



# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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Arnold J. Soolman  
Director, MPO Staff

The Boston Region MPO, the federally designated entity responsible for transportation decision-making for the 101 cities and towns in the MPO region, is composed of:

MassDOT Office of Planning and Programming  
City of Boston  
City of Newton  
City of Somerville  
Town of Bedford  
Town of Braintree  
Town of Framingham  
Town of Hopkinton  
Metropolitan Area Planning Council  
Massachusetts Bay Transportation Authority Advisory Board  
Massachusetts Bay Transportation Authority  
MassDOT Highway Division  
Massachusetts Port Authority  
Regional Transportation Advisory Council (nonvoting)  
Federal Highway Administration (nonvoting)  
Federal Transit Administration (nonvoting)

## MEMORANDUM

**DATE** August 19, 2010  
**TO** Transportation Planning and Programming Committee  
of the Boston Region Metropolitan Planning Organization  
**FROM** Arnold J. Soolman, CTPS Director  
**RE** Work Program for: MBTA Bus Route 1 Transit Signal Priority Study

### ACTION REQUIRED

Review and approval

### PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Bay Transportation Authority, vote to approve the work program for MBTA Bus Route 1 Transit Signal Priority Study in the form of the draft dated August 19, 2010.

### PROJECT IDENTIFICATION

#### Unified Planning Work Program Classification

Planning Studies

#### CTPS Project Number

23313

#### Client

Massachusetts Bay Transportation Authority  
*Project Supervisor:* Joseph Cosgrove

#### CTPS Project Supervisors

*Principal:* Efi Pagitsas  
*Manager:* Mark Abbott

#### Funding

MPO FTA \$5303 Contract #MA-80-0005

## IMPACT ON MPO WORK

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

## BACKGROUND

Transit signal priority (TSP) is an intelligent transportation systems (ITS) technology applied to traffic signals to reduce traffic delays and increase effective person-carrying capacity for buses along a corridor. TSP technology allows buses equipped with communication devices to request priority as they approach a traffic signal. Priority strategies include the extension of the green interval for the approach where the bus travels or the return to a green interval to serve the bus. The bus may communicate with the signal in this manner every time it is approaching a traffic signal or only when the bus is late. A TSP system can improve bus travel time and schedule reliability. Such systems have been widely installed around the country with documented benefits in bus travel time reductions ranging from 4 to 25 percent. TSP systems require careful examination of impacts on side street traffic delays and queues, and on bicyclists and pedestrians.

The MBTA has identified 15 Key Routes, which carry approximately 40 percent of all bus passengers, to be examined for bus improvement strategies, including TSP. Route 1, running primarily along Massachusetts Avenue and serving riders between Harvard Square in Cambridge and Dudley Square in Roxbury, is one of them.

In 2009, the MBTA collaborated with MassDOT and MPO staff on a Key Routes Initiative to develop bus improvement strategies for six of the 15 Key Routes: Routes 1, 15, 23, 28, 66, and 111. These strategies generally apply elements of rail rapid transit to bus service to reduce bus travel time, improve the quality of service for existing customers, and make bus service a more attractive option for potential new customers. Typical bus improvement strategies include segregating rights-of-way for buses; establishing procedures for pre-paid boarding; providing TSP for buses; enhancing frequency; and consolidating, eliminating, and relocating some bus stops.

In the first phase of this work, which was funded by the Commonwealth, MPO staff have studied five of the six routes<sup>1</sup> and have recommended bus stops for consolidation, elimination, and relocation; analyzed travel time data; and developed conceptual plans for TSP (green extension, and early green) and queue jumps. For each route, staff have documented the results of these analyses in a technical memorandum.

The second phase of the Key Routes Initiative<sup>2</sup> will look further at four of the routes and include in-depth signal priority evaluations of intersections along each route alignment and development of final recommendations for improvement strategies that should move forward

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<sup>1</sup> Evaluation of Route 23 is being completed by an outside consultant.

<sup>2</sup> Strategic Visioning for MBTA Bus Service, MPO Work Program, January 7, 2010.

on each route. Part of this second phase, already underway, is funded by the MBTA and covers intersection analyses for Routes 15, 66, and 111. In another part, Route 1, the subject of the present work program, will be evaluated under MPO funding designated in the MPO's federal fiscal year 2010 Unified Planning Work Program (UPWP).

## **OBJECTIVES**

The purpose of this work program is to evaluate TSP for Route 1 buses. This analysis will demonstrate which intersections could realistically support TSP strategies, including queue jumps, green extension, and early green, without significant impacts on general-purpose traffic, bicyclists and pedestrians, parking, and side streets.

