Rochester-Genesee Regional Transportation Authority

SIGNAL PRIORITIZATION STUDY

EXECUTIVE SUMMARY

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Transit priority measures give preferential treatment to transit vehicles over other vehicle traffic, thereby reducing transit delay at signalized intersections, and making transit vehicle travel times more consistent and competitive with automobile travel. In turn, this makes transit more attractive to both existing and future potential riders. Transit Priority Measures (TPM) assessed in this work include Transit Signal Priority (TSP) and queue jump lanes. The objective of this project is to identify bus routes which may benefit the most from the incorporation of TPM, and then develop specific TPM for the selected routes in the City of Rochester, New York.

Three major deliverables were developed for the RGRTA, namely:

- Task 1 — Operational Analysis;
- Task 2 — BRT System Assessment; and
- Task 3 — Concept of Operations.

Task 1 assessed ridership and revenue statistics along with existing traffic and transit operations for the following bus routes operated by the RGRTA:

- Route 1 Lake / Park;
- Route 2 Thurston / Parsells;
- Route 3 LyeII / Goodman;
- Route 4 Genesee / Hudson;
- Route 5 South / St. Paul;
- Route 6 Jefferson / Clifford;
- Route 7 Monroe / Clinton;
- Route 8 Chili / East Main;
- Route 10 Dewey / Portland;
- Route 18/19 University / Plymouth; and,
- Route 24 Rochester Institute of Technology / Marketplace Mall.

Each of these bus routes, except for Routes 18/19 and 24, are "through routed" through downtown Rochester. These routes begin at an outlying terminal, travel through downtown, and continue on to another outlying terminal. The middle of each route, therefore, is located downtown.

Determining which routes would be good candidates for enhancement through TPM implementation involved an assumption that the routes with the highest ridership and/or revenue would be the busiest during the traffic peak hours. The ridership and revenue statistics provided by the RGRTA were used to identify the bus routes with the highest ridership and revenue. The busiest routes were then subjected to traffic and transit operations analysis using Synchro models provided by the Monroe County Department of Transportation (MCDOT), and Routemapper Lite™ GPS video data surveys completed by IBI Group.

The analysis results indicated that the Lake Avenue portion of Route 1 Lake and the Dewey Avenue portion of Route 10 Dewey would benefit the most from the implementation of TPM. The general areas identified for TPM enhancements include:

- Route 1 Lake — between the intersections of Lake Avenue / Lyell Avenue and Lake Avenue / Maplewood Drive; and,
- Route 10 Dewey — between the intersections of State Street / Lyell Avenue and Dewey Avenue / Eastman Avenue.

The Task 2 report conducted an assessment of the RGRTA Transit Management System (TMS) and the Traffic Signal Control System (TSCS) currently in use by MCDOT, and New York State Department of Transportation (NYSDOT). The purpose of the report was to provide an assessment of these systems, and identify modifications required to implement TSP, along with a market comparison of alternative systems. Task 2 provided an assessment of current transit vehicle detection systems, required to implement TSP. The report also examined the concept of applying a Center-to-Center (C2C) approach to TSP implementation, which eliminates the use of a transit vehicle detection system. The Task 2 report recommends upgrading of the existing TMS and TSCS for future TSP implementation, and the selection of a viable transit vehicle detection system in the near term.

Task 3 built upon the work from these previous tasks, recommended TPM strategies, and, presented a plan for implementing the recommended TPM strategies along the selected RTS fixed route corridors. Existing traffic and transit operations were reviewed and cost estimates for implementing near term and long term TPM strategies along the selected bus routes were presented. Task 3 also examined the RouteMapper Lite™ video and GPS survey data which reported the average delay typically experienced by a bus on the selected routes. The RouteMapper Lite™ analysis identified individual signalized intersections, as well as clusters of adjacent signalized intersections where transit delay is significant. The signalized intersections identified through the RouteMapper Lite™" analysis were consistent with the locations identified through the Synchro analysis performed in Task 1.

The signalized intersections identified as candidates for TPM implementation have the following characteristics:

- Through delay is greater than 10 seconds (20 seconds or more for near term implementation);
- Through queue length is greater than 100 feet (200 feet or more, for near term implementation).

