



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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

MEMORANDUM

DATE October 5, 2017
TO Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, Executive Director
RE Work Program for Title VI Service Equity Analysis: Methodology Development Phase II

Action Required

Review and approval

Proposed Motion

That the Boston Region Metropolitan Planning Organization (MPO), upon the recommendation of the Massachusetts Department of Transportation (MassDOT), votes to approve the work program for *Title VI Service Equity Analysis: Methodology Development Phase II*, presented in this memorandum

Project Identification

Unified Planning Work Program Classification

Agency and Other Client Transportation Planning Studies and Technical Analyses

CTPS Project Number

11409

Client

MassDOT, Office of Transportation Planning
Project Supervisor: Nicole Tishler

CTPS Project Supervisors

Principal: Annette Demchur
Manager: Nicholas Hart

Funding

MassDOT §5303 Contract #C1218

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 Unified Planning Work Program.

Background

The Federal Transit Administration (FTA) Circular 4702.1B provides guidelines and requirements for implementing US Department of Transportation regulations pertaining to Title VI of the Civil Rights Act of 1964 (49 CFR 21). The Circular requires large transit providers (those that operate 50 or more fixed-route vehicles in peak service and that are located in an urbanized area with a population of 200,000 or more) to conduct a service equity analysis to evaluate, prior to implementing any major service change, whether the planned change would have a discriminatory impact based on race, color, or national origin.

The FTA guidelines for conducting the analysis recommend that transit providers measure potential disparate impacts and disproportionate burdens by comparing the proportion of persons in the protected class who are adversely affected by the service change with the proportion of persons not in the protected class who are adversely affected by the service change, using either ridership or population data. While an analysis based on ridership data has the potential to provide the most meaningful impact analysis for changes to existing services, it is costly and difficult to obtain statistically reliable results from passenger surveys, and such surveys do not account for potential riders who could be affected by new, extended, or rerouted services. Alternatively, an analysis based on the FTA guidelines for using population data is limited to a cursory look at the population of the area surrounding the location of the service change, and does not account for riders who may transfer to the area of the service change from other parts of the network, or for the existence of other transit options. In addition, neither of the FTA methods for conducting service equity analyses account for the varying magnitude of adverse effects attributable to different types of service changes.

In a previous Boston Region MPO study, *Title VI Service Equity Analysis: Methodology Development*, Central Transportation Planning Staff (CTPS) developed an improved methodology for conducting Title VI service equity analyses, and conducted a proof of concept to demonstrate its application. The developed methodology utilizes the Modified Transit Opportunity Index (MTOI) to measure the amount of transit opportunity provided to a census tract as a function of the transit system network. In the methodology, the adverse effects of a proposed service change are measured by calculating the percentage decrease in MTOI between the existing and proposed service for each census tract in the network. The percentage change in the MTOI of a census tract is multiplied by minority and nonminority

population for that census tract and aggregated for all census tracts to determine the total minority and nonminority impact of the service change. The ratio of the minority impact and the nonminority impact is calculated and compared to the transit agency's disparate impact threshold to determine if the proposed service change would result in a disparate impact.

This newly developed methodology provides a more accurate and comprehensive way of analyzing the equity impacts of major service changes than the current FTA methodology because it accounts for (1) riders who may be indirectly affected by the service change, not just those who currently use the service or who reside near the service; (2) the varying magnitude of adverse effects attributable to different types of service changes; and (3) the availability of alternative transit options that might reduce the potential adverse effects of a service change.

In this project, staff will develop a full-scale model of the MBTA bus and rapid transit network to provide a platform for conducting comprehensive assessments of the MTOI for each census tract within the network. This will require development of a computing framework that will measure transit opportunity metrics—such as spatial access to transit, number of trips between origins and destinations, and travel times between origins and destinations—using data from geographic information system (GIS) shapefiles, US Census and American Community Survey (ACS) data, General Transit Feed Specification (GTFS) data, Automatic Passenger Counter (APC) data, Automatic Vehicle Location (AVL) data, and MBTA passenger survey data.

The MTOI model will be used for conducting future Title VI service equity analyses of major service changes considered by the MBTA. Once completed, the tool will be presented to FTA. By completing this work, the MPO will continue to adhere to its commitment to conducting industry-leading Title VI and other transportation-equity-related work.

Objectives

- Develop a model of the MBTA bus and rapid transit network to provide a platform for conducting comprehensive Title VI service equity analyses of major transit service changes
- Present a new tool and methodology for conducting Title VI service equity analyses to the FTA to demonstrate that the methodology warrants compliance under federal regulations

Work Description

The work required to accomplish the project's objectives will be carried out in the five tasks described below.

Task 1 Update the State of the Practice Review

In the previous study, *Title VI Service Equity Analysis: Methodology Development*, CTPS reviewed FTA guidance and requirements, previous analyses of MBTA transit service changes, and Title VI analysis procedures used by other agencies, and conducted a literature review on the topic of transportation equity analysis. CTPS will update this review and use the findings to identify potential opportunities to strengthen components of the existing MTOI framework.

