Brampton

TRANSPORTATION & TRANSIT MASTER PLAN

Policy Paper No. 2

TRANSPORTATION SYSTEM MANAGEMENT & INTELLIGENT TRANSPORTATION SYSTEMS

May 2004

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FOREWORD

The City of Brampton has developed a Transportation and Transit Master Plan. The purpose of the Master Plan is to define the long-term transportation vision, policies and infrastructure needs to meet future transportation demands in an affordable and environmentally sustainable manner. In addition, it will include an implementation strategy and priorities for immediate action.

This Policy Paper is second in the series. It is intended to provide additional background on the Master Plan. To provide your input or to learn more about the Transportation Master Plan you can:

- Visit our website at www.brampton.ca and follow the links;
- Submit written comments to the address below; or
- Contact us by mail, email, phone, fax or in person at:

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June, 04

1.0 INTRODUCTION

This paper examines and assesses the current issues, trends, programs and options for Transportation System Management (TSM), including the use of Intelligent Transportation Systems (ITS), as they may be applicable to the City of Brampton. TSM refers to a set of techniques intended to optimize the use derived from the transportation system. This may relate to capacity, operations of particular vehicle groups, and priority for specific groups. ITS is a specific set of initiatives intended to assist in this optimization, through technological enhancements of the system controls. ITS and TSM are also intended to enhance the safety, efficiency and cost effectiveness of these systems for the movement of people, goods and services, while also reducing adverse impacts on the environment.

Even with infrastructure and service improvements to the City's road and transit networks, the road network will become more heavily used over time with increasing congestion, delays and travel times. There is a growing need to manage this congestion and to utilize traffic management techniques as a means of gaining the greatest benefit from the available infrastructure.

As a result, TSM and ITS will become increasingly important components of the system as it matures. The City of Brampton should work to obtain the maximum benefit from TSM and ITS initiatives as technology evolves. Efforts should focus on what the City can do alone or with other partners, taking into account the costs and benefits.

2.0 CURRENT ISSUES AND TRENDS

The following provides a brief overview of current TSM and ITS issues and trends.

Transportation System Management is receiving increased attention across North America. This is due, in part, to the increased competition for limited road capacity, the inability of transportation agencies to construct new transportation infrastructure in urban areas due to right-of-way and funding constraints, and the desire to recognize a return on the significant investment in transportation infrastructure, either in terms of revenue or improved all-day utilization.

The Transportation Association of Canada championed a new vision for urban transportation in 1993. This vision embodied the concept of sustainable transportation, and recognized the need to use TSM and ITS as a means to optimize the use of existing transportation systems. More recently, the Greater Toronto Services Board emphasized the need for an expanded traffic management system on GTA and Hamilton-Wentworth expressways, including Highway 407, and at key points on all trade corridors to U.S. border crossings.

The City of Toronto is advocating the expanded use of transit priority systems and HOV lanes through its proposed transportation vision for its new Official Plan. The Region of York's recent Transportation Master Plan includes policies for TSM and ITS. Similarly, the Region of Durham's recently released transportation master plan vision and policies include directions for the implementation of traffic responsive signal systems, traffic management and advanced traffic control measures to maximize available road capacity.

TSM can involve a combination of the following measures:

- Operational improvements such as the use of signal pre-emption for transit and emergency vehicles, and high-occupancy vehicle (HOV) lanes;
- Maintenance improvements such as the repair and enhancement of key communications and computer infrastructure;

- Minor physical improvements such as the construction of turning lanes and bus bays; and
- Technological improvements such as the use of high order traffic control and monitoring systems.

