



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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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 July 28, 2011
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, CTPS Acting Director
RE Work Program for: MBTA 2012 Review of Fare Structure, Tariffs, and
Service

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 2012 Review of Fare Structure, Tariffs, and Service in the form of the draft dated July 28, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Technical Support/Operations Analysis Projects
CTPS Project Number
11376
Client
Massachusetts Bay Transportation Authority
Project Supervisor: Charles Planck
CTPS Project Supervisors
Principal: Elizabeth Moore
Manager: Robert Guptill
Funding
Future MBTA contract

IMPACT ON MPO WORK

The MPO staff has sufficient resources to complete this work in a capable and timely manner. By undertaking this work, the MPO staff will neither delay the completion of nor reduce the quality of other work in the UPWP.

BACKGROUND

The last MBTA fare increase was in 2007, at which time fares were increased by an average of slightly less than 25 percent. Revenue realized from the fare increase was needed to address a substantial budget shortfall in fiscal year 2007 and anticipated shortfalls in subsequent years. These shortfalls were caused by, and continue to occur, in large part, because of gaps between anticipated and actual dedicated revenue from the state sales tax. The increased costs of labor and materials also contribute to budget gaps.

The MBTA has requested that CTPS analyze the impacts of potential changes in fare structure, tariffs, and service at this time. CTPS has provided technical assistance related to such changes in the past, most recently in 1991, 2000, 2004, and 2007. For the last fare increase, CTPS produced an analysis, much like the one proposed in this work program, which included projections of revenue, ridership, environmental, and socioeconomic impacts related to the proposed fare increase, as well as an analysis of the effects of substantial service reductions that would be needed if the fares were not increased. It is expected that CTPS will accomplish the current analysis by relying on its regional travel demand model along with various other data sources and analysis tools.

As part of the 2004 fare increase, the MBTA Board of Directors created the Rider Oversight Committee (ROC) to discuss customer-service improvements and service-quality issues. This committee is composed of members from three different groups: MBTA staff, transportation advocacy organizations, and riders at large. In late 2004, the MBTA began working with the ROC Finance Subcommittee to explore restructuring the fares. CTPS staff provided extensive technical support to this effort, estimating the revenue and ridership impacts of potential fare-structure changes. As the need for a fare increase in 2007 became apparent, CTPS continued to provide technical support to the ROC Finance Subcommittee, analyzing the impacts of raising the fares, in addition to restructuring them. An integral part of the ROC involvement in restructuring the fares was the development of a new Fare Policy, which established the goals and objectives that guided the fare restructuring. The Fare Policy, which also codified the new fare structure, was finalized through the efforts of an internal MBTA Fare Policy committee.

OBJECTIVE

To forecast the ridership, revenue, environmental, and socioeconomic impacts of potential changes in MBTA fare structure, tariffs, and service.

WORK DESCRIPTION

Task 1 Establish an Annual Estimate of MBTA Ridership, Calibrate Travel Model, and Summarize Peer Fare Levels

The first task will be to estimate annual MBTA ridership by station, line, mode, and product type. The automated-fare-collection (AFC) system has detailed data on the number of linked trips by date, time, and product type as well as sales of various product types. These data will be used to update the AFC portion of the spreadsheet tool used for the 2007 pre- and post-fare increase impacts analyses. This spreadsheet tool performs various calculations, such as transforming linked trips into unlinked trips and deriving commuter rail trips from pass-ride values and pass sales, and also includes an annual estimate of ridership for the other, non-AFC modes.

Once current ridership has been estimated, the CTPS regional travel demand model, which is currently calibrated to 2009 ridership, will be run and adjusted until it replicates the annual ridership estimate with a reasonable degree of accuracy and with parking at transit parking lots constrained to their capacities.

CTPS will update a matrix that compares the fare levels by mode and fare type of various peer transit agencies.

Products of Task 1

- Estimates of current ridership by station, line, mode, and product type for the MBTA system
- Travel model calibrated to current ridership
- Updated peer-agency comparison of fare levels

Task 2 Participate in Regular Meetings

The ROC holds meetings of its full membership on a monthly basis, and invites the MBTA General Manager and Secretary of Transportation to participate in every third meeting. The ROC standing committees meet monthly, including the ROC Finance Subcommittee, which discusses issues related to fares and fare structure. CTPS will provide professional staff support for each of the monthly meetings and will also participate in ROC Finance Subcommittee meetings. During the course of these meetings, CTPS staff will respond to any technical questions that may arise, especially as they may pertain to ridership statistics, the current fare structure, adherence to the standards of the Service Delivery Policy, and the Boston region's capital planning process. CTPS will also

model, to the extent possible, the ridership and revenue impacts of fare levels and structures suggested by the ROC.