Product of Task 1

An update of the previous study's outline detailing the strengths and weaknesses of the current state of the practice of Title VI service equity analysis

Task 2 Develop the Systemwide Title VI Service Equity Analysis Tool

CTPS will develop a full-scale model of the MBTA bus and rapid transit network. The model will be used to calculate the MTOI of census tracts served by the existing bus and rapid transit network, and it will have the flexibility to incorporate future service changes as they are proposed. This model will form the basis for the Title VI service equity analysis tool, which will be used for assessing the adverse effects of proposed changes to the MBTA bus and rapid transit network. The work to develop this tool will be carried out in the three subtasks below.

Subtask 2.1 Review and Evaluate Software Alternatives for Computing Platform

CTPS will review and evaluate alternative software products to serve as the platform for building the MTOI model discussed above. The software will be used to store and compute data from GIS shapefiles, US Census decennial and ACS data, GTFS data, APC data, AVL data, and MBTA passenger survey data. As such, the selected software must be capable of storing large data sets and efficiently performing lookups and calculations across large sets of origin and destination matrices.

Subtask 2.2 Develop and Test Network Prototype with Selected Software

CTPS will develop a small network prototype using the selected software. This task will allow staff to learn how to use the software and to create a basic stage to structure, develop, test, and debug the model framework in an efficient and effective manner prior to full-scale development. To ensure

accuracy of the model, MTOI calculations from the model will be tested against hand calculations of the prototype.

Subtask 2.3 Build Full-Scale MTOI Model for MBTA Bus and Rapid Transit Network

CTPS will build a full-scale model for calculating the MTOI of all census tracts contained within the MBTA bus and rapid transit network. Separate models will be constructed for each defined span of MBTA service, including weekday service, Saturday service, and Sunday service. Full-scale development will be structured on the framework developed in Subtask 2.2.

Subtask 2.4 Conduct Assessment of Tool

CTPS will conduct a sensitivity analysis along with a series of sample service equity analyses using outputs from the full-scale MTOI model. The results of those analyses will be compared to results obtained using the traditional methods provided by FTA.

Product of Task 2

A full-scale MBTA bus and rapid transit network model for calculating the MTOI from existing transit services and proposed major service changes, for use as a tool for conducting the MBTA's future Title VI service equity analyses

Task 3 Generate User Manual for Conducting Title VI Service Equity Analysis with the MTOI Model

CTPS will document the development and framework of the MTOI model and generate a user manual to facilitate its use as a tool for conducting Title VI service equity analysis of proposed major service changes.

Products of Task 3

A memorandum documenting the development and framework of the MTOI model, and a user manual for use as a tool for conducting Title VI service equity analyses of proposed major service changes

Task 4 Present the New Methodology and Tool to the FTA

CTPS will work with the MBTA and MassDOT Office of Diversity and Civil Rights (ODCR) to present the new Title VI service equity analysis tool and methodology to the FTA. CTPS will provide technical assistance to demonstrate to the FTA that the methodology warrants compliance under federal regulations.

Products of Task 4

Correspondence with the FTA

Task 5 Provide Technical Assistance to the MBTA and MassDOT ODCR

CTPS will meet with the MBTA and MassDOT ODCR on a regular basis to provide updates on the development and operation of the Title VI service equity analysis tool and methodology.

Products of Task 5

Technical assistance to the MBTA and MassDOT ODCR

Estimated Schedule

It is estimated that this project will be completed 12 months 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 \$137,285. This includes the cost of 48.6 person-weeks of staff time, overhead at the rate of 105.66 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/NH/nh

Exhibit 1
ESTIMATED SCHEDULE
Title VI Service Equity Analysis: Methodology Development Phase II

Task	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	
1. Update the State of the Practice Review	█												
2. Develop the Systemwide Title VI Service Equity Analysis Tool		█											
3. Generate User Manual for Conducting Title VI Service Equity Analysis with the MTOI Model						█							
4. Present the New Methodology and Tool to the FTA									█				
5. Provide Technical Assistance to the MBTA and MassDOT ODCR	█												

Exhibit 2**ESTIMATED COST****Title VI Service Equity Analysis: Methodology Development Phase II**

Direct Salary and Overhead									\$136,785
Task	Person-Weeks					Direct Salary	Overhead (105.66%)	Total Cost	
	M-1	P-5	P-4	P-3	Total				
1. Update the State of the Practice Review	0.4	0.0	0.0	1.6	2.0	\$2,703	\$2,856	\$5,559	
2. Develop the Systemwide Title VI Service Equity Analysis Tool	1.0	2.0	2.0	26.0	31.0	\$40,300	\$42,581	\$82,881	
3. Generate User Manual for Conducting Title VI Service Equity Analysis with the MTOI Model	1.0	0.4	0.4	2.0	3.8	\$5,626	\$5,945	\$11,571	
4. Present the New Methodology and Tool to the FTA	2.4	0.0	0.0	2.4	4.8	\$7,398	\$7,817	\$15,216	
5. Provide Technical Assistance to the MBTA and MassDOT ODCR	3.0	0.0	0.0	4.0	7.0	\$10,483	\$11,076	\$21,559	
Total	7.8	2.4	2.4	36.0	48.6	\$66,510	\$70,275	\$136,785	
Other Direct Costs									\$500
Travel								\$500	
TOTAL COST									\$137,285

Funding