

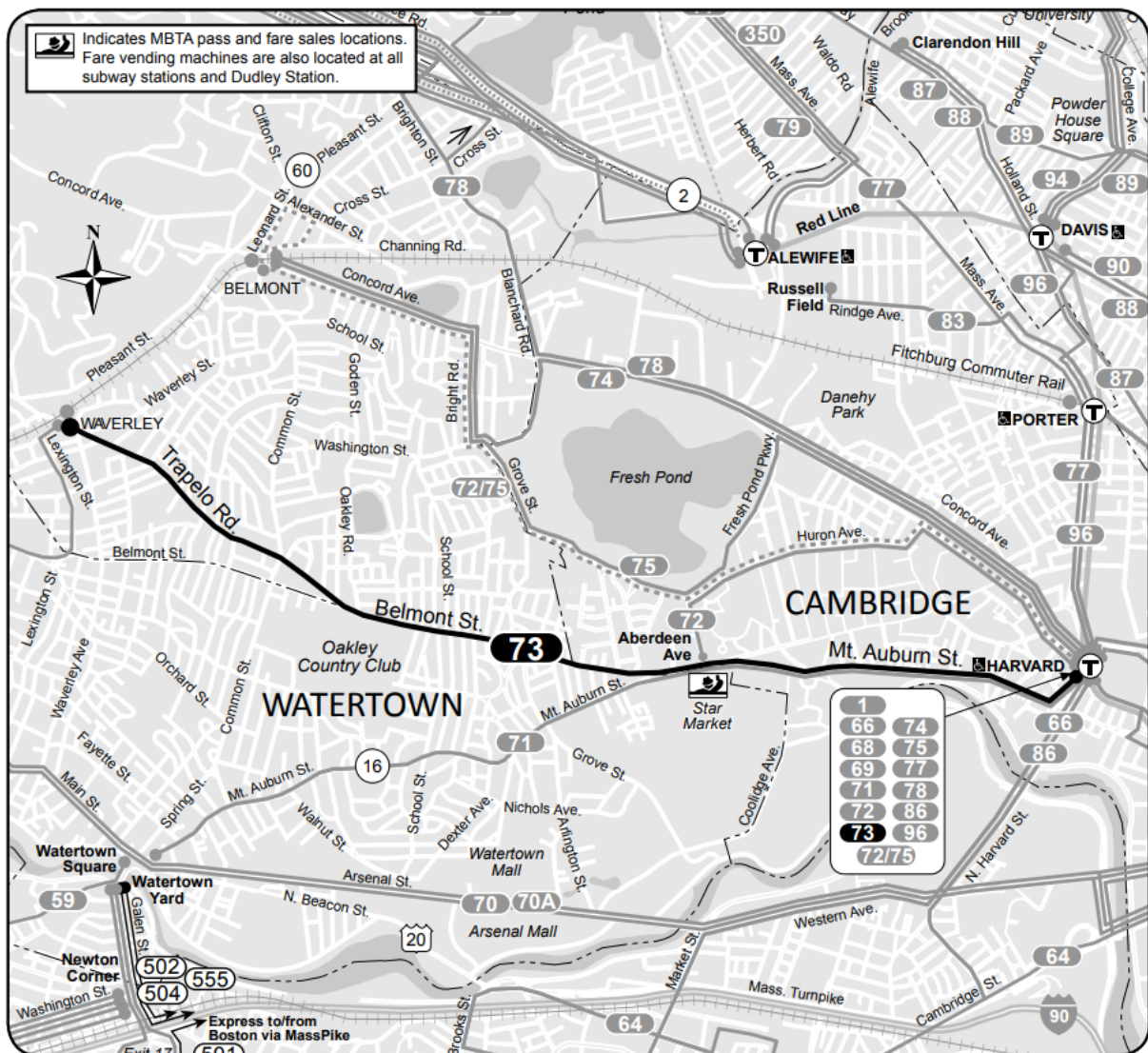
Route 73

Waverly Square – Harvard Station

Route Overview

Route 73 Waverly Square – Harvard Station is a Key Bus route that operates between Waverly Square in Belmont and Harvard Square (see Figure 1). The route operates primarily along Trapelo Road, Belmont Street, and Mount Auburn Street.

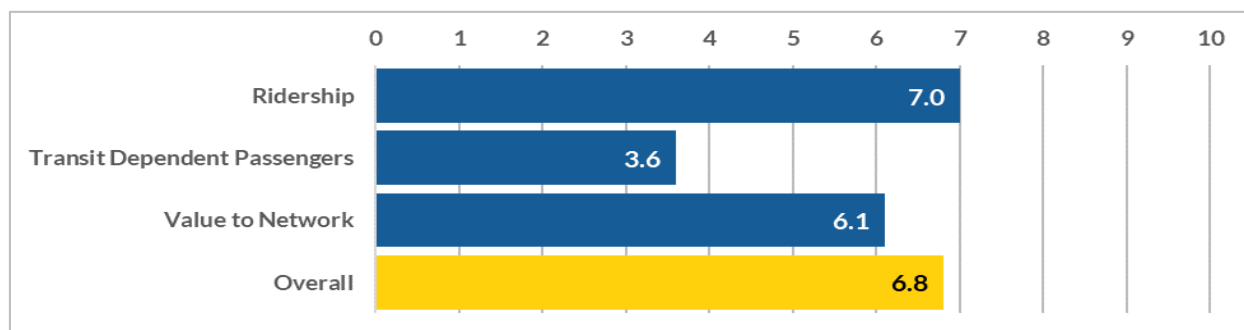
Figure 1 | Service Map



Network Importance

Route 73 is a relatively important route within the bus network (see Figure 2). On a relative scale of 0 to 10, the route rates 7.0 in terms of ridership, 3.6 in terms of transit dependent ridership, and 6.1 in terms of its value to the network (which reflects the number of people who are uniquely served, the number of jobs and other important destinations, and the number of transferring passengers). Its overall score, which gives a 70% weighting to overall ridership and a 15% weight to both other measures, is 6.8.

