



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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James A. Aloisi, Jr.
Secretary of Transportation
and MPO Chairman

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
the following:

Executive Office of Transportation
and Public Works

City of Boston

City of Newton

City of Salem

City of Somerville

Town of Bedford

Town of Framingham

Town of Hopkinton

Metropolitan Area Planning Council

Massachusetts Bay Transportation
Authority Advisory Board

Massachusetts Bay Transportation
Authority

Massachusetts Highway Department

Massachusetts Port Authority

Massachusetts Turnpike Authority

Regional Transportation Advisory
Council (nonvoting)

Federal Highway Administration
(nonvoting)

Federal Transit Administration
(nonvoting)

MEMORANDUM

DATE June 18, 2009

TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization

FROM Arnold J. Soolman, CTPS Director

RE Work Program for: State Fiscal Year 2010 National Transit Database
Purchased Bus Transportation Passenger-Miles and Boardings Estimates

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 State Fiscal Year 2010 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates in the form of the draft dated June 18, 2009.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

14315

Client

Massachusetts Bay Transportation Authority

Project Supervisor: Lauren Coughlin

CTPS Project Supervisors

Principal: Liz 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

For a number of years, in support of the MBTA's National Transit Database submittals to the Federal Transit Administration, CTPS has produced passenger-miles and boardings estimates for the MBTA's directly operated bus and trackless trolley system and, since SFY 1996, for the heavy rail and light rail transit systems. In SFY 2001, the scope of analysis was expanded to include bus routes operated as part of the Interdistrict Bus Program and Suburban Transportation Program and other contracted MBTA local bus service.

OBJECTIVE

To develop estimates of passenger-miles and boardings for bus routes operated as part of the Interdistrict Bus Program and Suburban Transportation Program and all other contracted MBTA local bus service.

WORK DESCRIPTION

The data that will form the basis for the passenger-miles and boardings estimates will be collected through onboard ridechecks. These ridechecks will be conducted as part of the ongoing bus data collection program.

Task 1 Develop Sampling Plan

Ridecheck data will be collected according to the approach used in previous years, where a predetermined number of randomly selected trips is sampled each week across all MBTA-funded private-carrier bus routes. This approach is outlined specifically in Federal Transit Administration Circular 2710.4A and is, by definition, considered to meet FTA's minimum thresholds for statistical precision and confidence.

Under this sampling plan, weekly assignments will be randomly selected using the CTPS bus ridership information database. These selections will occur quarterly and cover all the weeks during that period. Assignments will be distributed to tabulators each week.

Product of Task 1

Bus sampling plan and traffic checkers' assignments

Task 2 Collect Data

CTPS staff members will carry out the assignments created in Task 1. As in the past, ridecheck data to be collected include boardings and alightings by stop, farebox readings, trip-level travel times, departure/arrival times, and intermediate-stop arrival times. These data will be collected using palmtop computers and uploaded directly to the CTPS bus ridership information database, where they will be checked for completeness and accuracy.

Product of Task 2

Ridecheck data in electronic form

Task 3 Estimate Passenger-Miles and Boardings

Estimates of passenger-miles and boardings for private-carrier bus services will be produced the same way as for directly operated services, using revenue data from the MBTA and output from the CTPS bus ridership information database. Specifically, estimates of the average farebox deposit will be generated, along with the average passenger trip length, based on ridecheck observations. By dividing the average farebox deposit into total revenue, an estimate of total boardings may be made. Multiplying this total by the average trip length yields total passenger-miles.

Product of Task 3

Estimates of passenger-miles and boardings for private-carrier bus services

Task 4 Document Results

The results of Task 3 will be documented in a technical memorandum. The memorandum will also discuss the FTA requirement that the true values for passenger-miles and boardings have a 95 percent probability of falling within 10 percent of the estimates. Since the weekly random-sampling technique outlined in FTA Circular 2710.4A and described in Task 1 will be followed, this FTA requirement will be considered to have been met.