ITS is one component of TSM that involves the use of information and communication technologies to better manage and improve the services which transportation providers offer to the public. Urban area ITS can be characterized as a combination of several key elements:

- *Traffic Signal Control Systems* that are automatically adjusted to optimize traffic flow;
- *Freeway Management Systems* that provide information to motorists, detect problems for increased capacity and flow, and minimize congestion from collisions;
- *Transit Management Systems* that allow new ways of monitoring and maintaining transit fleets through advanced locating devices and equipment monitoring systems;
- *Incident Management Systems* that enable communities to identify and respond to collisions or breakdowns with the best and quickest type of emergency services, minimizing clean-up and medical response time;
- *Electronic Toll Collection* that provides both drivers and transportation agencies with convenient and reliable automated transactions, dramatically improving traffic flow and increasing operational efficiency in toll collection;
- *Electronic Fare Payment Systems* that enable a person to use a single smart card to pay for parking, bus and train fares, as well as tolls;
- *Railroad Crossings* that are coordinated with traffic signals and train movements;
- *Emergency Response Coordination* that ensures the closest available and most appropriate emergency unit can be dispatched to a collision;
- *Parking Control and Management,* to

  - Improve management capabilities of parking facilities through monitoring and collection of information with respect to occupancy, turnover, equipment operation, revenues, etc.;
  - Reduce hunting time for parking in the Central Business District and other areas of the City;
  - Improve public safety in parking lots; and
  - Minimize staff requirements without impacting customer service.
- *Regional Multimodal Traveller Information* systems that provide road and transit information to travellers, businesses and motor carriers, so they can adjust travel plans when necessary;
- *Intermodal Freight Management* systems tracks and monitors freight in the transport system. This includes the freight terminal management, whereby intermodal transfers are better managed. In addition, this helps in better traffic routing and control, container tracking, and security of site and freight.
- *Fleet Management of City vehicles;* and
- *Data Collection and Management,* to
  - Improve operational efficiencies through frequent updating of databases and electronic sharing of data between agencies;
  - Find efficiencies in data collection and archival; and
  - Improve access to historical fleet records (vehicle maintenance, inspections, driver records, etc.) by regulatory and inspection personnel to improve enforcement and safety.

Regardless of the type and combination of TSM or ITS elements used, there is general consensus that the most successful programs have four essential elements. First, there is extensive cooperation between various political jurisdictions, non-profit agencies and the private sector. Second, they employ integrated technological infrastructure at the appropriate geographic level. Third, TSM and ITS have the capability to build upon and

evolve user services, technology applications and institutional relationships. Finally, TSM and ITS devices must be properly maintained.

3.0 EXISTING THE CITY OF BRAMPTON POLICIES, PROGRAMS & PRACTICES

The City of Brampton Official Plan includes provisions for the development of HOV and Reserved Bus Lanes as part of the city-wide transportation system and in support of a rapid transit network. To further this direction, the City in its 2000 Official Plan indicates pursuing designation of HOV lanes on major arterial roads in co-ordination with the Region of Peel, the Ministry of Transportation and adjacent municipalities. The City also envisions a proactive role in co-ordinating the development of HOV systems and other travel demand management activities. In order to support the effective operations of HOV systems, the City plans to:

(i) Encourage the provision of strategically located park and ride lots, and where appropriate, express transit stations;
(ii) Schedule transit services to support HOV systems; and
(iii) Utilize and encourage incentives for people to shift from single occupant vehicles to ridesharing modes.

The City has performed a number of feasibility studies for High Occupancy vehicle Lanes and/or Rapid Bus Service Lanes. These are as follows:

1. Queen Street HOV study 1995
2. Queen Street/Highway 7 HOV/RBL Feasibility Study 1996

The City of Brampton, in its Official Plan, has indicated the corridors for potential HOV lanes or reserved bus lanes, as follows:

1. Steeles Avenue from Winston Churchill Boulevard to Highway 50;
2. Hurontario Street from south of Mississauga Brampton boundary to Steeles Avenue and from Queen Street to Bovaird Drive;
3. Highway 410 from Brampton Mississauga Boundary to Bovaird Drive;

4. Highway 407 across the City of Brampton;
5. Highway 7 from Creditview Road to east of Airport Road;
6. Goreway Drive from Queen Street to Steeles Avenue;
7. McVean Drive from North of Highway 407 to the Brampton/Mississauga boundary;
8. Mississauga Road from Queen Street to South of the Brampton/Mississauga Boundary; and
9. Humberwest Parkway extension from Airport Road to Goreway Drive.