Figure 2 | Relative Importance within MBTA Bus Network (on a scale of 0 to 10)



Service Overview

Schedule

Route 73 provides frequent service for most of the day every day of the week. On weekdays, it operates from 5:02 AM to 1:20 AM with the following service frequencies:

- Every 17 to 21 minutes from the beginning of service through 6:00 am.
- Every five to 12 minutes in the early AM and AM peak periods.
- Every four to 15 minutes in the midday base and school periods.
- Every four to 10 minutes in the PM peak period.
- Every three to 23 minutes in the evening and late evening periods.
- Every 15 to 40 minutes during the night period, with the longer frequencies after midnight.

Table 1 | Schedule Statistics

SERVICEDAY	SPAN OF SERVICE	FREQUENCY (RANGE)	FREQUENCY (AVERAGE)	DAILY TRIPS (INBOUND/OUTBOUND)
Monday-Friday	5:02 AM to 1:20 AM			127/124
Sunrise	5:02 AM to 5:59 AM	17 - 21	19	3/5
Early AM	6:00 AM to 6:59 AM	5 - 12	9	7/9
AM Peak	7:00 AM to 8:59 AM	2 - 9	6	23/19
Midday Base	9:00 AM to 1:29 PM	6 - 15	13	20/19

SERVICEDAY	SPAN OF SERVICE	FREQUENCY (RANGE)	FREQUENCY (AVERAGE)	DAILY TRIPS (INBOUND/OUTBOUND)
Midday School	1:30 PM to 3:59 PM	4 - 15	11	14/17
PM Peak	4:00 PM to 6:29 PM	4 - 10	6	28/29
Evening	6:30 PM to 9:59 PM	3 - 20	9	23/18
Late Evening	10:00 PM to 11:59 PM	15 - 23	19	6/6
Night	12:00 AM to 1:20 AM	15 - 40	38	3/2
Saturday	4:49 AM to 1:19 AM	10 - 44	17	72/72
Sunday	6:26 AM to 1:04 AM	20 - 40	20	53/55

Note: Span of service reflects the time the first bus begins service until the time the last bus finishes service.

On Saturdays, service operates from 4:49 AM to 1:19 AM, which is a longer span than on weekdays. Service operates every 10 to 44 minutes throughout the day, with the longer service frequencies very early and very late. On Sundays, service operates from 6:26 AM to 1:04 AM, every 20 to 40 minutes throughout the day, also with the longer service frequencies early and very late.

Route 73 exceeds the MBTA's span of service guidelines, but fails to meet some service frequency guidelines:

- On weekdays, during the late evening period, some trips operate up to 23 minutes apart versus the standard of 20 minutes.
- On Saturdays and Sundays when the all-day minimum service frequency standard is 20 minutes, some early morning trips run slightly longer and the last evening trips run up to 45 minutes apart.

Note also that Route 73 uses the same alignment as Route 71 Watertown Square-Harvard Station from the intersection of Belmont Street and Mount Auburn Street to Harvard Station. The two routes operate with schedules that are very similar, but different, and as a result, the schedules of the two routes are not always coordinated.

Service Patterns

Route 73 operates fairly consistently. On weekdays and Saturdays, service is run with trackless trolleys. Pattern 73.0 makes most trips, which operate the full length of the route between Waverly Square and Harvard Station. In addition to this primary pattern, there are three other patterns

- Pattern 73.1, does not serve Cambridge Common and is interlined with Route 77.
- Pattern 73.4, short-turn that begins service on Trapelo Road at Belmont Street and is operated with diesel buses.
- Pattern 73.2 operates on Sundays with diesel buses. All trips operate between Waverly Square and Harvard Station, but operate to and from the upper busway.

Table 2 | Service Patterns

PATTERN	ORIGIN	DESTINATION	UNIQUE FEATURE	TRIPS PER WKD	TRIPS PER SAT	TRIPS PER SUN
INBOUND				127	72	53
73.0	Waverly Square	Cambridge Common (Waterhouse Street)	Serves Harvard Station upper and lower busway	103	66	-
73.1	Waverly Square	Harvard Station	Skips Cambridge Common (Waterhouse Street), service is interlined with Route 77	21	6	-
73.2	Waverly Square	Harvard Station	Deiseal bus, only serves Harvard Station upper busway	-	-	53
73.4	Trapelo Road at Belmont Street	Harvard Station	Short turn	3	-	-
OUTBOUND				124	72	5
73.0	Cambridge Common (Waterhouse Street)	Waverly Square	Serves Harvard Station upper and lower busway	103	66	-
73.1	Harvard Station	Waverly Square	Skips Cambridge Common (Waterhouse Street), service is interlined with Route 77	21	6	-
73.2	Harvard Station	Waverly Square	Deiseal bus, only serves Harvard Station upper busway	-	-	55

Ridership

Route 73 carries approximately 6,200 passengers on weekdays, 2,200 on Saturdays, and 1,600 on Sundays. It is the MBTA's 17th highest ridership bus route on weekdays, the 26th highest on Saturdays, and the 20th highest on Sundays.

Ridership by Stop

An overwhelming majority of Route 73 riders travel to and from Harvard Station. On weekday inbound trips (see Figure 3):

- 480 passengers board at the first stop in Waverley Square.
- A total of 1,060 passengers board and only 50 alight at the seven stops along Trapelo Road before Trapelo Road at Belmont Street.

- 90 passengers board and none alight at Trapelo Road at Belmont Street. This stop is where the single AM inbound short-trip begins service.
- A total of 500 passengers board and 490 alight at the nine stops along Mount Auburn Street. Most of the alightings are at the two stops closest to Harvard Square: Brewer Street with 70 alightings and University Road, with 310 alightings. This segment is also served by Route 71 Watertown Square-Harvard Station, which has 320 boardings along this segment.
- 2,290 passengers, or 78% of all inbound riders, alight at Harvard Station.