The MBTA, as it did for the 2007 fare increase and restructuring, will coordinate an internal fare policy committee to discuss revisions to the MBTA Fare Policy with respect to potential changes to the fare structure. CTPS staff will participate in these meetings.

Task 3 Forecast Ridership Impacts of Potential Changes in Fare Structure, Tariffs, and Service

CTPS uses two methodologies to forecast ridership. The first is a spreadsheet-based model that CTPS constructed to analyze the 2007 fare increase and restructuring. As described above, the spreadsheet-based model lists the number of linked trips for each product type on each mode, including parking utilization. This model then applies price changes to each category along with various elasticities of demand with respect to fares. These elasticities are based on past experiences with fare changes at the MBTA and at peer transit properties around North America. The second methodology uses the CTPS regional travel demand model, a four-step model that estimates the frequency of origins and destinations of trips in each travel zone by trip purposes (trip generation), matches origins with destinations (trip distribution), assigns a specific transportation mode (such as private vehicle, public transportation, walking, etc.) to each origin-destination trip pair (mode choice), and determines the route between the origin and destination using the chosen mode (route assignment).

The primary difference between the two methodologies is that the spreadsheet-based model can only be used to estimate the impacts of a fare change, while the regional travel demand model can forecast impacts caused by both fare changes and service changes. The chief strengths of the CTPS spreadsheet-based model are that it accounts for every distinct fare that can be paid for an MBTA transit service and that it properly assigns the fare to the correct number of passengers who are in that fare-payment and modal category (for example, those who use the LinkPass to ride both a bus and train in the conduct of a trip). In comparison, the regional travel demand model does not permit analysis of fares at this detailed level, but assumes an average modal fare across all fare types. The spreadsheet-based model also estimates the diversion of riders between modal and fare-payment categories; for example, when some transit users, faced with a fare increase, choose to continue using the MBTA, but switch to a different route or mode in order to lessen the financial impact of the fare increase. However, unlike the regional travel demand model, the spreadsheet-based model cannot predict how many riders who leave the system due to a fare increase are switching to driving alone, carpooling, or walking. The regional travel demand model also provides the outputs necessary for conducting the environmental and socioeconomic impact analyses.

Using the spreadsheet-based model, CTPS will analyze as many as three separate and complete fare-pricing and fare-structure scenarios, after the MBTA, MassDOT, and the ROC Finance Subcommittee approve of the selection of the scenarios to be analyzed.

Summaries of each scenario will describe the potential fare changes for each fare-payment category and each transit mode. CTPS will also use the spreadsheet-based model to analyze the impacts of individual fare-pricing and fare-structure changes, as permitted by the budget. In addition, a package of proposed service changes will be provided to CTPS by the MBTA to be evaluated in conjunction with the fare structure and tariffs that are ultimately proposed. Using the CTPS regional travel demand model, CTPS will analyze up to three scenarios that reflect possible combinations of changes in fare structure, tariffs, and service.

Due to their complementary nature, the regional travel demand model and the spreadsheet-based model will be used together. As the regional travel demand model's fare categories are much more limited than those used in the spreadsheet-based model, the more detailed fare categories in the spreadsheet-based model will be aggregated and averaged to provide the inputs used in the regional travel demand model. These average fares will be used in the regional travel demand model to forecast ridership changes resulting from the changes in fare structure and tariffs, by line and mode, and these changes will be compared to the estimates from the spreadsheet-based model. These results will be added to estimates of the changes resulting from proposed service changes included in each scenario to provide an estimate of the changes likely from the scenario as a whole. The two models' results will be summarized in tabular and graphical form for review by the MBTA.

Products of Task 3

- Forecasts of ridership changes by line and mode of the proposed fare-structure, tariff, and service scenarios
- Forecasts of diversions to the drive-alone, carpool, and walk modes
- Forecasts of change in vehicle-miles traveled (VMT) due to diversions to the drive-alone and carpool modes

Task 4 Forecast Revenue Impacts of Potential Changes in Fare Structure, Tariffs, and Service

The spreadsheet-based model described above calculates fare-revenue changes along with ridership changes resulting from a fare-structure and/or tariff change. The regional travel demand model also estimates revenue based on the average fare inputs. As was done for ridership, the changes in revenue forecast by the two models will be summarized in tabular and graphical form for review by the MBTA.

