



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Stephanie Pollack, MassDOT Secretary and CEO and MPO Chair
Karl H. Quackenbush, Executive Director, MPO Staff

MEMORANDUM

DATE November 5, 2015
TO Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush
CTPS Executive Director
RE Work Program for: Identifying Opportunities for Alleviating Bus Delay

Action Required

Review and approval

Proposed Motion

That the Boston Region Metropolitan Planning Organization vote to approve the work program for Identifying Opportunities for Alleviating Bus Delay presented in this memorandum

Project Identification

Unified Planning Work Program Classification

Planning Studies

CTPS Project Number

11400

Client

Boston Region Metropolitan Planning Organization

CTPS Project Supervisors

Principal: Annette Demchur

Manager: Jonathan Belcher

Funding

MPO §5303 Contract #84080

MPO §5303 Contract #91027

Impact on MPO Work

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

Background

Reliable bus transportation provides mobility, access, and livability benefits to residents throughout the region and improves transportation capacity on congested roadways; however, delays in bus service diminish these benefits. Increased use of operational and infrastructure improvements—such as proof-of-payment fare collection, changes in bus seating configuration and fare collection equipment, effective scheduling practices, bus queue jumps, and transit signal priority—could decrease bus delay, which in turn would improve on-time performance, reduce travel times for transit passengers, and make transit a more attractive travel mode. Using a variety of data sources available to MPO staff, these factors can be analyzed, and solutions tailored to the specific causes of delay can be developed.

MPO staff will use automatic passenger counter (APC) and automatic vehicle location (AVL) data to identify Massachusetts Bay Transportation Authority (MBTA) bus routes that regularly experience significant delays. Using passenger boarding, passenger fare payment, roadway geometry, and roadway congestion data sets, staff will conduct further analysis to identify the causes of delay by route, such as operational issues related to fare payment, heavy passenger loads, stop locations, and roadway design and congestion issues. MPO staff will then develop and recommend possible low-, medium-, and high-cost operational or infrastructure transit improvements that could reduce service delays on the bus routes studied. Staff will also compare the recommended improvements and rank them in terms of their effects on transit delay, on-time performance, travel time, and potential operational cost savings.

This study is a companion to the CTPS Dedicated Bus Lanes study, which is currently under way. Both studies will provide input to Focus 40 (the MBTA's 25-year "master plan") and Go Boston 2030 (the City of Boston's long-range transportation plan).

Objectives

The principle objectives of this work are to identify some of the causes of bus delay and to develop recommendations for reducing delay.

Work Description

Task 1 Assess Factors That Lead to Delay at Bus Stops

MPO staff will use bus dwell time and passenger boarding and alighting data provided by the MBTA to assess multiple factors that lead to bus delay at stops systemwide. Each factor will be assessed to determine its contribution to total dwell time and whether it is a global, route-specific, or stop-specific contributor. These assessments will inform possible changes to global operating strategies, route schedules, and bus stop configurations to mitigate these delays.

Subtask 1.1 Assess Dwell Time as a Function of Passenger Boarding and Alighting

MPO staff will utilize bus dwell time and passenger boarding and alighting data provided by the MBTA to assess dwell time as a function of passenger boarding and alighting. Staff will estimate dwell time per boarding passenger, accounting for a change in rate based on the number of passengers boarding. Should data be available, staff will also assess the increase in dwell time as a function of the exit location (front or rear door) of passengers.

Subtask 1.2 Assess Dwell Time as a Function of Fare Payment Methods at Locations That Have a Long Dwell Time per Boarding Passenger

For locations with a long dwell time per boarding passenger, MPO staff will conduct further analysis using fare transaction data to assess the impact on dwell time of passengers paying cash fares and passengers adding value to a CharlieCard.

Subtask 1.3 Assess Dwell Time as a Function of Bus Seating Layout

The MBTA recently procured new buses with fewer seats and a layout that provides additional room for standees. MPO staff will assess the difference in dwell times on trips operating with this new seating layout and the dwell times of identical trips operating with the old seating layout.

Subtask 1.4 Assess Dwell Time as a Function of Onboard Passenger Load

A crowded bus can result in obstructed doorways and aisles, making it more difficult and time consuming for passengers to board and alight. MPO staff will assess dwell time as a function of the onboard passenger load.