The City of Brampton envisages developing Queen Street and Main Street as Transit Priority Corridors by 2005. The Region of Peel has not planned any significant ITS/TSM related initiative in the foreseeable future. At present the Region has implemented or is in the process of implementing the following systems:

- 'Pogostick' Traffic Cameras: These cameras are used for time lapse photography on specific intersections. Intended to understand traffic delays and critical movements these cameras might also help in intersection incident management;
- Mobile Radar Trailer: This is mainly geared towards driver awareness. The unit displays individual vehicle speeds as opposed to the allowable speed limit; and
- Red Light Cameras: These cameras are used by the law enforcement agencies to check any traffic red light related infractions.

The City supports integration of transit fares and services between Brampton Transit, Mississauga Transit and GO Transit, along with efficient interconnections between the local transit systems and the commuter bus and commuter rail services.

The City and the Region have joint jurisdiction over the signalized traffic control system within the City. The City controls about 50% of the intersections through centrally monitored traffic control system, while the Region controls 42% of the intersections.

Four percent of the signalized intersections are ramp terminals to provincial highways and are controlled by the Province, while the remaining 4% are under the jurisdiction of 407 ETR private tollway. This split between the City and the Region likely results in inefficiencies with respect to staffing and capital expenditures, as well as issues of inconsistency in signal, timing and phasing between the two agencies.

Signal pre-emption in the City is provided through the use of an OptiCom system that provides emergency service vehicles priority over other traffic at most signalized intersections in the City, and at selected fire station accesses.

4.0 EXPERIENCE IN OTHER JURISDICTIONS

TSM and ITS policies, programs and practices vary across political jurisdictions. The following provides a brief overview of TSM and ITS methods being employed in the Greater Toronto Area and other selected jurisdictions.

Basic Ideas for Traffic Management

There is a wide range of techniques that are applied in municipalities to manage traffic and transit operations, to ensure that vehicles move effectively and safely through the network. These include the following:

- One-way streets. One–way streets can be implemented individually to manage traffic volumes in problem areas, or in one-way pairs. One-way pairs are normally implemented to manage turning movement volumes to or from major streets, or to control traffic infiltration in residential communities;
- Reversible lanes. These are implemented on a temporal basis to obtain greater capacity in the peak direction (e.g. Jarvis Street in Toronto), where the right-of-way does not permit widening. This is a somewhat unusual strategy, which should be applied with caution;
- Parking management. Temporal restrictions on on-street parking supply are used to increase capacity in the peak direction of flow;
- Bus bays. The concept of bus bays is seen by most municipalities now as counter-productive, in terms of reducing the priority for transit vehicles;
- Traffic calming measures. Physical design measures are implemented to control speed and/or volume in residential neighbourhoods; and
- Channelized right turn lanes. These measures are being removed in municipalities as they become more urbanized. The rationale for doing so is that they are not supportive of pedestrian movements, and hence they also limit the ability of pedestrians to access the transit network.

Freeway Traffic Management

There are two freeway traffic management systems operating within the GTA. In addition to the City of Toronto's RESCU system, the Ministry of Transportation operates COMPASS on parts of the 400 series highways. These systems include extensive detectorization, Closed Circuit TV and computerized Changeable Message Signs to inform drivers of downstream traffic conditions, incident detection and management. On the eastbound Queen Elizabeth Way in Mississauga, the system provides ramp metering to control access to the expressway. Collectively, this provides enhanced traffic flow, reduced delay and improved response to collisions and other incidents.

Numerous major municipalities across the GTA and throughout Ontario have computerized traffic signal systems. The Regional Municipality of Ottawa-Carleton also operates an Internet site as a community information ITS tool. The website can be reached at www.ottawa.on.ca then following the links: City Services ⇨ Transportation ⇨ Travelwise. The website provides a one stop, on-line source for complete information on transportation methods such as walking, cycling, carpooling and public transit. The site is being expanded with an on-line cycling map, information on workplace commuting and walk to school information.

Municipalities such as Ottawa, Calgary and Edmonton have included ITS strategies in their municipal Transportation Plans, to achieve a wide range of objectives. Typically, these include transit priority and improved traffic operations as key goals. The City of Edmonton is committed to an expenditure of $ 45 million over 10 years (capital + operating).