Product of Task 4

Forecasts of fare-revenue impact of the proposed fare-structure, tariff, and service scenarios

Task 5 Forecast Air-Quality Impacts of Potential Changes in Fare Structure, Tariffs, and Service

The environmental analysis will consist of forecasting changes in vehicular emissions of ozone precursors (volatile organic compounds and oxides of nitrogen) and other pollutants that might result from changes in fare structure, tariffs, and service. This will entail forecasting changes in both transit-vehicle and automobile emissions, and CTPS has well-established procedures for doing both. The VMT-by-roadway-link output from the regional travel demand model will be combined with the latest MOBILE emissions rates to estimate the total change in emissions for the region.

Product of Task 5

Forecasts of emissions changes resulting from the proposed fare-structure, tariff, and service scenarios

Task 6 Forecast Environmental-Justice Impacts of Potential Changes in Fare Structure, Tariffs, and Service

In this task, the potential impact of changes in fare structure, tariffs, and service on different socioeconomic groups will be analyzed. This work will be closely related to ongoing work at CTPS in the area of environmental justice, and some of the analytical approaches used in that work will be brought to bear in this project. The MBTA measures the impact of service changes on minority and low-income neighborhoods (target populations) compared to all other areas, as part of its biennial service-planning process and ongoing Title VI monitoring program.

As was done for the 2007 pre-fare increase impacts analysis, the average fare-structure and/or tariff changes, in both absolute and percentage terms, will be computed and compared to existing conditions using the regional travel demand model for both target populations and the system. To the extent that proposed service changes are modeled, CTPS will also compare the estimated changes in walking access and egress times, waiting times, in-vehicle travel times, and the number of transfers for both target populations and the system.

Products of Task 6

- Comparative analysis of fares from the proposed fare-structure, tariff, and service scenarios
- Comparative analysis of walking access and egress times, waiting times, in-vehicle travel times, and number of transfers resulting from the proposed service-change scenarios

Task 7 Produce Draft Report for Public Review

In this task, CTPS will compile the results of the analyses performed in Tasks 1-6 into a draft report that will be released for review during the public process.

Product of Task 7

Draft report in electronic format

Task 8 Assist the MBTA in Preparing Communication Materials for Public Hearings and Fare Change Implementation

In this task, CTPS will provide the MBTA with explanatory materials in the desired formats for use at public meetings and hearings and for general customer communication in advance of the potential fare increase. In the past, such materials have explained the need for a fare increase, summarized the impacts of the proposed increase, and listed the new fares in tabular format. In addition, CTPS staff will participate in a technical advisory role at public meetings.

Product of Task 8

Information and materials needed by the MBTA for public hearings

Task 9 Additional Analysis as Suggested by Public Hearings

There may be ideas presented during the public process that the MBTA will ask CTPS to analyze. It is possible, for example, that the MBTA might want certain facets of the proposed changes to be modified in the spreadsheet-based model assumptions in order to predict their ridership and revenue consequences. Alternatively, additional work on the socioeconomic impacts could be called for.

Product of Task 9

Additional analyses, as requested by the MBTA following the public hearings

Task 10 Prepare Final Report

A report that documents all analyses and findings will be prepared. In addition, if an increase is proposed as a result of the process, CTPS will assist the MBTA in preparing the environmental-finding document for the Board of Directors that will include the purpose of and need for a fare increase; actions taken to avoid a fare increase; the impacts of the fare increase, including economic, transportation, air quality, and environmental justice; alternatives to a fare increase, including impacts of no fare increase; and measures to reduce impacts.