Outbound ridership patterns are essentially the inverse of inbound patterns. Weekend patterns are also similar but with lower passenger volumes.

Ridership by Trip

On weekdays, Route 73's ridership is very peak oriented with its highest ridership inbound in the AM and outbound in the PM. On weekday inbound trips (see Figure 4):

- Ridership is approximately 20 passengers per trip from the start of service at 5:02 AM through 6:00 AM.
- Ridership then increases rapidly to 50 to 60 passengers per trip between 6:30 AM and 9:30 AM. Because the large majority of passengers are traveling to Harvard Station, maximum loads are nearly as high as total ridership per trip, and maximum loads exceed the MBTA's loading standards by up to 10 passengers.
- Ridership then declines to less than 30 passengers per trip at around 11:30 AM. However, the decline is not linear, with some spikes to over 40 passengers.
- Ridership per trip is then around 30 passengers per trip through around 3:30 PM, but with some spikes to 30 to 40 passengers.
- Between 3:30 PM and 6:00 PM, there is an outbound peak, with ridership per trip that varies from fewer than 10 passengers per trip to a high as 60.
- Ridership per trip then generally ranges from 10 to 20 passengers through 8:00 PM.
- Ridership is then less than 10 passengers per trip through the end of service.

On weekday outbound trips (see Figure 5):

- AM ridership is generally low until around 7:30 AM, when a small outbound peak begins.
- From 7:30 AM to 8:30 AM, most trips carry 20 to nearly 40 passengers.
- From 8:30 AM to 1:30 PM, most trips carry 20 to 30 passengers.
- From 1:30 PM to around 3:30 PM, ridership increases to 20 to 40 passengers per trip.

- Beginning at around 3:30 PM until close to 7:00 PM, most trips carry over 50 passengers and many over 60. As in the AM inbound, maximum loads are very close to total ridership, and many trips are very overcrowded.
- From 7:00 PM to 10:30 PM, most trips carry 20 to over 40 passengers.
- Ridership then declines steadily to only three passengers on the last outbound trip at 1:08 AM.

As described above, many AM inbound and PM outbound trips are overcrowded. However, during other periods, maximum loads are low, and often only around 20 passengers. This indicates that service may not be correctly distributed throughout the day. Reducing service during the midday and adding service during the peak periods may be more appropriate.

On Saturdays, inbound ridership is highest between 8:00 AM and 7:30 PM, when most trips carry 20 to nearly 40 passengers (see Figure 6). However, there are also large fluctuations in ridership per trip. Outbound ridership is highest between 1:30 PM and 11:00 PM, when most trips carry 20 to 30 passengers (see Figure 7).

On Sundays, inbound ridership is highest between 11:00 AM and 4:30 PM, when most trips carry 20 to over 35 passengers (see Figure 8). Outbound ridership per trip patterns are flatter and lower. Ridership is low in the morning, with most trips carrying fewer than 10 passengers through 11:30 AM. Ridership per trip is slightly higher through 9:00 PM, with most trips serving between 10 and 30 riders. After 9:00 PM ridership per trip drops to fewer than 10 riders per trip.

Please note that ridership data for Route 73 was collected manually, and there were fewer observations for Route 73 trips than for other routes. As a result, there may be more significant fluctuations in ridership for one trip to the next, though the overall ridership trends reflect actual conditions.