Product of Task 4

A technical memorandum describing the data collection and analysis processes, summarizing results, and discussing FTA's statistical validation requirements

ESTIMATED SCHEDULE

It is estimated that this project would be completed 15 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

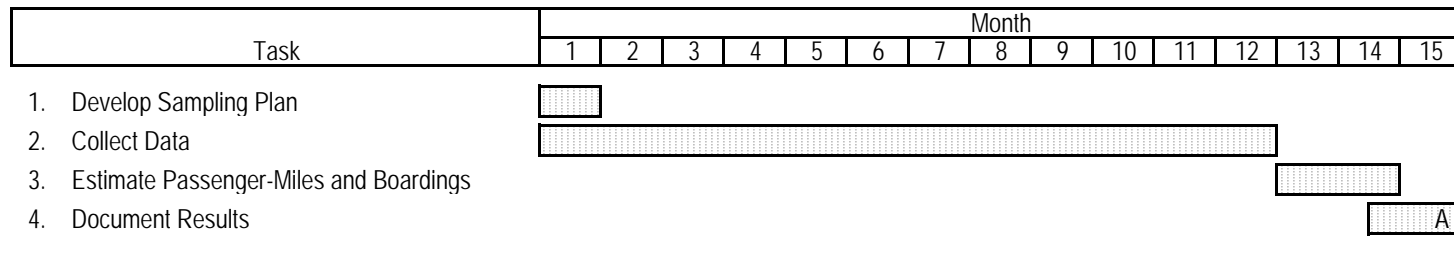
The total cost of this project is estimated to be \$38,020. This includes the cost of 28.4 person-weeks of staff time, overhead at the rate of 86.97 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/RSG/rsg

Exhibit 1

ESTIMATED SCHEDULE

State Fiscal Year 2010 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates



Products/Milestones

A: Technical memorandum

Exhibit 2

ESTIMATED COST

State Fiscal Year 2010 National Transit Database Purchased Bus Transportation Passenger-Miles and Boardings Estimates

Direct Salary and Overhead **\$37,020**

Task	Person-Weeks						Direct Salary	Overhead (@ 86.97%)	Total Cost
	M-1	P-4	SP-3	SP-1	Temp	Total			
1. Develop Sampling Plan	0.0	0.6	1.2	0.0	0.0	1.8	\$1,677	\$1,458	\$3,135
2. Collect Data	0.2	0.0	2.3	9.8	11.0	23.3	\$13,722	\$11,934	\$25,656
3. Estimate Passenger-Miles and Boardings	0.0	1.8	0.0	0.0	0.0	1.8	\$2,196	\$1,910	\$4,105
4. Document Results	0.9	0.6	0.0	0.0	0.0	1.5	\$2,205	\$1,918	\$4,124
Total	1.1	3.0	3.5	9.8	11.0	28.4	\$19,800	\$17,220	\$37,020

Other Direct Costs **\$1,000**

Travel \$1,000

TOTAL COST **\$38,020**

Funding

Future MBTA Contract



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MEMORANDUM

DATE June 18, 2009
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Arnold J. Soolman, CTPS Director
RE Work Program for: State Fiscal Year 2010 National Transit Database
Directly Operated Bus and Rail Passenger-Miles and Boardings
Estimates

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 State Fiscal Year 2010 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates in the form of the draft dated June 18, 2009.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

14316

Client

Massachusetts Bay Transportation Authority

Project Supervisor: Melissa Dullea

CTPS Project Supervisors

Principal: Liz Moore

Manager: Robert S. 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

For many years, in support of the MBTA's National Transit Database (NTD) submittals to the Federal Transit Administration (FTA), CTPS has produced passenger-miles and boardings estimates for the MBTA's bus and trackless trolley system. In SFY 1996, the scope of the analysis expanded to include the heavy rail and light rail transit systems. In SFY 2000, the scope expanded again to include the MBTA commuter rail system.

OBJECTIVES

The primary objective of this project is to develop estimates of passenger-miles and boardings for the following MBTA transportation modes: motor bus, trackless trolley, heavy rail, light rail, and commuter rail. CTPS will also verify MBTA estimates of the average passenger trip length for the commuter rail mode. The data that will form the basis of these estimates will be collected in a variety of ways:

- Ridechecks on buses and trackless trolleys, through both the ongoing bus data collection program and supplementary data collection
- Electronic passenger fare-mix counts from automated fare-collection (AFC) faregates at heavy rail and light rail subway stations and fareboxes on motor bus and trackless trolley routes
- Fare-mix counts of passengers on surface light rail, including counts of passengers boarding through rear doors or otherwise failing to interact with the farebox
- Passenger surveys on the heavy rail and light rail systems and on the Silver Line Waterfront to determine origin and destination information
- Commuter rail ridership data provided by the Massachusetts Bay Commuter Railroad Company (MBCR) and previous CTPS counts

WORK DESCRIPTION

Task 1 Develop Sampling Plans

For the heavy rail and light rail systems, as well as the Silver Line Waterfront service, a sampling plan for passenger surveys will be devised to ensure a random selection of stations across all parts of each system for all days of the week and time periods over the entire year.