After reviewing the locations identified through the various analysis methods, a matrix was developed to summarize the issues at each location, and any noteworthy geometric characteristics. **Table-S 1** and **Table-S 2** present the analysis matrix for the two preferred routes, and identify locations that will benefit from the implementation of TPM. Delay, queue, speed concerns and the TSP thresholds were developed using the Synchro analysis, while the critical cluster of signalized intersections was confirmed using RouteMapper Lite™ analysis.

Table-S 1: Route 1 Lake TPM / TSP Candidate Locations

Intersection Location	Delay Concern	Queue Concern	Speed Concern	RouteMapper Lite ™ Delay	RouteMapper Lite ™ Delay & ∆Delay	Within Critical Section?	TSP - 20 Sec Threshold	TSP - 10 Sec Threshold	Geometric Characteristics
Dewey / Eastman		Y				Y		Y	
Dewey / Ridge	Y		Y	Y	Y	Y	Y	Y	
Dewey / Ridgeway	Y		Y	Y	Y	Y	Y	Y	
Dewey / Driving Park	Y		Y	Y	Y	Y		Y	
Dewey / Lexington		Y		Y	Y	Y		Y	
Dewey / Glendale Park		Y				Y			
Dewey / Flower City Park					Y	Y			
Dewey / Emerson		Y	Y	Y	Y	Y		Y	
Lyell / Plymouth		Y				Y		Y	
Lake / Lyell	Y	Y		Y	Y	Y	Y	Y	NB - Right Turn Only Lane - Buses Excepted, but no farside receiving merge lane
State / Brown		Y						Y	Exclusive bus lanes in each direction
State / Inner Loop	Y	Y		Y	Y		Y	Y	NB exclusive bus lane
State / Main								Y	

Table-S 2: Route 10 Dewey TPM / TSP Candidate Locations

Intersection Location	Delay Concern	Queue Concern	Speed Concern	RouteMapper Lite ™ Delay	RouteMapper Lite ™ Delay & ΔDelay	Within Critical Section?	TSP - 20 Sec Threshold	TSP - 10 Sec Threshold	Geometric Characteristics
Dewey / Eastman		Y				Y		Y	
Dewey / Ridge	Y		Y	Y	Y	Y	Y	Y	
Dewey / Ridgeway	Y		Y	Y	Y	Y	Y	Y	
Dewey / Driving Park	Y		Y	Y	Y	Y		Y	
Dewey / Lexington		Y		Y	Y	Y		Y	
Dewey / Glendale Park		Y				Y			
Dewey / Flower City Park					Y	Y			
Dewey / Emerson		Y	Y	Y	Y	Y		Y	
Lyell / Plymouth		Y				Y		Y	
Lake / Lyell	Y	Y		Y	Y	Y	Y	Y	NB - Right Turn Only Lane - Buses Excepted, but no farside receiving merge lane
State / Brown		Y						Y	Exclusive bus lanes in each direction
State / Inner Loop	Y	Y		Y	Y		Y	Y	NB exclusive bus lane
State / Main								Y	

Using the above tables and analysis performed in previous tasks, a ranking system was developed to prioritize signalized intersections based on the benefit potential from TSP or from Queue Jump Lanes. Rank 1 locations are signalized intersections that should be improved in the near term (0-3 years). Rank 2 locations are intersections that could potentially benefit from improvements in the longer term (4-5 years), while Rank 3 locations are signalized intersections that would experience minimal benefit from the proposed improvements. In addition, Rank 3 locations were intended to fill in the areas in between the Rank l and Rank 2 locations after a ten-year horizon has passed. In general, the Rank 1 locations for TSP and for Queue Jumps were located on the same cross streets for both route corridors, including:

- Lake Avenue / Dewey Avenue at Ridge Road;
- Lake Avenue / Dewey Avenue at Ridgeway Avenue;
- Lake Avenue / Dewey Avenue at Driving Park Avenue;
- Lake Avenue / Dewey Avenue at Lexington Avenue; and,
- Lake Avenue at Lyell Avenue;

Rank 1 and Rank 2 signalized intersections were organized into Near Term and Long Term TPM implementation plans, which provided details on the proposed improvements, preliminary cost estimates, and a timeline for implementation. The preliminary cost estimate for the Near Term TPM (TSP and Queue Jump Lanes), excluding construction costs, range between $879,000 (using existing Opticom equipment for transit vehicle detection) to $1.1 million (using new radio-based GPS technology). The preliminary cost estimate for the Long Term TPM, excluding construction costs, range from $301,000 to $400,000. The range in cost is due to TSP equipment options.