Figure 3 | Weekday Inbound Ridership by Stop Map

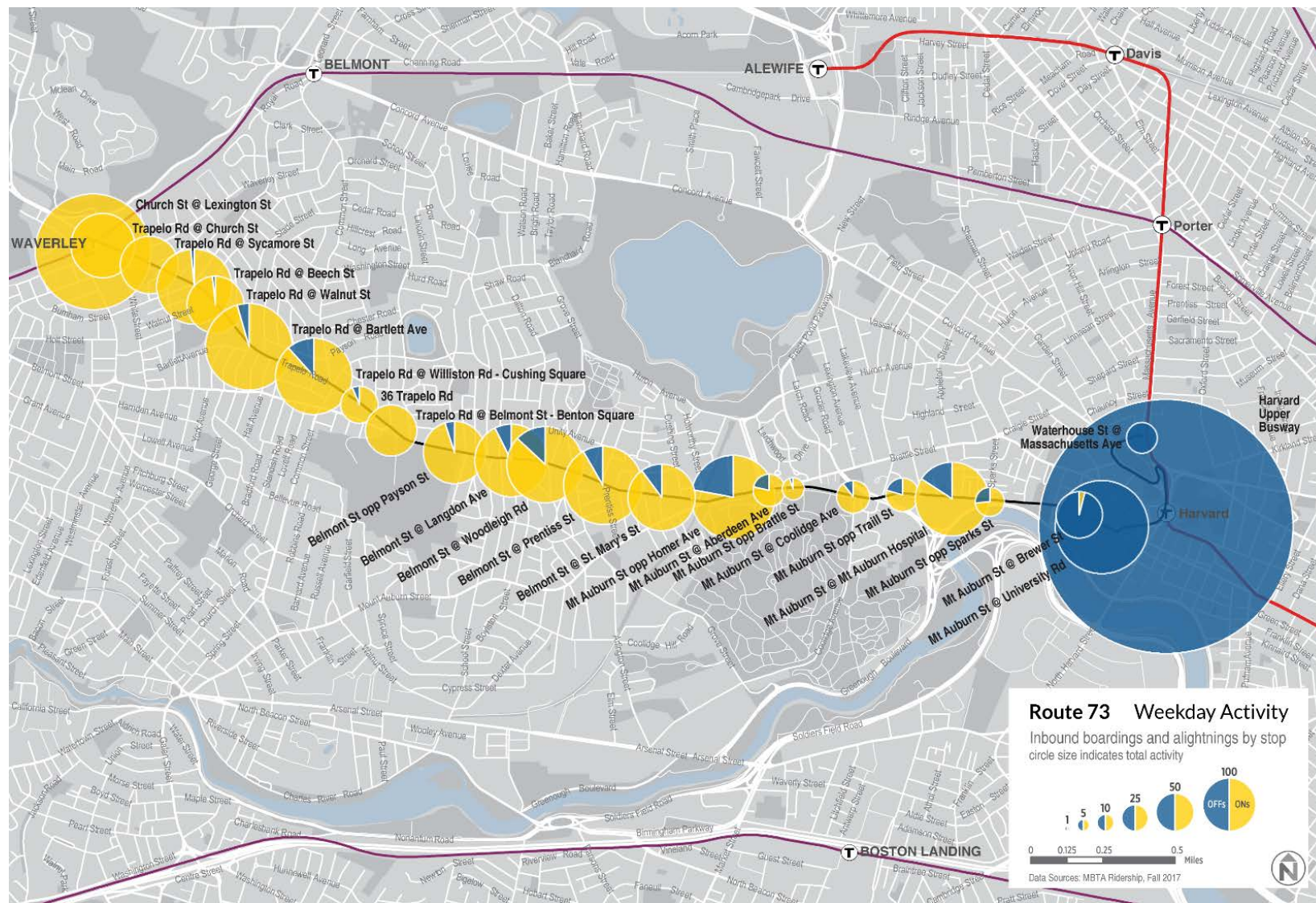


Figure 4 | Weekday Ridership by Trip: Inbound

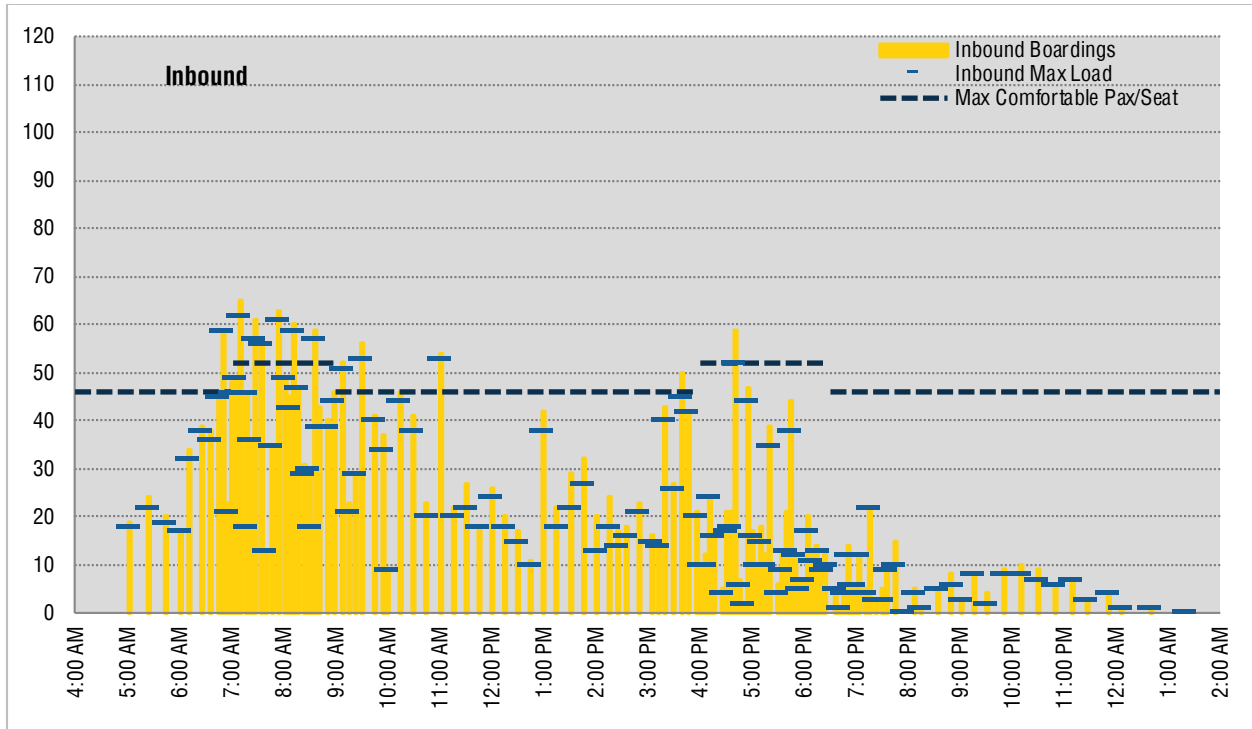


