



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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

MEMORANDUM

DATE May 19, 2016
TO Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush
CTPS Executive Director
RE Work Program for: MBTA SFY 2017 National Transit Database: Data
Collection and Analysis

Action Required

Review and approval

Proposed Motion

That the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Bay Transportation Authority, vote to approve the work program for MBTA 2017 National Transit Database: Data Collection and Analysis, presented in this memorandum

Project Identification

Unified Planning Work Program Classification

Technical Support/Operations Analysis Projects

CTPS Project Number

14351

Clients

Massachusetts Bay Transportation Authority
Project Supervisor: Melissa Dullea

CTPS Project Supervisors

Principal: Annette Demchur
Manager: Andrew Reker

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 any 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 modes. In state fiscal year (SFY) 1996, the scope of the analysis was expanded to include the heavy rail and light rail transit modes. In SFY 2000, the scope was expanded further to include the MBTA commuter rail mode. Since SFY 2001, CTPS has also produced passenger-miles and boardings estimates for the MBTA's purchased-service bus routes (that is, routes for which the MBTA contracts with a private carrier to provide the service). Beginning in SFY 2014, at the request of the FTA, the MBTA reclassified some of its bus routes as bus rapid transit for NTD reporting.

In SFY 2014, the FTA began to allow the MBTA to use its automatic passenger counter (APC) data for reporting to the NTD. In SFY 2016, the MBTA directed CTPS to conduct passenger counts on APC-equipped buses for verifying APC data. The MBTA uses these counts, along with its APC data, to estimate the unlinked passenger-trips and passenger-miles traveled on its buses and bus rapid transit vehicles. CTPS will continue to collect these data in SFY 2017.

For purchased services, CTPS began collecting full-route ridecheck data in SFY 2010 rather than collecting data for a random sample of trips. It was determined that the methodology employing full-route ridechecks satisfies the FTA's requirement that the true values for passenger-miles and boardings have a 95 percent probability of falling within 10 percent of the estimates. In addition, this methodology provides ridership and schedule adherence data for each purchased bus route that could be used for planning purposes. In SFY 2017, CTPS will continue to use full-route ridechecks to estimate total passenger-miles and boardings.

Objectives

The objectives of this project are to develop estimates of passenger-miles and boardings for the MBTA's directly operated transportation modes, including trackless trolley, heavy rail, and light rail. CTPS will also develop an estimate of the average trip length per passenger for the commuter rail mode and estimates of passenger-miles and boardings for contracted MBTA local bus service, and will review the MBTA's APC-derived passenger-miles and boarding estimates for the bus and bus rapid transit modes.

CTPS will collect the data upon which these estimates will be based in a variety of ways:

- Full-route ridechecks on contracted MBTA local bus service and trackless trolley service
- MBTA APC data
- Passenger counts on APC-equipped buses
- Fare-mix counts from automated-fare-collection (AFC) faregates at stations and from fareboxes on vehicles
- Passenger surveys on the heavy rail mode, light rail mode, and gated portions of the bus rapid transit mode to determine origin-destination information
- Inferred origin-destination information from AFC data
- Commuter rail ridership data from passenger counts conducted by the MBTA or its contractors, or from the MBTA's mobile ticketing vendor

Work Description

Task 1 Develop Sampling Plans

For the heavy rail mode, light rail mode, and gated portions of the bus rapid transit mode, staff will develop a sampling plan for passenger surveys that will ensure that there is a random selection of stations over the entire year for all days of the week and all service periods.

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. CTPS will conduct counts of passengers who do not interact with the farebox. For each car, it may be necessary to have two ridecheckers: one to count the number of rear boardings and the other to count the number of passengers boarding through the front door by category—those who interact with the farebox and those who do not interact with the farebox (flash-pass trips, children, and fare evaders). Staff will develop a sampling plan that will ensure that these observations are conducted on surface light rail over the entire year for all days of the week and all service periods.

For the trackless trolley mode and purchased bus services, CTPS will develop sampling plans for conducting full-route ridechecks on each route. Staff will perform these ridechecks on each scheduled trip for each route one time over the course of a single quarter during SFY 2017. The selection of quarters will be determined by CTPS staffing availability.

In SFY 2017, CTPS may obtain and analyze three potential data sources: conductor audits, data from the MBTA's mobile ticketing vendor, and Keolis

Commuter Service's spring 2016 passenger counts. No direct data collection is planned for commuter rail.