Table-S 3 summarizes the signalized intersections by rank, and details the type of TPM recommended for each signalized intersection as part of the Near Term and Long Term Implementation Strategy.

Three different cost estimates were provided in the report covering the following three possible scenarios for system enhancement:

- Scenario 1: Assume all existing Opticom equipment in the field is viable and sufficient. Discriminator programming and testing would still be required,
- Scenario 2: Assume wholesale upgrade of existing Opticom infrared system similar to existing; and,
- Scenario 3: Assume wholesale replacement with radio-based Opticom GPS system.

Given the present state of TSP technology and the modest incremental increase in TSP implementation costs between scenarios, Scenario 3 would be an ultimate recommendation for the implementation of TSP on RTS bus routes 1 and 10 in the City of Rochester. In an effort to control costs while still receiving some benefit from TSP, implementation strategies which modify existing equipment could be initiated first (i.e. Scenario 1) prior to providing new equipment at each intersection location identified in this report. However, the most effective method of delivering TSP benefits using Opticom equipment presently is the use of radio-based Opticom GPS system as described in Scenario 3 (or other similar radio based technology).

As future opportunities arise for TPM implementation, either independently or as part of future construction projects in the two corridors, constructability should be taken into consideration. Low cost and ease of construction should be considered whenever construction projects are being proposed.

It should be noted that planned infrastructure improvements within the study area were not analyzed as part of this study effort. These improvements are detailed to the extent possible in the report, but the improvements are not currently in place and no firm timeline was established for their completion in future years.

Table-S 3: Summary of TPM and Implementation Timelines by Intersection

Intersection	TSP Rank	Queue Jump Rank	Near Term TPM Applied		Long Term TPM Applied	
			TSP	Queue Jump Lanes	TSP	Queue Jump Lanes*
Lake Avenue at Ridge Road	1	1	X	X		
Lake Avenue at Ridgeway Avenue	1	1	X	X		
Lake Avenue at Driving Park Avenue	1	1	X	X		
Lake Avenue at Lexington Avenue	1	1	X			X
Lake Avenue at Ravine Avenue	2	1	X	X		
Lake Avenue at Phelps Avenue	2	1	X	X		
Lake Avenue at Lyell Avenue	1	1	X	X		
Lake Avenue at Seneca Parkway	2	2	X	X		
Lake Avenue at Glendale Park	2	3	X			X
Dewey Avenue at Ridge Road	1	1	X	X		
Dewey Avenue at Ridgeway Avenue	1	1	X	X		
Dewey Avenue at Driving Park Avenue	1	1	X	X		
Dewey Avenue at Lexington Avenue	1	3	X	X		
Dewey Avenue at Emerson Street	1	1	X	X		
Dewey Avenue at Glendale Park	2	3	X			X
Dewey Avenue at Flower City Park	2	3	X			X
Lyell Avenue at Plymouth Avenue	2	3	X	X		
State Street at Inner Loop Highway Ramps	2	2	X			X
State Street at Main Street	3	2			X	X
State Street at Commercial Avenue	3	2			X	X
Lake Avenue at Ambrose Street	3	3			X	X
Lake Avenue at Augustine Street	3	3			X	X
Lake Avenue at Flower City Park	3	3			X	X
Lake Avenue at Maplewood Drive	3	3			X	X
Lyell Avenue at Saratoga Avenue	3	3			X	X
Dewey Avenue at Birr Street	3	3			X	X
Dewey Avenue at Alameda Street	3	3			X	X
Dewey Avenue at Magee Avenue	3	3			X	X
Dewey Avenue at Steko Avenue / Palm Street	3	3			X	X
Dewey Avenue at Eastman Avenue	3	3			X	X

* Long Term Queue Lanes to fill in areas between Rank 1 and Rank 2 queue jump intersections after ten year horizon