Figure 5 | Weekday Ridership by Trip: Outbound

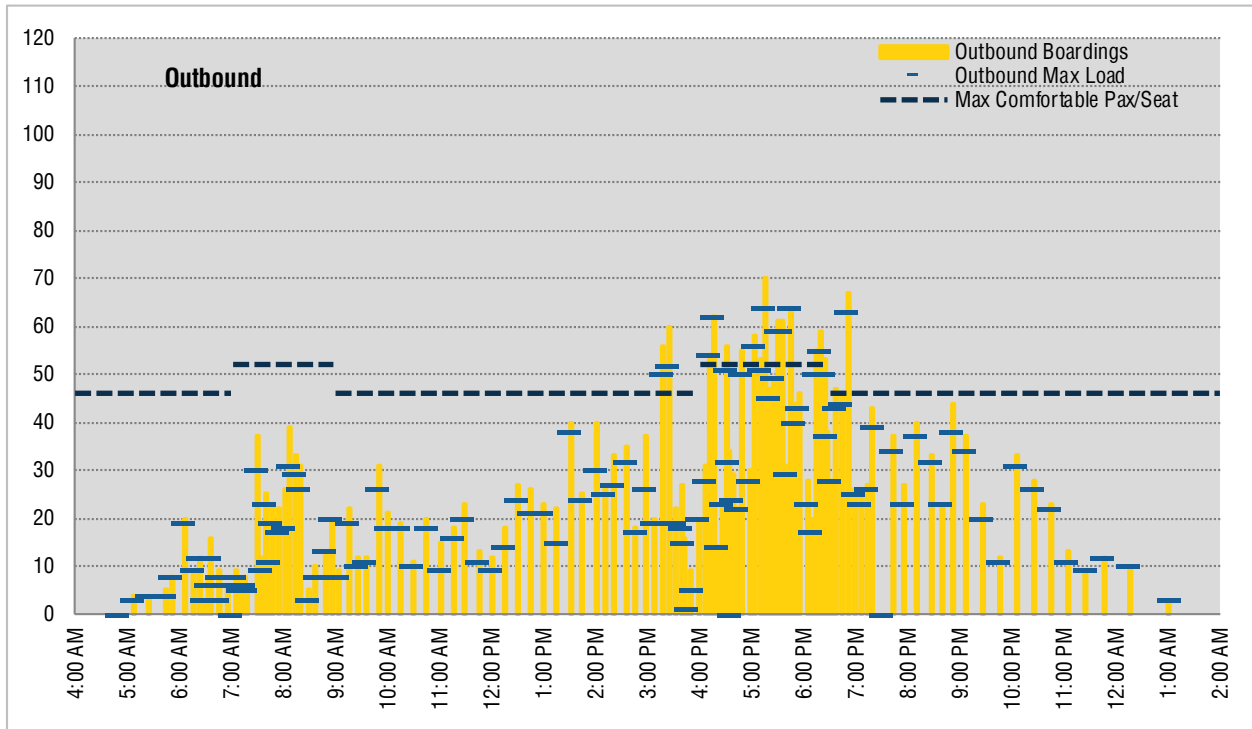


Figure 6 | Saturday Ridership by Trip: Inbound

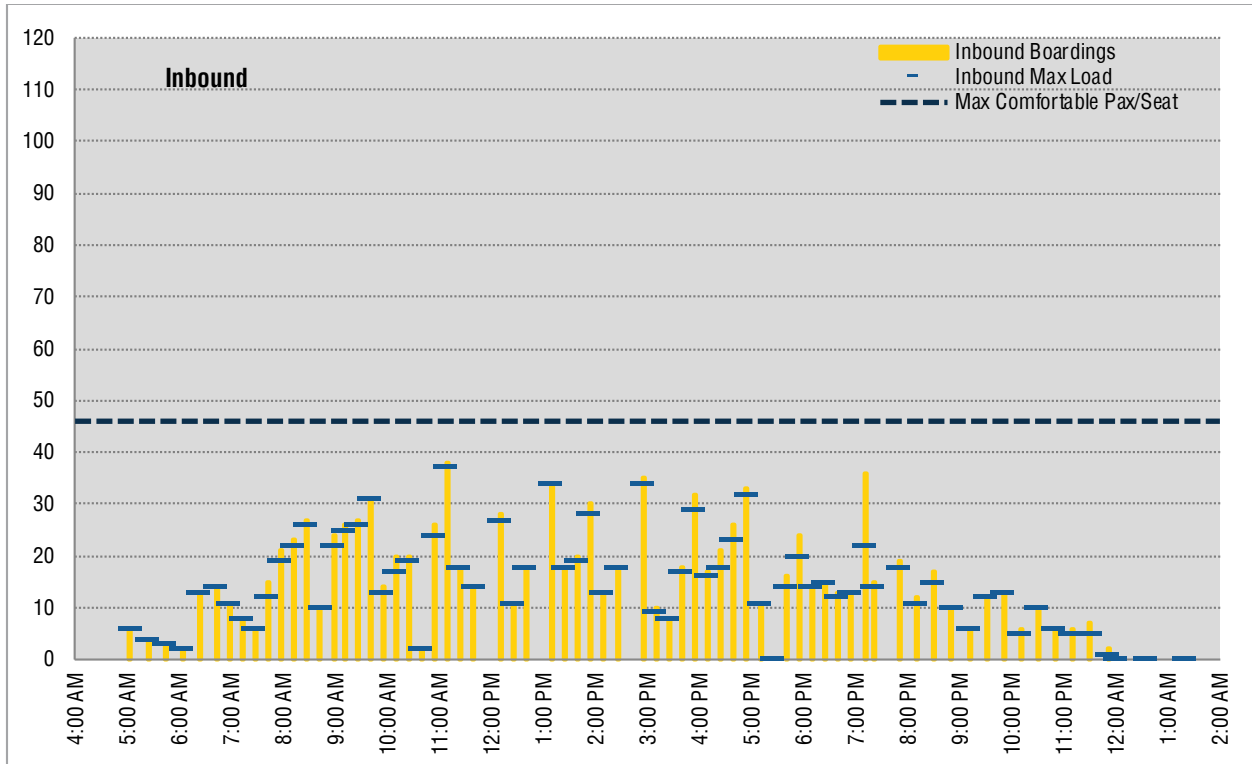


Figure 7 | Saturday Ridership by Trip: Outbound