CTPS will collect as much data as possible through electronic means, using hand-held mobile devices that support CTPS-developed applications, for the following:

- Passenger origin-destination surveys
- Faregate noninteraction counts
- Surface light rail rear-door boarding counts
- Surface light rail front-door passenger counts, including farebox noninteraction counts
- Bus and trackless trolley farebox counts and farebox noninteraction counts
- Bus and trackless trolley boardings and alightings by stop
- Inferred heavy and light rail origin-destination data by station

Products of Task 1

- Sampling plans for SFY 2017 passenger surveys
- Sampling plan for SFY 2017 surface light rail observations
- Sampling plans for SFY 2017 bus and trackless trolley ridechecks

Task 2 Collect Data

The ridecheck assignments generated by the sampling plans created in Task 1 for purchased bus and trackless trolley will be executed. CTPS will conduct full-route ridechecks on these modes using mobile devices, will classify how passengers pay for their trips, and, where applicable, will note the number of passengers who do not interact with the farebox. CTPS will also conduct passenger surveys at each of the survey locations, and will conduct counts of the number of passengers passing through faregates, including counts of those who do not interact with the faregates, at station survey locations that have faregates. Along Green Line and Mattapan Line surface routes, CTPS will conduct onboard counts of passengers, including those who do not interact with the farebox.

CTPS will perform ridechecks, passenger surveys, and passenger counts, using mobile devices where practicable. 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 a different database, where they also will be checked for completeness and accuracy.

The MBTA will provide CTPS with detailed AFC data for all of the MBTA's modes for which data exist.

Products of Task 2

- Passenger survey results
- Noninteraction data for faregates and fareboxes
- Passenger count data for surface light rail, purchased bus, and trackless trolley
- AFC data on total boardings for all modes
- Ridecheck data
- APC data for unlinked passenger trips and passenger-miles traveled
- Detailed AFC data by transaction

Task 3 Process Ridecheck, Passenger Survey, and Passenger Count Data

CTPS will process the ridecheck, passenger survey, and passenger count data, including noninteraction data for faregates and fareboxes.

Product of Task 3

Processed ridecheck, passenger survey, and passenger count data

Task 4 Estimate Passenger-Miles and Boardings*Subtask 4.1 Estimate Passenger-Miles and Boardings for Directly Operated Services*

For the MBTA's directly operated services, CTPS will obtain information from the MBTA through AFC faregate passenger counts about the total number of passengers boarding at subway stations on either the heavy rail or the light rail mode. Staff will then estimate the factors that account for the number of transfers between modes, based on the findings of the origin-destination passenger surveys conducted in Task 2 and the processed AFC data. In addition, staff will develop a faregate noninteraction factor from the observations at station survey locations, and will apply the factor to the AFC faregate counts to estimate the total number of unlinked heavy rail and light rail riders attributable to subway boardings.

For light rail surface stops, CTPS will use counts of boarding passengers who do not interact with the farebox in order to develop a farebox noninteraction factor. Staff will apply this factor to the AFC farebox counts of the total number of passengers on surface light rail. Staff will then apply additional factors to account for transfers made to other light rail lines or to heavy rail lines, which will generate estimates of the total of unlinked light rail and heavy rail riders attributable to light rail surface boardings.

For the heavy rail and light rail modes, CTPS will convert the origin-destination data generated by the passenger surveys and the processed AFC data into estimates of the average passenger-miles per transit mode. The average passenger-miles per passenger will be multiplied by the total number of passengers to yield estimates of the total number of passenger-miles for

each mode. CTPS will also generate an estimate of passenger-miles using its origin-destination model.

For the MBTA's bus and bus rapid transit modes, CTPS will select some bus trips that have APC-equipped busses to conduct passenger counts for use in APC data verification. CTPS will then provide the results of these counts to the MBTA. The MBTA will use these CTPS-produced results in estimating passenger-miles traveled and unlinked passenger trips. CTPS will then assess the MBTA's estimates of passenger-miles traveled and unlinked passenger trips.

For the commuter rail mode, CTPS will use one or more of the sources of ridership counts described in Task 1 as the basis for estimating passenger boardings. In the past two years, because conductor audit data were not available, CTPS obtained anonymized origin-destination data from the MBTA's mobile ticketing vendor. That dataset was sufficient for estimating the average passenger-miles traveled per trip. In addition, in SFY 2017, CTPS will examine Keolis's spring 2016 passenger counts; this dataset should be sufficient for calculating the average passenger-miles traveled per trip. However, CTPS does not produce estimates of unlinked passenger trips for commuter rail, and does not expect to conduct any direct observations of the commuter rail mode.

