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 7, 2011**

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

FROM **Karl H. Quackenbush, Acting CTPS Director**

RE **Work Program for: Low-Cost Improvements to Bottleneck Locations**

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 Federal Highway Administration, vote to approve the work program for Low-Cost Improvements to Bottleneck Locations in the form of the draft dated June 30, 2011.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Planning Studies

CTPS Project Number
13249

Client
Boston Region Metropolitan Planning Organization

CTPS Project Supervisors
Principal: Efi Pagitsas
Manager: Chen-Yuan Wang

Funding
MassDOT Highway Division 3C PL Contract #66104

IMPACT ON MPO WORK

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

BACKGROUND

According to the Federal Highway Administration, "Much of recurring congestion is due to physical bottlenecks – potentially correctible points on the highway system where traffic flow is restricted. While many of the nation's bottlenecks can only be addressed through costly major construction projects, there is a significant opportunity for the application of operational and low-cost infrastructure solutions to bring about relief at these chokepoints."[1] To be consistent with this guidance, the local office of the Federal Highway Administration has recommended, as part of its comments on the Unified Planning Work Program process, that the MPO identify the three worst bottlenecks in the region that can be mitigated with low-cost countermeasures and develop recommendations for such countermeasures at these locations.

In the first bottleneck study, MPO staff selected five freeway mainline bottleneck locations and proposed low-cost improvements for three locations. In that study, staff realized that some of the freeway mainline bottleneck locations would require costly major construction fixes and therefore were not studied. In this bottleneck study, MPO staff expanded the study to look at low-cost improvements to bottleneck locations at interchanges of state highways, in addition to interstate highways.

Usually, bottlenecks occur at a specific location and clear out downstream from that location. They have a traffic queue upstream and improved flow conditions downstream. There is an important distinction between "bottlenecks" and "congestion." Bottlenecks are congested highway segments with recurring operational problems (congestion that occurs at the same location and time daily and is predictable). It is generally considered to be the result of an imbalance between supply and demand. However, congestion can result from causes other than bottlenecks, such as incidents, work zones, and bad weather. Recurring bottlenecks, the subject of this work program, are usually influenced by the highway design or operation at the point where the bottleneck begins, including:

- Merges, diverges, lane drops, and weaving sections
- Abrupt changes in highway alignment
- Short acceleration lanes and short ramp length
- Deficient ramp signal, poor signal coordination between ramp and the arterial connecting to the ramp, and exit ramp geometry

[1] U.S. Department of Transportation, Federal Highway Administration, *Recurring Traffic Bottlenecks: A Primer: Focus on Low-Cost Operations Improvements,* June 2009, p. 1.

There are several options for addressing bottlenecks, including bringing supply and demand in alignment and investing in new highway capacity, but they are costly. Additional options include congestion mitigation strategies that provide alternative commute options such as telecommuting, making transit easier and more attractive to use, and ridesharing. For low-cost operational and geometric improvement, the strategies include:

- Shoulder conversions to travel lanes
- Restriping merge and diverge to serve demand better
- Lane reallocation
- Modification of weaving areas and ramps
- Improved traffic signal timing
- Parking management
- Application of access management principles
- Provision of traveler information
- Construction of high-occupancy-vehicle (HOV) lanes
- Congestion pricing

The MPO agrees with FHWA that, if there are opportunities to implement low-cost bottleneck mitigation countermeasures in this region's highway and arterial system, those countermeasures should be identified and carried out. Benefits of localized low-cost bottleneck improvements include:

- They are less invasive to the physical and human travel environment.
- Lower costs allow for more locations to be addressed.
- They are highly cost-effective.
- They can have significant safety benefits.
- They address existing problems and therefore have high visibility.
- They may actually end up being the long-term solution required.

OBJECTIVES

There are two objectives:

1. Identify three bottleneck segments or points where low-cost mitigation improvements seem applicable. The identified bottlenecks may not be the worst in the region, as the worst may not be correctible with low-cost mitigation strategies.

2. Recommend low-cost mitigation improvements. The recommendations are to be based on analysis of traffic volumes, geometric design, and other data and projected service performance associated with the countermeasures at each location.

WORK DESCRIPTION

To meet the objectives mentioned above, MPO staff will perform the following tasks:

Task 1 Inventory the Candidate Locations for Bottleneck Study

MPO staff will develop an initial list of candidate bottleneck locations in the highway and arterial roadway system of the MPO region. To this end, staff will largely rely on their knowledge of congestion and bottleneck locations in the region's roadway system. In addition, staff will review Congestion Management Process monitoring data and recent MPO and other planning studies, consult with MassDOT and local representatives, seek input from private-sector transportation professionals, and meet with other MPO staff who drive frequently under congested conditions. The identified locations will not necessarily be the worst bottleneck locations. Instead, the main criteria will be that the bottleneck is caused by an operational characteristic, such as those listed in the Background section of this memorandum, and can seemingly be corrected with low-cost mitigation measures similar to those listed in the Background section.

