 1,380 passengers outbound in the PM peak

Average passengers, 2002

Weekdays: 44,000

Saturdays: 37,000

Sundays: 22,000

The B41 loops through Downtown Brooklyn on Cadman Plaza West, Tillary Street and Adams Street, and continues along Livingston Street to Flatbush Avenue. The route then proceeds along Flatbush Avenue to Avenue N in the Flatlands neighborhood. From that point, some buses continue along Flatbush Avenue to the Kings Plaza shopping mall, while other buses turn onto Avenue N and head toward Bergen Beach. Local and limited-stop services are provided on both the Kings Plaza and Bergen Beach routes, so in fact there are a total of four B41 services.

This report focuses exclusively on the limited-stop service to Kings Plaza, because it most acutely experiences the problem of low speeds. The Kings Plaza branch carries more passengers than the Bergen Beach branch, and the passengers who choose to ride the limited-stop service are more affected by slow travel speeds because they tend to make longer trips.

To identify problems and opportunities on the B41 route, six trips were observed in detail. Observations were made in March and April 2003 during the morning and evening rush hours and in the afternoon. Three inbound and three outbound trips were observed. Each trip was observed in its entirety, between Tillary Street and Kings Plaza. Measurements were taken on how long buses spend at bus stops, at red lights and in motion. Qualitative observations were made as well regarding the specific problems afflicting the B41.

## Current B41 Opportunities

The range of observed travel times between Tillary Street and Kings Plaza was 56 to 59 minutes for inbound buses and 53 to 67 minutes for outbound buses. Table 1 shows in detail how these buses spent their time.

	<b>Inbound</b>	<b>Outbound</b>
Stopped at red lights	11-15 minutes	13-18 minutes
Stopped at bus stops	7-15 minutes	6-15 minutes
In motion	29-37 minutes	32-38 minutes
Total trip time	56-59 minutes	53-67 minutes

B41 buses spend slightly more than one-half of their time in motion. Nearly half of the time the bus is stopped, either at red lights or at bus stops. There are several opportunities to improve travel times on the B41:

- Increase the in-motion speeds of buses
- Reduce passenger boarding times at busy stops
- Eliminate lightly-used bus stops, which reduce time spent at stops and also allow buses to travel “in synch” with traffic lights.
- Mitigate traffic congestion at selected bottlenecks

Specifics of these opportunities are discussed below.

## **Problems and Solutions**

Based on the observations discussed above, specific problems were identified that are responsible for the slow running times on the B41. The recommended actions are targeted at each major problem. In combination, these actions can produce significant improvements in bus travel times. The following discussion addresses each problem and solution, beginning with issues that affect the Downtown Brooklyn portion of the B41 route.

### **1. Problem:** Buses make frequent stops along Livingston Street

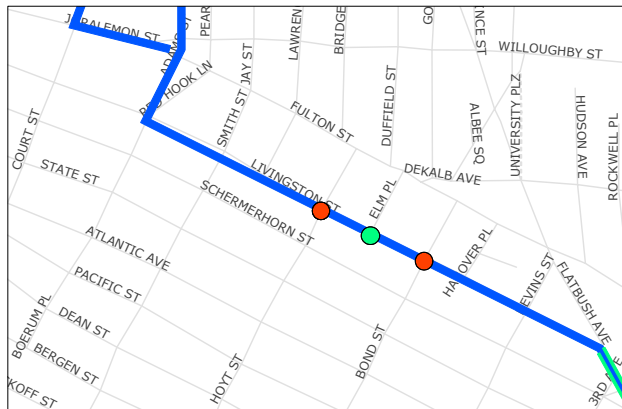
**Solution:** Replace the bus stops at Hoyt Street and Bond Street with a single intermediate stop at Elm Street

B41 buses make all local stops along Livingston Street in Downtown Brooklyn. It makes sense that buses should stop along Livingston Street because major shopping and business destinations, such as Macy’s department store, are located there. Currently, however, the B41 makes an excessive number of stops along Livingston Street – there are four stops, at Smith Street, Hoyt Street, Bond Street and Nevins Street. Stops are spaced only two short blocks apart from each other.