Products of Task 10

- Final report in electronic format
- Environmental findings

ESTIMATED SCHEDULE

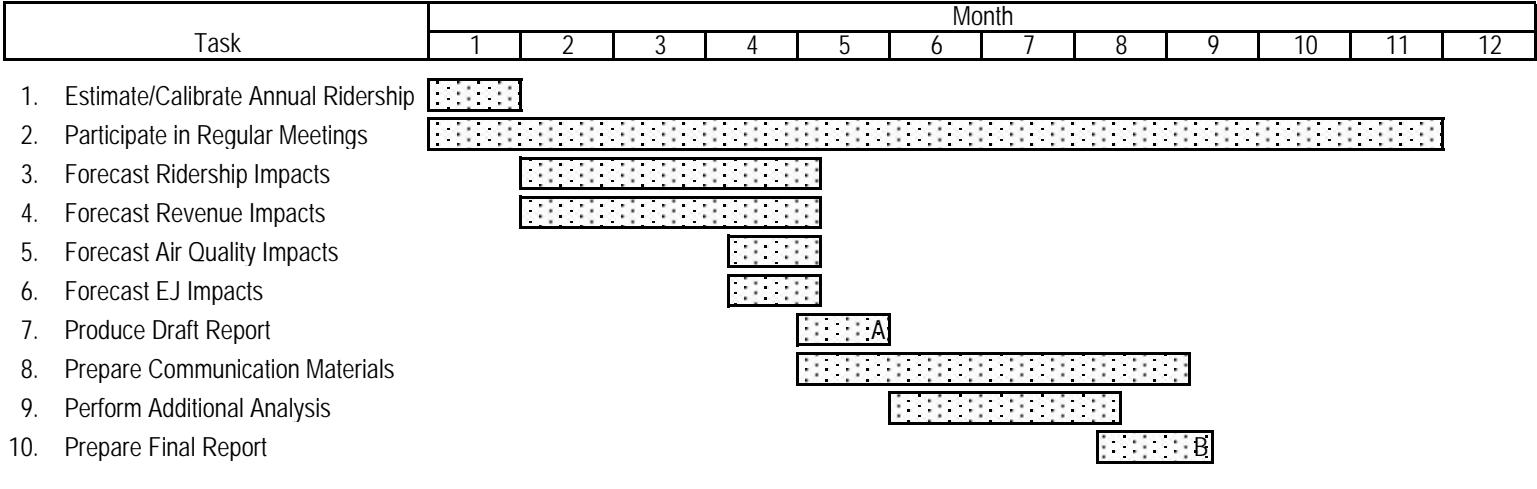
It is estimated that this project will be completed 11 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$124,819. This includes the cost of 48.8 person-weeks of staff time and overhead at the rate of 90.69 percent. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/RG/rg

Exhibit 1
 ESTIMATED SCHEDULE
 MBTA Potential 2012 Fare Increase and Service Reductions: Impact Analysis



Products/Milestones
 A: Draft report
 B: Final report and environmental findings

Exhibit 2
 ESTIMATED COST
 MBTA Potential 2012 Fare Increase and Service Reductions: Impact Analysis

Direct Salary and Overhead \$124,819

Task	Person-Weeks					Direct Salary	Overhead (@ 90.69%)	Total Cost
	M-1	P-5	P-4	P-2	Total			
1. Estimate/Calibrate Annual Ridership	0.5	1.0	3.0	0.5	5.0	\$6,501	\$5,895	\$12,396
2. Participate in Regular Meetings	2.0	0.0	4.0	0.0	6.0	\$8,154	\$7,395	\$15,549
3. Forecast Ridership Impacts	1.3	0.3	6.5	0.0	8.1	\$10,536	\$9,555	\$20,092
4. Forecast Revenue Impacts	1.2	0.2	3.5	0.0	4.9	\$6,553	\$5,943	\$12,497
5. Forecast Air Quality Impacts	1.0	0.0	2.5	0.0	3.5	\$4,687	\$4,251	\$8,938
6. Forecast EJ Impacts	0.9	0.0	1.5	1.5	3.9	\$4,585	\$4,158	\$8,743
7. Produce Draft Report	2.2	0.0	3.2	0.0	5.4	\$7,506	\$6,807	\$14,312
8. Prepare Communication Materials	1.0	0.0	2.0	0.0	3.0	\$4,077	\$3,697	\$7,774
9. Perform Additional Analysis	2.5	0.0	2.5	0.0	5.0	\$7,143	\$6,478	\$13,621
10. Prepare Final Report	2.0	0.0	2.0	0.0	4.0	\$5,714	\$5,182	\$10,897
Total	14.6	1.5	30.7	2.0	48.8	\$65,456	\$59,362	\$124,819

Other Direct Costs \$0

TOTAL COST \$124,819

Funding
 Future MBTA Contract