For light rail service at surface stops, onboard observations are necessary because not all passengers interact with fare collection equipment when boarding Green Line and Mattapan High-Speed Line vehicles. Counts of passengers boarding through rear doors and failing to interact with the farebox will be conducted. Two ridecheckers will be necessary, one to count the number of rear boardings and the other to note the number of passengers boarding through the front door who do not interact with the farebox (flash-pass trips, children, and fare evaders). A sampling plan will be devised to ensure that these observations are conducted on surface light rail for all days of the week and time periods over the entire year.

For the bus and trackless trolley systems, a sampling plan for ridechecks will be devised to ensure a random selection of trips across all parts of each system for all days of the week and time periods over the entire year. Ridecheckers will also note the number of passengers who board through rear doors or otherwise fail to interact with the farebox.

No direct data collection is planned for commuter rail. However, a sampling of some trips may be necessary to verify the figures reported by the contract operator.

For this state fiscal year, an effort will be made to collect as much data as possible through electronic means using the CTPS supply of palmtop computers. Staff from the CTPS Information Technology and Services Group will develop the following palmtop applications:

- Light rail, heavy rail, and Silver Line Waterfront passenger surveys
- Faregate non-interaction count
- Surface light rail rear door boarding count
- Surface light rail front door farebox non-interaction count
- Bus and trackless trolley farebox non-interaction count

Products of Task 1

- Heavy rail and light rail sampling plan for SFY 2010 passenger surveys
- Surface-light-rail sampling plan for SFY 2010 observations
- Bus and trackless trolley sampling plan for SFY 2010 ridechecks
- Palmtop applications for passenger survey and count

Task 2 Collect Data

The heavy rail, light rail, and Silver Line Waterfront assignments generated by the sampling plan created in Task 1 will be executed. CTPS personnel will conduct passenger surveys at each of the heavy rail, light rail, and Silver Line Waterfront survey locations. Counts of the number of passengers passing through faregates, and specifically those who do not interact with the faregate, at station survey locations will also be conducted. Along Green Line and Mattapan High-Speed Line surface routes, onboard observations of passengers, and specifically those who do not interact with the farebox,

will be conducted. Ridechecks on selected bus trips will also be performed by CTPS personnel, using palmtop computers.

All ridechecks, passenger surveys, and passenger counts will be performed by CTPS personnel, using palmtop computers. The data collected on ridechecks will be uploaded directly to the CTPS bus ridership information database, where they will be checked for completeness and accuracy. Passenger survey results and passenger count data will be uploaded directly to the CTPS non-palm database, where they will similarly be checked for completeness and accuracy.

AFC data will be requested from the MBTA for total heavy rail and light rail subway station boardings, as well as for total surface light rail, motor bus, and trackless trolley boardings. In addition, AFC data will be requested for total farebox deposits for each sampled bus and trackless trolley trip.

Products of Task 2

- Completed passenger survey assignments for heavy rail, light rail, and Silver Line Waterfront stations in electronic form
- Completed passenger count assignments for surface light rail, motor bus, and trackless trolley in electronic form
- Ridecheck data in electronic form
- AFC data on total boardings for light and heavy rail stations and surface light rail, motor bus, and trackless trolley routes
- AFC revenue data for motor bus and trackless trolley fareboxes for ridechecked trips

Task 3 Clean, Code, and Keypunch Survey, Passenger Count, and Ridecheck Data

CTPS will clean the heavy rail and light rail passenger survey data as necessary after downloading them into a spreadsheet program. The program will allow for the processing of the origin-destination data as well as any other data included on the form. The farebox non-interaction passenger count data for surface light rail, motor bus, and trackless trolley will also be entered into a spreadsheet for processing. Ridecheck data will also be cleaned.

Products of Task 3

- Heavy rail and light rail passenger survey data in electronic form
- Surface light rail, motor bus, and trackless trolley passenger count data in electronic form
- Cleaned ridecheck data in electronic form

Task 4 Estimate Passenger-Miles and Boardings

Information on the total number of passengers boarding at subway stations on the heavy rail and light rail systems will be obtained from the MBTA through AFC faregate

passenger counts. Factors that account for the number of transfers between each mode will then be estimated based on the origin-destination passenger surveys conducted in Task 2. Additionally, a faregate non-interaction factor will be developed from the observations at station survey locations. These factors will be applied to the AFC faregate counts to estimate total unlinked heavy rail and light rail riders attributable to subway boardings.

For light rail surface stops, counts of passengers boarding through rear doors and failing to interact with the farebox will be used to develop a farebox non-interaction factor. This factor will be applied to the AFC farebox counts of total passengers on surface light rail, which will then be increased to account for transfers made to other heavy rail or light rail lines, resulting in an estimate of total unlinked light rail and heavy rail riders attributable to light rail surface boardings.