These frequent bus stops are a source of delay for passengers who board or exit elsewhere in Downtown Brooklyn, including passengers who board at the very busy stop on Adams Street by the Supreme Court and the Marriott hotel. Buses typically spend a total of one to two minutes at the four Livingston Street bus stops and also must travel slowly as they pull in and out of each stop.

To reduce this delay, the bus stops at Hoyt Street and Bond Street should be eliminated and replaced with a single intermediate stop at Elm Street. Typically, only a few passengers board or exit at the Hoyt Street and Bond Street stops. These few passengers would have to walk no more than one additional block to access the proposed stop at Bond Street, while the larger number of passengers traveling through Livingston Street would enjoy faster service.

**Figure 2. Replace Hoyt and Bond St. stops with one stop at Elm St.**



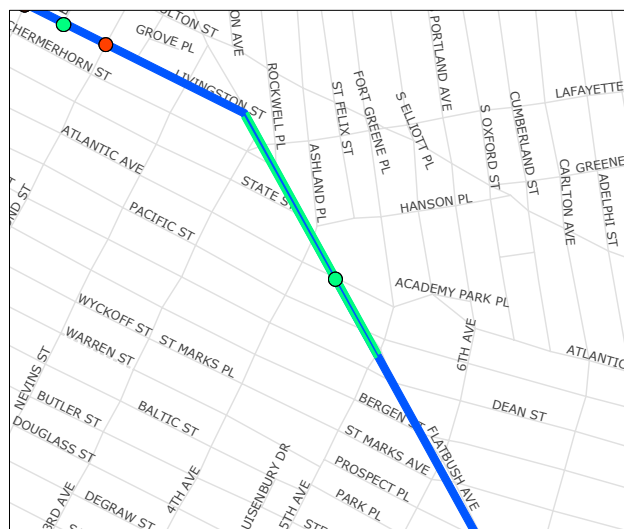
**2. Problem:** Heavy traffic congestion in the vicinity of Atlantic Terminal

**Solution:** Add a bus lane on Flatbush Avenue between Livingston St. and 5th Avenue and enforce the bus lane.

Average speeds for B41 limited-stop buses *while in motion* are between 12 and 15 miles per hour. That is to say, even when time stopped at bus stops and red lights is excluded, the buses are still quite slow. Traffic congestion along the B41 route is the main reason for these low average speeds. Congestion does not occur consistently throughout the B41 route, however. Rather, congestion is most severe at several particular locations.

One spot where traffic congestion is severe is at the Atlantic Terminal area. This is the intersection of Flatbush Avenue, Atlantic Avenue and 4th Avenue, at the site of the Atlantic Center mall and the Long Island Rail Road terminal. At its worst, the traffic backup begins on Livingston Street and extends along Flatbush Avenue to around 5th Avenue.

**Figure 3. Add bus lane and pre-boarding fare payment in Atlantic Terminal area**



Livingston Street currently has bus lanes, which are intended as exclusive congestion-free rights-of-way for buses. Currently, these bus lanes are inadequate because they do not extend through the entire congested area and because they are not well-enforced.

The Livingston Street bus lanes should be extended along Flatbush

Avenue, to 5th Avenue. Better police enforcement of the bus lanes is needed, to ensure that they are used as intended. Ticketing would discourage general traffic from using the bus lane and would encourage delivery vehicles to keep their stays as short as possible.