To this end, the following objectives will be set for this study:

1. Evaluate existing conditions of signalized intersections along MBTA bus Route 1 and schedule adherence performance for the buses.
2. Evaluate the potential for transit signal priority and queue jumps under the bus stop consolidation assumptions that resulted from the first phase of the Key Routes Initiative.
3. Document existing conditions and improvement strategies for intersections and buses in terms of impacts on delays, travel time for general traffic, queues, bus stop locations, pedestrians, parking, and bus travel time.

## **WORK DESCRIPTION**

### **Task 1 Evaluate Existing Conditions**

Staff will focus on the following analysis emphasis areas:

- First, staff will convene planning and engineering staff from MassDOT, the MBTA and its consultants, and the cities of Boston and Cambridge. The purpose of these meetings will be to discuss:
  - Existing conditions in general terms
  - The availability of turning movement count data and signal plans
  - Desirable analysis output format for implementation by city staff
  - The need/potential for TSP, queue jumps, or other treatments
  - Coordination of work with other planning efforts, such as the City of Boston's Dudley Square Transportation Action Plan and MassDOT's Roxbury/Dorchester/Mattapan Transit Needs Study
  - City conditions that must be met for implementation
- Following interactions with agency and municipal officials, staff will devise screening tools (intersection performance measures) and displays (lists, tables, or maps) to prioritize route locations for bus priority. Potential metrics will include intersection traffic volumes, bus delays by route segment, bus segment ridership,

and likely implementation feasibility by location as viewed by city officials. This screening will yield the intersections for which, from a need and an implementation point of view, further analysis will be practical to pursue.

- Staff collected turning movement counts (TMCs) at all intersections along Route 1 in Boston as part of the first phase of the Key Routes Initiative. Unless TMC data already exist for intersections in Cambridge, staff will collect the same data at Cambridge intersections.
- For each intersection that has potential for TSP treatment, staff will perform existing conditions analysis using SYNCHRO or VISSIM software. Analysis will be performed for the AM and PM peak hours and will include: level of service, queues, delays, and parking.
- Based on existing conditions analysis and on bus ridership and bus travel time statistics, staff will develop an existing conditions operations profile for bus Route 1 service. This information will be compared against bus operational performance under TSP scenarios.

#### ***Product of Task 1***

- A technical memorandum describing:
  - Interactions with agency and city officials
  - Priority locations selected for TSP treatment
  - Analysis methodology
  - Results of existing conditions analysis for Route 1 intersections
  - Existing bus performance profile

#### **Task 2 Evaluate TSP and Other Strategies**

SYNCHRO or the calibrated VISSIM model will be used to evaluate the impact of TSP and queue jump strategies on bus operations, traffic operations, parking, side street traffic, and cyclists and pedestrians. Evaluation will assume the bus stop consolidation recommendations made in the first phase of the Key Routes Initiative.

The TSP strategy will likely be a combination of green extension and/or early return to green on the approach of the bus (red truncation), depending on the location of the bus stops (far side or near side) and the established bus detection decision.

Finally, the TSP strategy will be evaluated for feasibility of implementation and for impacts on delay, travel time, queues, pedestrians, parking, and bus travel time for a five-year horizon.

#### ***Product of Task 2***

- A technical memorandum documenting the results of TSP strategies analyses, including impacts on traffic, delays, queues, parking, bus operations, and cyclists and pedestrians

**ESTIMATED SCHEDULE**

It is estimated that this project will be completed 12 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

**ESTIMATED COST**

The total cost of this project is estimated to be \$124,982, \$50,400 to be spent during FFY 2010 and the rest during FFY 2011. This includes the cost of 54.5 person-weeks of staff time and overhead at the rate of 88.99 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

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Exhibit 1  
 ESTIMATED SCHEDULE  
 MBTA Bus Route 1 Transit Signal Priority Study

Task	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Evaluate Existing Conditions											A	
2. Evaluate TSP Strategies												B

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Products/Milestones

A: Technical memorandum for Task 1

B: Technical memorandum for Task 2

Exhibit 2  
 ESTIMATED COST  
 MBTA Bus Route 1 Transit Signal Priority Study

<b>Direct Salary and Overhead</b>	<b>\$124,782</b>
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Task	Person-Weeks					Total	Direct Salary	Overhead (@ 88.99%)	Total Cost
	M-1	P-5	P-4	P-2	Temp				
1. Evaluate Existing Conditions	3.0	10.0	0.5	12.0	4.0	29.5	\$33,762	\$30,045	\$63,806
2. Evaluate TSP Strategies	4.0	10.0	1.0	10.0	0.0	25.0	\$32,264	\$28,712	\$60,976
Total	7.0	20.0	1.5	22.0	4.0	54.5	\$66,026	\$58,756	\$124,782

<b>Other Direct Costs</b>	<b>\$200</b>
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Travel	\$200
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<b>TOTAL COST</b>	<b>\$124,982</b>
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*Funding*  
 MPO FTA \$5303 Contract #MA-80-0005