Subtask 1.5 Review Characteristics of Trips That Depart Late from Their Origin Points

MPO staff will analyze the characteristics of bus trips that depart late from their origin points to determine if lengthy passenger boarding times at origin points prevent on-time departures, how bus route interlining affects on-time departures (interlining is the use of the same revenue vehicle and/or operator on more than one route without taking the bus back to the garage between

trips), and if there are any factors other than traffic delay that restrict buses from leaving origin points on time. They will produce tables and graphs that summarize the analysis.

Products of Task 1

Tables and graphs summarizing the analysis

Task 2 Conduct a Detailed Review of Dwell Times on an MBTA Key Route Corridor

MPO staff will conduct field observations of multiple bus trips on one key bus route corridor and document the observed causes of delay in a table. Staff will use the information collected to help identify the factors that contribute to bus delay by trip and by stop.

Product of Task 2

A table identifying the observed causes of delay

Task 3 Develop Potential Improvements for Three Intersections That Have Significant Delays

As part of the Prioritization of Dedicated Bus Lanes study for MassDOT, MPO staff are currently identifying roadway segments along high-ridership bus routes for which the installation of bus lanes shows the greatest potential for reducing delay and improving travel times. The analysis for this MassDOT-funded project will produce data that can be used to identify the segments that experience significant delays. In this task, staff will use the Dedicated Bus Lanes study data to identify three intersections along the non-key routes that have the most bus service and the highest number of bus delays caused by traffic congestion (bus stops and intersections along key routes were studied previously, as part of the MBTA's Key Bus Route project). MPO staff will review and analyze these intersections to develop and recommend potential changes for improving bus travel times. Staff will rank the alternatives by projected cost-effectiveness and produce a table that summarizes the analysis and rankings of the recommended potential improvements.

Product of Task 3

A table summarizing recommended potential improvements for three intersections

Task 4 Develop Recommendations for Improving Bus Service

MPO staff will review the products of Tasks 1, 2, and 3 to identify significant factors contributing to delay by route and develop proposed policies and solutions to improve bus service. Staff will identify low-, medium-, and high-cost transit operational and/or infrastructure improvements that could reduce service delays on the bus routes studied. Staff will also compare the recommended

improvements and rank them in terms of their effects on transit delay, on-time performance, travel time, and potential operational cost savings.

Product of Task 4

A table showing the results of the analyses and rankings of the recommended improvements

Task 5 Produce a Memorandum

Produce a memorandum that presents the results of Tasks 1 through 4.

Product of Task 5

Memorandum

Estimated Schedule

It is estimated that this project will be completed 19 weeks after work commences. The proposed schedule, by task, is shown in Exhibit 1.

Estimated Cost

The total cost of this project is estimated to be \$65,000. This includes the cost of 23.1 person-weeks of staff time and overhead at the rate of 98.88 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/JB/jb

Exhibit 2
ESTIMATED COST
Identifying Opportunities for Alleviating Bus Delay

Direct Salary and Overhead	\$65,000
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Task	Person-Weeks						Direct Salary	Overhead (98.88%)	Total Cost
	M-1	P-5	P-4	P-3	P-1	Total			
1. Assess Factors That Lead to Delay at Bus Stops	0.5	0.0	2.0	3.1	0.0	5.6	\$6,998	\$6,920	\$13,918
2. Conduct a Detailed Review of Dwell Times on an MBTA Key Route Corridor	0.5	0.0	1.0	0.0	1.6	3.1	\$3,485	\$3,446	\$6,931
3. Develop Potential Improvements for Three Intersections That Have Significant Delays	0.5	4.5	0.5	0.0	0.0	5.5	\$9,741	\$9,632	\$19,374
4. Develop Recommendations for Improving Bus Service	0.5	0.0	1.9	0.0	0.0	2.4	\$3,378	\$3,340	\$6,718
5. Produce a Memorandum	1.0	0.5	4.0	1.0	0.0	6.5	\$9,080	\$8,979	\$18,059
Total	3.0	5.0	9.4	4.1	1.6	23.1	\$32,683	\$32,317	\$65,000

Other Direct Costs	\$0
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TOTAL COST	\$65,000
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Funding
MPO §5303 Contract #84080
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