Meanwhile, the origin-destination data generated by the passenger surveys will be converted into estimates of the average passenger-miles per passenger for both the heavy rail and light rail systems. This conversion will make use of procedures developed a number of years ago for the Systemwide Rapid Transit Survey. Multiplying the average passenger-miles per passenger by the total number of passengers will yield estimates of total passenger-miles for each mode.

As with surface light rail, a farebox non-interaction factor developed as part of the ridecheck sample will be applied to the AFC farebox count of total motor bus and trackless trolley passengers to estimate total boardings. Total passenger-miles will be estimated, as in previous years, using the ridecheck sample of trips to develop an average trip distance; this distance multiplied by total boardings results in total passenger-miles.

For the commuter rail system, ridership counts supplied by MBTA will provide the basis for the estimate of passenger boardings. Counts by station, in conjunction with data indicating the percentage of alightings prior to North Station and South Station (from the 2000 Commuter Rail Peak Load Counts report), will provide the basis for the estimate of average passenger trip length.

Product of Task 4

Estimates of passenger-miles and boardings for all MBTA modes discussed above

Task 5 Document Results

The results of Task 4 will be documented in a technical memorandum. This memorandum will include a statistical analysis confirming that the true values for passenger-miles and boardings have a 95 percent probability of falling within 10 percent of the estimates, as required by the FTA.

Product of Task 5

A technical memorandum describing the data collection and analysis processes, summarizing results, and presenting a statistical analysis of the results

ESTIMATED SCHEDULE

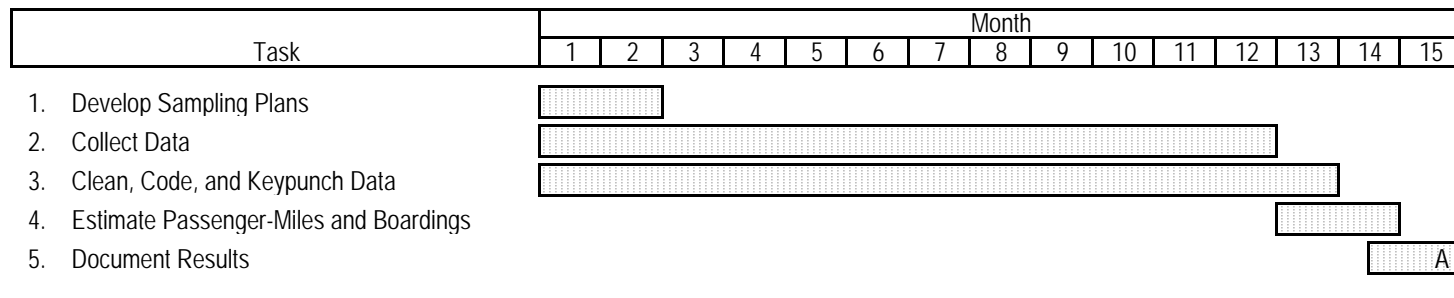
It is estimated that this project would be completed 15 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$87,193. This includes the cost of 68.8 person-weeks of staff time, overhead at the rate of 86.97 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/RSG/rsg

Exhibit 1
 ESTIMATED SCHEDULE
 State Fiscal Year 2010 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates



Products/Milestones
 A: Technical memorandum

Exhibit 2

ESTIMATED COST

State Fiscal Year 2010 National Transit Database Directly Operated Bus and Rail Passenger-Miles and Boardings Estimates

Direct Salary and Overhead	\$86,465
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Task	Person-Weeks						Direct Salary	Overhead (@ 86.97%)	Total Cost
	M-1	P-4	SP-3	SP-1	Temp	Total			
1. Develop Sampling Plans	0.0	0.8	2.1	0.0	0.5	3.4	\$2,884	\$2,508	\$5,393
2. Collect Data	0.2	0.2	7.2	23.7	22.7	54.0	\$32,268	\$28,063	\$60,331
3. Clean, Code, and Key punch Data	0.0	2.0	3.8	0.0	2.0	7.8	\$6,451	\$5,610	\$12,061
4. Estimate Passenger-Miles and Boardings	0.0	2.0	0.0	0.0	0.0	2.0	\$2,440	\$2,122	\$4,562
5. Document Results	0.6	1.0	0.0	0.0	0.0	1.6	\$2,202	\$1,915	\$4,118
Total	0.8	6.0	13.1	23.7	25.2	68.8	\$46,244	\$40,219	\$86,465

Other Direct Costs	\$728
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Travel	\$728
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TOTAL COST	\$87,193
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Funding

Future MBTA Contract