Product of Task 1

An initial list of bottleneck locations, including associated characteristics

Task 2 Screen the Initial List of Bottlenecks and Propose Two for Analysis

Candidates from the initial list will be evaluated in order to select up to two locations for final analysis. The candidate locations will be screened based on need (queue length, volume impacted, safety), ease of implementation (available right-of-way, available capacity from nearby or opposing streams of traffic), and cost considerations. Staff will present the initial list and final recommendations to the Transportation Planning and Programming Committee for review.

Product) of Task 2

A technical memorandum discussing the selection of two bottlenecks for analysis and for development of low-cost mitigation countermeasures; it will include maps showing the locations and lengths of the bottlenecks.

Task 3 Identify Alternative Countermeasures and Perform Analysis

As the bottleneck locations will have been selected with a seemingly suitable countermeasure in mind, it will not be difficult to identify mitigation strategies. In some cases, there may be more than one strategy to consider. In compiling a comprehensive list of potential countermeasures, staff will mainly rely on their technical expertise and judgment regarding the nature of bottlenecks. However, in addition, staff will seek the input of public and private transportation professionals who are also familiar with the operation of the region's roadway system and input from other MPO staff who frequently travel through the identified bottleneck locations.

Analysis of the potential countermeasures will be qualitative and, if possible, quantitative. Qualitative assessment will include consideration of existing conditions, reasons for the bottleneck, length of the bottleneck, characteristics of the mitigation strategy, right-of-way and other requirements, potential non- transportation impacts, and other factors. Depending on data availability and level of complexity of the bottleneck, staff may perform a quantitative assessment of the bottleneck location. This may involve applying a microsimulation model or simply developing a traffic flow map. Regardless of the technical assessment level employed by staff, analysis will include conceptual designs of existing conditions and proposed countermeasures.

Product) of Task 3

- List of alternative countermeasures
- Analysis results of tested countermeasures, including countermeasure conceptual designs

Task 4 Document the Results

Staff will write a technical memorandum to document the process for choosing the two bottlenecks, characteristics of the locations, analysis of existing conditions, the countermeasures considered and the impact of those countermeasures, and conceptual designs of the recommended strategies.

Products of Task 4

A technical memorandum documenting the analysis, results, and recommendations

ESTIMATED SCHEDULE

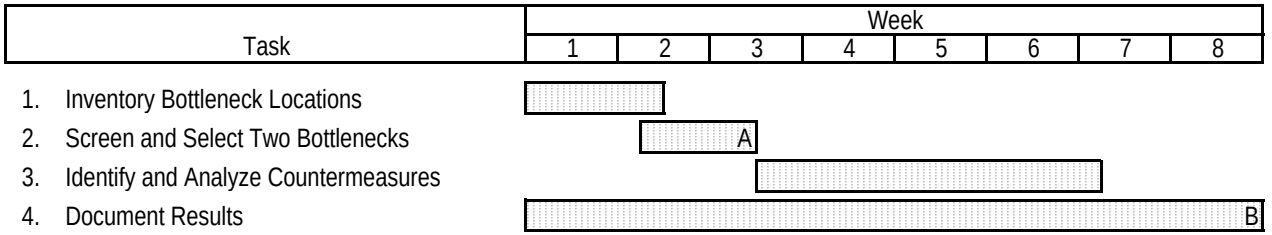
It is estimated that this project will be completed eight weeks after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be $20,388. This includes the cost of 6.6 person-weeks of staff time, overhead at the rate of 90.69 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/EP/ep

Exhibit 1
ESTIMATED SCHEDULE
Low-Cost Improvements to Bottleneck Locations



Products/Milestones

A: Bottleneck Selection Technical Memorandum

B: Final Draft Technical Memorandum

Exhibit 2
ESTIMATED COST
Low-Cost Improvements to Bottleneck Locations

Direct Salary and Overhead	$20,188

Task	Person-Weeks M-1	P-5	Total	Direct Salary	Overhead (@ 90.69%)	Total Cost
1. Inventory Bottleneck Locations	0.2	0.5	0.7	$1,125	$1,020	$2,145
2. Screen and Select Two Bottlenecks	0.2	0.5	0.7	$1,125	$1,020	$2,145
3. Identify and Analyze Countermeasures	0.5	3.0	3.5	$5,604	$5,083	$10,687
4. Document Results	0.5	1.2	1.7	$2,733	$2,478	$5,211
Total	1.4	5.2	6.6	$10,587	$9,602	$20,188

Other Direct Costs	$200
Travel	$200

TOTAL COST	$20,388

Funding
MassDOT Highway Division 3C PL Contract #66104