Subtask 4.2 Estimate Passenger-Miles and Boardings for Purchased Bus Services

For purchased bus services, CTPS will produce estimates of passenger-miles and boardings using revenue data from the MBTA and output from CTPS's database of bus ridership information. CTPS will generate estimates of the average farebox deposit, and will then estimate the average trip length per passenger based on ridecheck observations. The total boardings will be estimated by dividing the average farebox deposit into the total revenue. The total passenger-miles will be calculated by multiplying the total boardings by the average trip length per passenger.

Product of Task 4

Estimates of passenger-miles and boardings for all MBTA modes

Task 5 Document Results

CTPS will document the results of Task 4 and the methodology of the study in three technical memoranda: one for purchased bus services, one for directly operated services, and one for the commuter rail mode. The technical memoranda will describe the data-collection and analysis processes and present a summary of the results.

Product of Task 5

Three technical memoranda

Task 6 Assist with the Compliance Audit

The FTA requires that an independent auditor review and verify the MBTA's estimates of directly operated bus and rail passenger-miles and boardings. As the agency responsible for these estimates, CTPS will provide any materials and assistance necessary for the audit.

Estimated Schedule

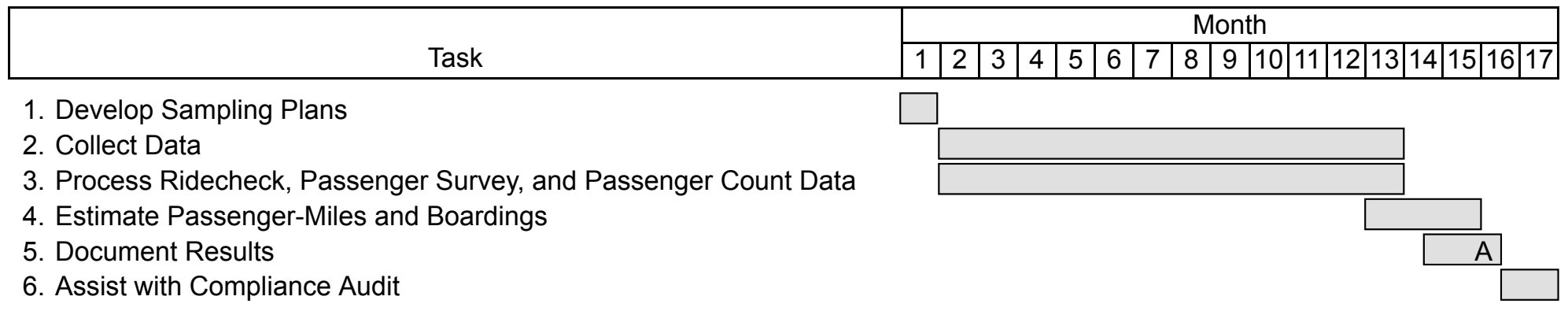
It is estimated that this project will be completed 17 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

Estimated Cost

The total cost of this project is estimated to be \$141,398. This includes the cost of 95.4 person-weeks of staff time, overhead at the rate of 102.7 percent, and travel. A detailed breakdown of the estimated costs is presented in Exhibit 2.

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Exhibit 1
ESTIMATED SCHEDULE
MBTA SFY 2017 National Transit Database: Data Collection and Analysis



Products/Milestones

A: Technical memoranda

Exhibit 2
ESTIMATED COST
MBTA SFY 2017 National Transit Database: Data Collection and Analysis

Direct Salary and Overhead	\$140,898
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Task	Person-Weeks							Direct Salary	Overhead (102.70%)	Total Cost
	M-1	P-5	P-3	SP-3	SP-1	Temp	Total			
1. Develop Sampling Plans	0.1	0.6	1.0	2.1	1.5	0.5	5.8	\$5,649	\$5,801	\$11,450
2. Collect Data	0.5	0.7	2.6	11.7	21.9	43.3	80.7	\$53,914	\$55,370	\$109,284
3. Process Ridecheck, Passenger Survey, and Passenger Count Data	0.0	0.0	0.8	0.0	0.8	1.0	2.6	\$2,050	\$2,105	\$4,154
4. Estimate Passenger-Miles and Boardings	0.0	0.0	2.8	0.0	0.0	0.0	2.8	\$3,308	\$3,397	\$6,704
5. Document Results	0.5	0.2	2.4	0.0	0.0	0.0	3.1	\$4,118	\$4,229	\$8,348
6. Assist with Compliance Audit	0.0	0.0	0.4	0.0	0.0	0.0	0.4	\$472	\$485	\$958
Total	1.1	1.5	10.0	13.8	24.2	44.8	95.4	\$69,511	\$71,388	\$140,898

Other Direct Costs	\$500
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Travel	\$500
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TOTAL COST	\$141,398
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Funding
 Future MBTA Contract