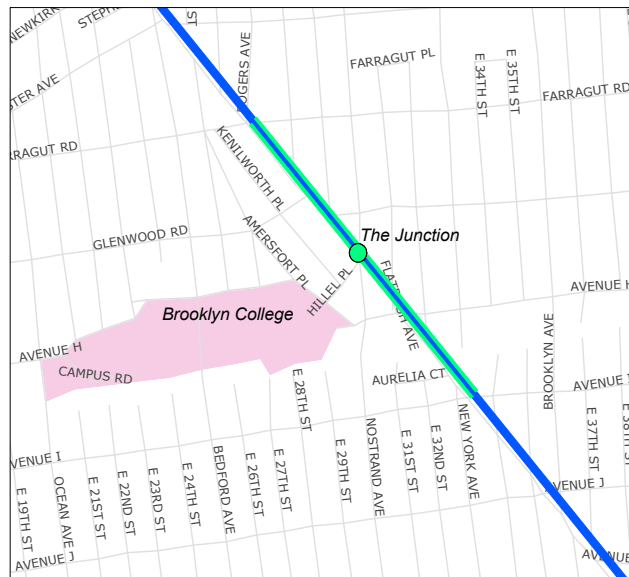
The new segment of bus lane should be in effect inbound between 7 a.m. and noon and outbound between noon and 7 p.m. The bus lane should be striped or painted a distinctive color in order to discourage other vehicles from stopping or parking in the lane.

**3. Problem:** Heavy traffic congestion in the vicinity of the Junction

**Solution:** Add bus lanes on Flatbush Avenue between Farragut Road and Avenue I, in effect throughout the day on both sides of the street

Another congested spot along the B41 route is at the intersection of Flatbush Avenue and Nostrand Avenue, commonly known as “the Junction.” This intersection of two major thoroughfares is also the site of intensive commercial activity. Traffic congestion in this area is not confined to the peak hour. Rather, congestion occurs throughout the day, especially in the afternoon, on both sides of Flatbush Avenue.

**Figure 4. Add bus lane and pre-boarding fare payment in Junction area**



A bus lane should be created on Flatbush Avenue to help buses move efficiently through this busy area. These bus lanes should extend from Farragut Road to Avenue I. There should be a bus lane on each side of the street, in effect throughout the day (e.g. from 7:00 am to 7:00 pm).

**4. Problem:** Buses stop for one to two minutes at major transfer points

**Solution:** Pre-boarding fare payment at Atlantic Avenue and Nostrand Avenue

The B41 stop at Atlantic Avenue is at the Brooklyn Terminus of the Long Island Rail Road. Large crowds of railroad passengers transfer to the bus at this stop, particularly in the morning rush hour. Similarly, the B41 stops at Nostrand Avenue is at the last stop on the 2 and 5 subway lines. Large crowds of subway passengers transfer to the bus at this stop, particularly in the afternoon and evening rush hour.



At each of these locations, it takes a long time for all of the passengers to board the bus. In the morning, buses spend more than one minute at Atlantic Avenue. In the afternoon, buses spend more than two minutes at Nostrand Avenue. In contrast, the buses typically spend about 25 seconds at most other stops on Flatbush Avenue. The long dwell times at Atlantic Avenue and Nostrand Avenue create significant delays for bus riders already on board.

Pre-boarding fare payment at Atlantic Avenue (inbound in the morning) and Nostrand Avenue (outbound in the afternoon) would mean that passengers pay their fares before boarding the bus. Customers would pay their fare at the end of the line at a portable MetroCard farebox. The “paid area” can be separated from the rest of the sidewalk with a railing parallel to the avenue and several feet from the curb. Transit employees would need to be stationed at each stop during pre-boarding operations.

With pre-boarding fare payment, passengers could board much more quickly because they do not need to stop at the onboard farebox. Passengers could board through both the rear and front doors of the bus, which would also speed up boarding. Dwell times would be reduced very substantially.

When pre-boarding fare payment is not operational, customers would line up and board in the usual manner and pay fares on the bus.

Based on observations of the time needed for on-board fare payment, we estimate that pre-boarding fare payment would reduce the time that the bus spends at these locations to 25 seconds, comparable to the time spent at most other bus stops on the route.

It would also be useful to paint bus stops a distinctive color in order to discourage other vehicles from stopping or parking in bus stops.