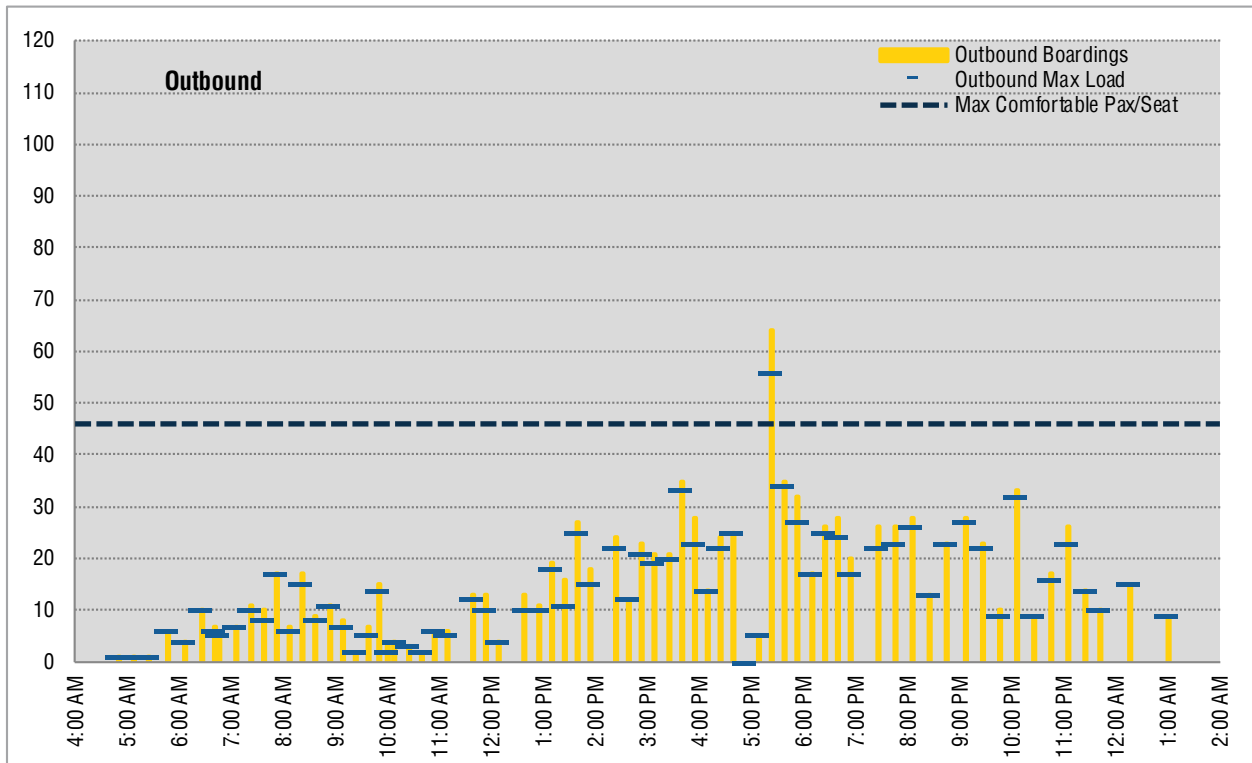


Figure 8 | Sunday Ridership by Trip: Inbound

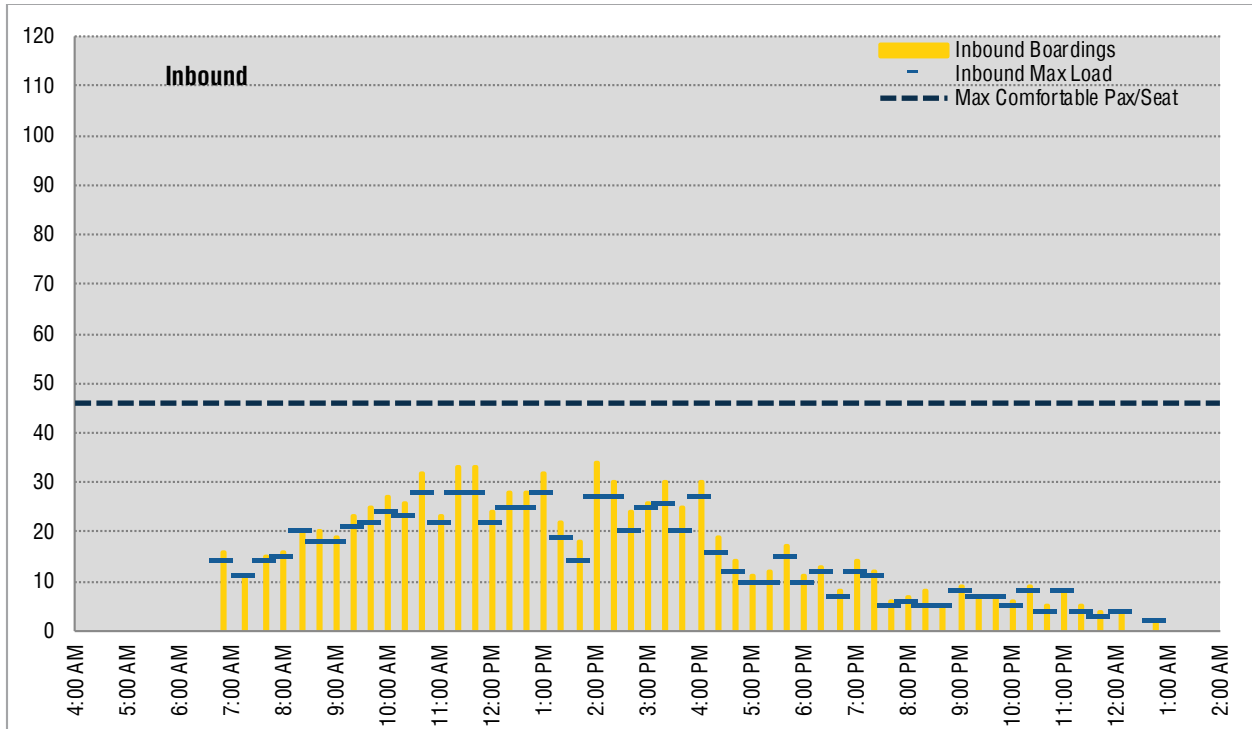
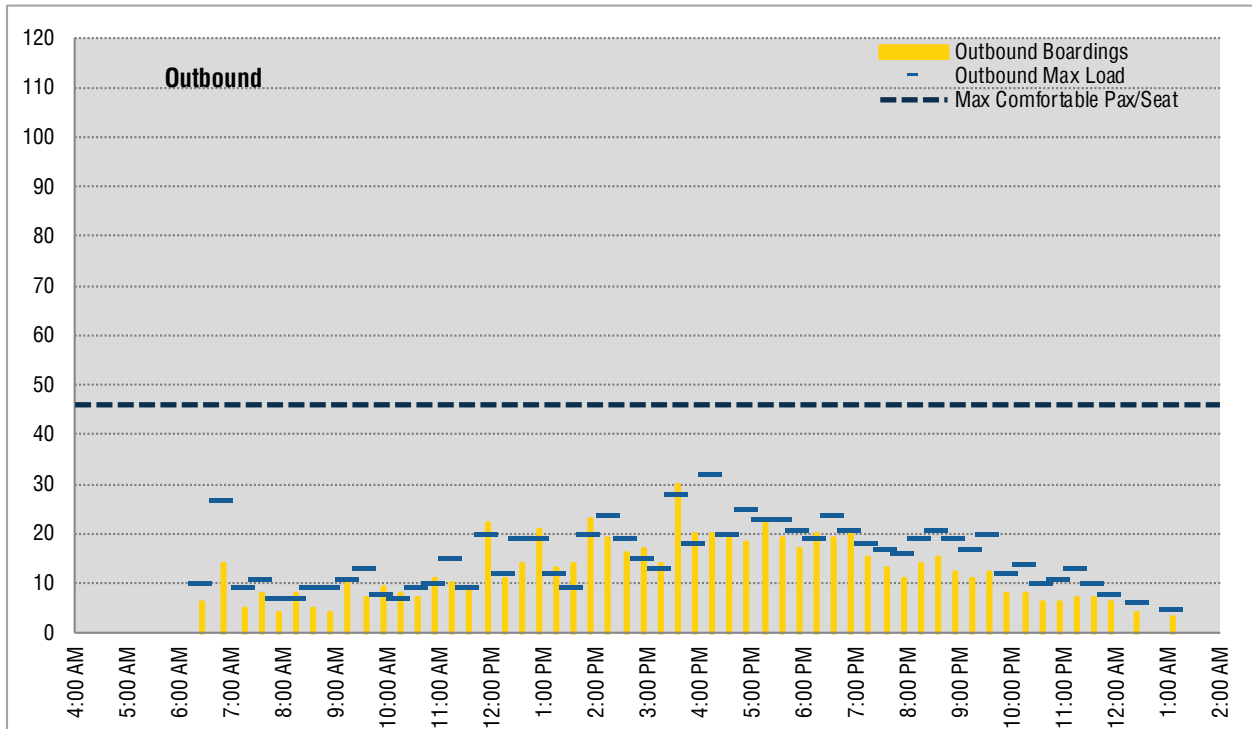