- 5. Problem:** Buses make frequent stops between Kings Highway and Kings Plaza  
**Solution:** Extend limited-stop service from Kings Highway to Kings Plaza, bypassing all intermediate stops except Fillmore Avenue

Limited-stop service on the B41 operates between Atlantic Avenue and Kings Highway. As noted previously, buses make all local stops in Downtown Brooklyn. Buses also make all local stops between Kings Highway and Kings Plaza, at the outer end of the route.

Between Kings Highway and Kings Plaza, there are five intermediate stops on the inbound B41 and six intermediate stops on the outbound B41. These intermediate stops serve a relatively small number of passengers. In contrast, Kings Plaza is a major source of ridership. The majority of riders on the B41 beyond Kings Highway are traveling to or from Kings Plaza. In the afternoon, buses often depart Kings Plaza almost fully loaded. The intermediate stops are a source of delay for these Kings Plaza riders.



B41 limited-stop service should be extended to Kings Plaza. Buses should bypass all intermediate stops between Kings Highway and Kings Plaza, with the exception of Fillmore Avenue. That one intermediate stop should be preserved to maintain stop spacing that is consistent with the rest of the B41 Limited. Fillmore Avenue is a good place for a limited stop also because it is a bus transfer point (the B100 crosstown bus operates along Fillmore Avenue).

Passengers who currently use the bypassed stops would have the option of walking a few blocks further to board the B41 Limited at limited stops (e.g., Kings Highway, Fillmore Avenue or Kings Plaza). Alternatively, these passengers can ride the B41 Local, which would continue to make all stops. Meanwhile, passengers traveling to or from Kings Plaza would enjoy faster service.

- 6. Problem:** Outbound buses spend over one minute pulling into the Kings Plaza stop  
**Solution:** Reconfigure the bus parking area at Kings Plaza to allow buses to pull in more quickly

Kings Plaza is the last stop on the B2, B9, B41 and B46 bus routes. A generously-sized bus parking area accommodates buses that terminate there. This parking area consists of three lanes of pavement on Flatbush Avenue alongside the shopping mall. Buses use this area for passenger drop-offs and pick-ups and for layovers between trips. Flanking this bus parking area is an oversized sidewalk and pedestrian plaza, which includes bus stops and leads directly to the mall entrance. On the other side of the bus parking area, Jersey barriers separate the buses from Flatbush Avenue traffic.

This bus parking area is convenient for passengers because all of the bus stops are located right at the mall entrance. There is ample room for passengers to wait, although there is no bus shelter and minimal signage.

The parking area is a source of delays for B41 riders because it is not used efficiently. There is no well-defined traffic pattern for buses using the parking area. Instead, buses haphazardly drive into the area and park wherever they can. (See Figure 8 on next page.) Incoming buses must often weave around other buses that are randomly parked in the middle of the area. In short, buses get in each others' way and create traffic

**Figure 5. Extend limited stop service to Kings Plaza and reconfigure Kings Plaza stop**



backups. As a result, it typically takes one to two minutes for a bus arriving at Kings Plaza to pull up to the bus stop. As noted above, Kings Plaza is a popular destination and passengers traveling to Kings Plaza are delayed as their bus struggles to pull into the parking area.

**Figure 6. Bus congestion at Kings Plaza**



The bus parking area at Kings Plaza should be reconfigured to allow buses to pull in much more quickly. A more orderly traffic pattern is needed.



One possible solution is to set up well-marked bus bays where the next bus for each service (e.g., B41 local, B41 limited, and for other routes such as the B46 and B9) would pull in to drop off and load passengers. Buses on layover would wait in a separate area. This plan would better organize bus movements and provide greater clarity for bus passengers. As part of this project, passenger amenities such as bus shelters and better signage should be installed as well. In this way, the Kings Plaza bus terminal could become a modern transit center, not just a three-lane patch of asphalt.

## **7. Other issues.**

Other improvements to the route would also improve B41 operations. For example, it would be helpful to extend the length of certain bus stops so that buses do not need to wait to enter the stop. Additional observations are needed, however, to identify locations where bus congestion is a perpetual problem. Better marking of bus lanes, bus stops and the Cadman Plaza terminus would also improve bus speeds by deterring other vehicles from using these spaces.