Figure 9 | Sunday Ridership by Trip: Outbound



Passenger Comfort

The MBTA desires that passengers travel in relatively comfortable conditions. At the same time, the MBTA's definition of comfort reflects the very high volume environment in which the MBTA operates, and that some passengers may have to stand for a portion of their trip. More specifically, at least 92% of passengers' travel times should be in comfortable conditions, and ideally, at least 96% of travel times should be in comfortable conditions. Comfortable conditions are considered to be 140% or less of seated capacity during high volume periods and 125% or less during other periods.

Only limited comfort data is available for trackless trolley service. However, considering that many weekday peak period trips are overcrowded and that a high percentage of trips are not run (see next section), it is almost certain that comfort levels are below both the minimum and target levels of 92% and 96%, respectively. However, on weekends, given that maximum loads are low, it is certain that comfort levels are very high.

Reliability and Speed

Reliability

Route 73's overall reliability is 83% on weekdays, 82% on Saturdays, and 75% on Sundays (see Table 2). These levels exceed the target standard for Key Bus Routes of 80% on weekdays and Saturdays and the minimum standard of 75% on Sundays.

However, dropped trips are a significant issue, with 4.3% of weekday trips dropped in the Fall of 2017. These dropped trips exacerbate the overcrowding problems described above.

Table 3 | Reliability

SERVICE DAY	ORIGIN/MID-ROUTE ON-TIME PERFORMANCE	DESTINATION ON-TIME PERFORMANCE	OVERALL RELIABILITY	DROPPED TRIPS
Monday-Friday	81%	91%	83%	4.3%
Saturday	83%	79%	82%	-
Sunday	76%	72%	75%	-

Running Times

Reliability is also adversely impacted by actual running times that exceed scheduled running times. As shown in Figure 10, on weekdays, AM peak inbound running times exceed scheduled times by up to five minutes. Differences during the rest of the day are only a few minutes, but actual times are still longer than scheduled times.

Figure 10 | Scheduled & Median Travel Time by Trip: Route 73 Inbound

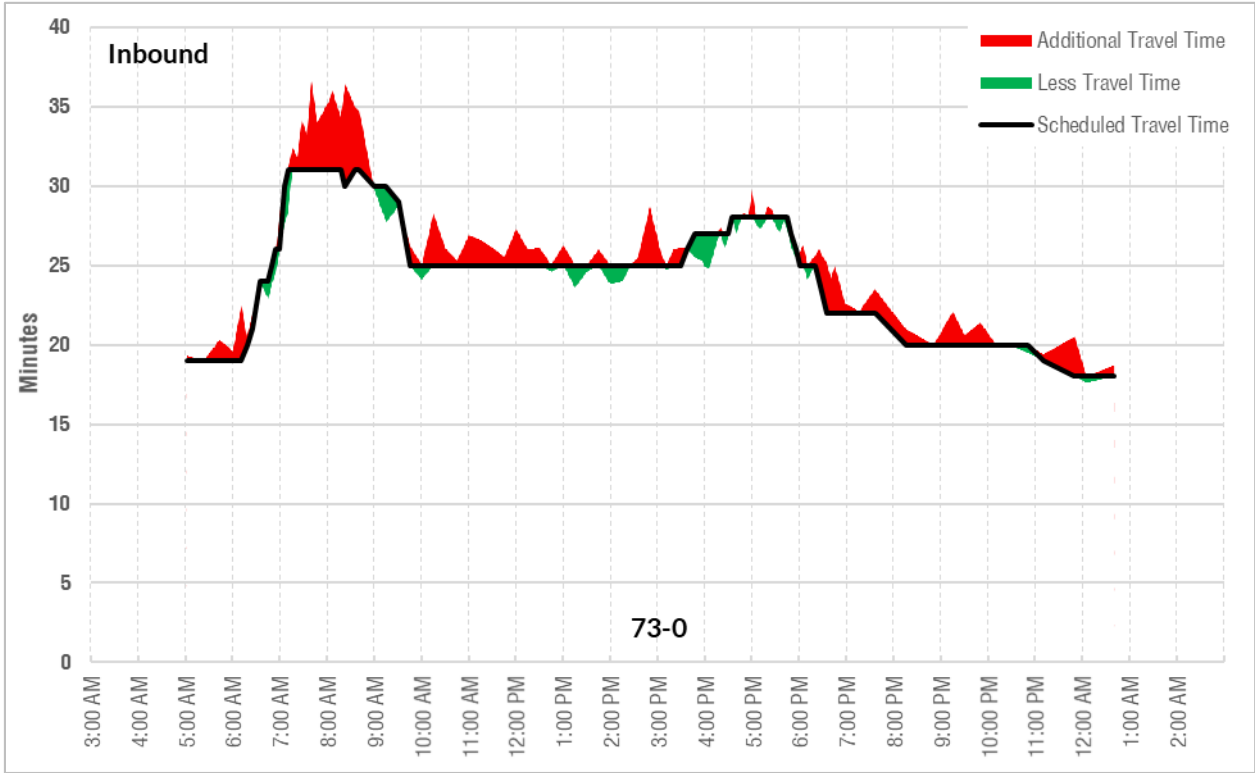
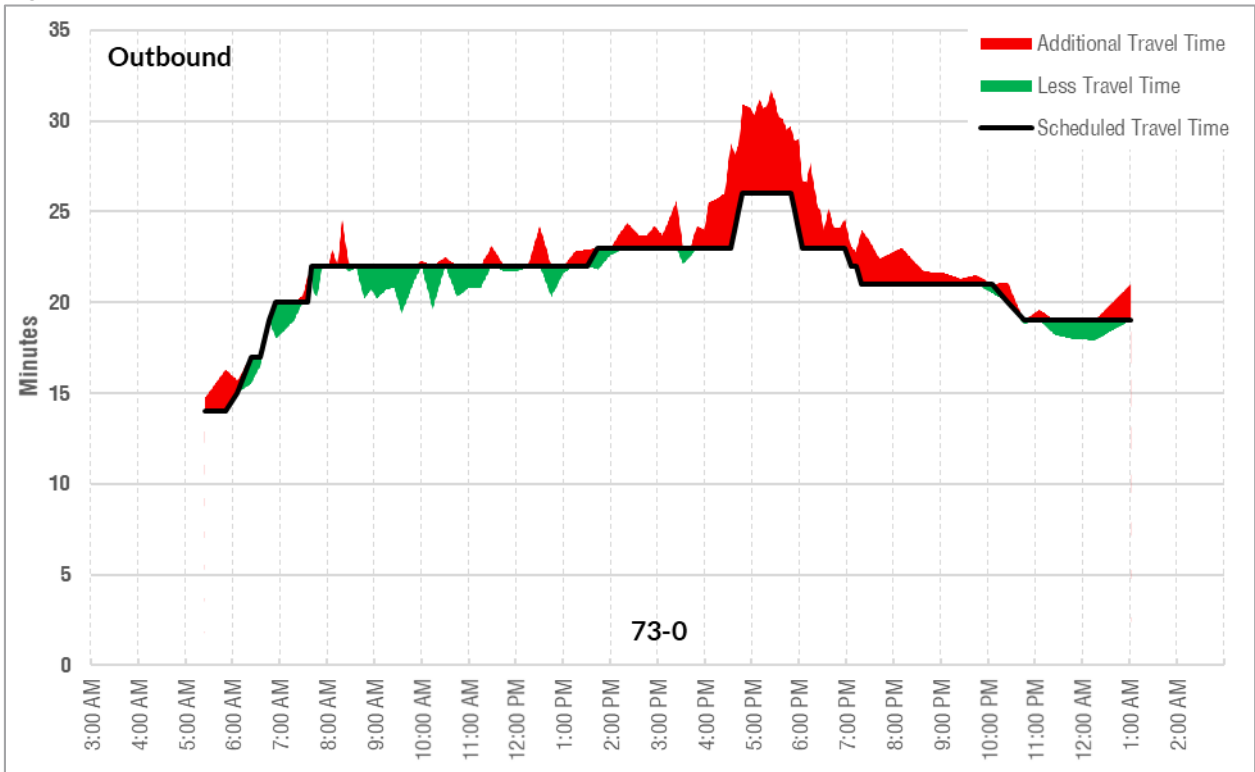


Figure 11 | Scheduled & Median Travel Time by Trip: Route 73 Inbound



Stop Spacing

Route 73 has an average of six stops per mile, which is at the high end of the MBTA's guideline of four to seven stops per mile for Key Bus routes. However, certain parts of the route have stops within a tenth of a mile of each other. This is unnecessarily close and makes service slower and less reliable. These areas include:

- Along Trapelo Road between Beech Street and Walnut Street
- Along Mount Auburn Street between Aberdeen Street and Brattle Street. Note that since the development of this document, this stop has been removed.

Summary

Overall, Route 73 is a strong route with very high weekday ridership (6,200 passengers). However, it is more commuter-oriented than most other Key Bus routes, with very high weekday AM inbound and PM outbound ridership and proportionally lower weekday off-peak ridership. Weekend ridership is also proportionately lower (2,200 on Saturdays and 1,600 on Sundays).

Route 73's major issue is peak period overcrowding, with many AM inbound and PM outbound trips overcrowded. This overcrowding is exacerbated by a high number of dropped trips (4.3% in the Fall of 2017). To address this overcrowding, more peak period service needs to be provided and the number of dropped trips reduced. At the same time, more off-peak service is provided than is needed and trips run with light loads.