## Reducing Delays on the B41

How would our recommendations translate into reduced B41 running times?

A spreadsheet model was created to project time savings based on the data collected on the observed trips. The same approach used for the B41 was used for First and Second Avenue in our reports, “Bus Rapid Transit in New York City” and “Reducing Delays on the M96 Bus.”

The model predicts how B41 limited-stop buses spend their time between Tillary Street in Downtown Brooklyn and Kings Plaza. The model predicts a range of travel times of 47 to 69 minutes for inbound buses and 51 to 74 minutes for outbound buses, as shown in Table 2.

	<b>Inbound</b>	<b>Outbound</b>
Stopped at red lights	11-16 minutes	13-19 minutes
Stopped at bus stops	8-16 minutes	6-16 minutes
In motion	28-37 minutes	32-40 minutes
Total trip time	47-69 minutes	51-74 minutes

The “best” and “worst” cases presented in Table 2 are meant to illustrate typical good and bad cases, not the absolute best or worst case that ever could occur. All of the six trips actually observed fell inside the ranges in the table, because each of these trips – like most actual trips – had a mix of good and bad elements.

To model time savings from our recommendations, the following quantitative effects were assumed:

- Consolidating bus stops on Livingston Street reduces the total time spent at bus stops by 10-15 seconds. This is the amount of time that the bus typically spends at a lightly-used stop in Downtown Brooklyn.
- Consolidating bus stops on Livingston Street, extension of the Livingston Street bus lanes and improved police enforcement all help to improve average in-motion speeds. Together, these effects improve bus speeds in motion in Downtown Brooklyn (Tillary Street to Atlantic Avenue) by 1 mph for what are currently the fastest trips and by to 3 mph for what are currently the slowest trips.
- The proposed Livingston Street improvements also reduce the number of red lights that the bus encounters, by allowing the bus to travel “in synch” with traffic lights. We estimate that buses would stop at up to 2 fewer traffic lights in Downtown Brooklyn.
- Bus lanes in the vicinity of the Junction improve average bus speeds in motion on the limited-stop portion of the route (Atlantic Avenue to Kings Highway) by 1

mph for what are currently the fastest trips and by 2 mph for what are currently the slowest trips. These bus lanes also allow buses to stop at 1 to 3 fewer traffic lights by enabling buses to travel “in synch” with traffic lights.

- Pre-boarding fare payment at Atlantic Avenue and Nostrand Avenue reduces worst-case dwell times at these stops from 90-100 seconds to 25 seconds, comparable to dwell times at most other Flatbush Avenue stops on the limited-stop portion of the route.
- Introducing limited-stop service between Kings Highway and Kings Plaza allows the bus to stop at 2 fewer red lights; reduces total time at bus stops from 60-140 seconds to 25-50 seconds; and improves average speeds in motion on this portion of the route by 2 to 5 mph. With such improvements, the Kings Highway-Kings Plaza portion of the route would be comparable to the existing limited-stop portion of the route between Atlantic Avenue and Kings Highway.
- Redesigning the bus parking area at Kings Plaza reduces the amount of time that outbound buses spend pulling into Kings Plaza from 60-150 seconds to 15-40 seconds. This time is considered to be time spent “in motion.”

Overall, these improvements would reduce B41 Limited running times between Tillary Street and Kings Plaza by 5 to 14 minutes inbound and 7 to 16 minutes outbound. Table 3 shows the percentage reductions in travel times and in travel time variability.

<b>Table 3. Predicted reductions in travel time and travel time variability</b>		
	<b>Inbound</b>	<b>Outbound</b>
Reduction in Travel Time	5 to 14 minutes	7 to 16 minutes
% Reduction in Travel Time	12% to 20%	14% to 21%
Reduction in variability	9 minutes	8 minutes
% Reduction in variability	39%	36%

In sum, with the implementation of these recommendations, one of Brooklyn’s slowest bus routes could become noticeably faster and more reliable.