5.0 TSM AND ITS OPTIONS AND IMPLICATIONS

There are numerous TSM and ITS options that the City of Brampton can pursue. Table 1 summarizes these options and their advantages and disadvantages.

Table 1. TSM and ITS Options for the City of Brampton

Option	Advantages	Disadvantages
Arterial High-Occupancy Vehicle (HOV) lanes	Preferential treatment for HOVs on designated arterials	Adds to roadway congestion for trucks, difficult to enforce
Signal pre-emption for emergency and transit vehicles	Reduces delay for emergency response vehicles and buses at traffic signals; improves transit operational efficiency	Signal priority for buses can be capital intensive
Freeway Traffic Management System	Reduces delay and congestion on freeway network	MTO and/or 407ETR must be the program implementor; potentially difficult to achieve
Regional Multi-modal Traveller Information System	Reduces both passenger and motorist delay on transit and arterial road network. Especially effective for visitors to the Region, or those unfamiliar with the road network	Very capital intensive, and requires broad cooperation among a variety of agencies and vehicle manufacturers
Roadway Operation and Maintenance Technologies	Enhances response to severe weather emergencies	Moderately capital intensive, and other sources of information can be utilized such as the Weather Network
Traffic Responsive Area Control (TR1)	Provides significant improvements to traffic operations on arterial roads that are parallel to a freeway	Requires software and moderate capital and maintenance expenditures for detectorization
Traffic Responsive Intersection Control (TR2)	Provides substantial enhancements to key signalized intersections	Requires software and moderate capital and maintenance expenditures for detectorization
Assumption of all Traffic Signal Control Functions under one agency	Provides effective co-ordination of all signal operations under one responsible jurisdiction	Requires co-operation between the City of Brampton and the Region of Peel
Traffic Adaptive Control (SCOOT)	Provides area wide responsive control to all selected intersections under central control. This could provide better management of tidal flows	Requires significant software and computer hardware plus high capital and maintenance expenditures for detectorization and other field equipment
Inter-modal freight management	Provides tracking of container location across various modes, management of inter-modal transfer facilities, routing and control, freight security etc.	Onus on private inter-modal operators. Requires capital and maintenance expenditures. Overall, however, there may be a net saving for the City, due to better movement of trucks. Inefficient inter-modal freight management may lead to avoidable congestion
Public transit on-board information	Real-time service data from various service modes and transfer points helps patrons with travel decisions. 'Elastic' routes within the City can be facilitated with demand responsive transit	Capital-intensive. Automated infrastructure is required for monitoring real-time service and demand data
Tolls on entire facilities or specific expressway lanes	Makes cost of travel/infrastructure explicit; discourages long-distance commuting; cost recovery for infrastructure	Requires Provincial initiative

6.0 DIRECTIONS FOR CHANGE

Creation of a detailed ITS strategy for the City is a project for further detailed study. This will be an ongoing activity, because technology continues to evolve at a rapid pace. However, of the options outlined in Table 1, the following are recommended for the City of Brampton to pursue (due to their clear benefit):

- Basic ideas: the City will undoubtedly consider concepts such as one-way street systems, parking management and neighbourhood traffic management as the City evolves

- Wireless vehicle location can be implemented for buses in the City to improve schedule adherence tracking and system performance. This will support effective transit operations. Automatic Vehicle Location (AVL) has been implemented in a number of transit systems in the Greater Toronto Area

- As part of the *Accele*RIDE Bus Rapid Transit program, introduce transit priority signal systems. These may include passive and/or active transit priority signal operations, depending on the needs of the particular corridors

- The MTO COMPASS project can and should be extended into the City on Highways 410, 407 and 427, to improve the operational effectiveness of the expressway system. This will in turn improve the operational efficiency of the municipal arterial network. Since the City has no freeways directly under its jurisdiction, there is no advantage to developing or implementing any form of Freeway Traffic Management Systems (FTMS) directly. By taking advantage of Provincial expertise in this area, the City can reap the benefits of FTMS without incurring the significant capital and maintenance costs associated with a system of this complexity. The City should work with MTO to extend COMPASS into Brampton. The existing and projected volumes on the expressway network support the need for an FTMS in Brampton.

- Implementation of Traffic Responsive Area (TR1) and Critical Intersection (TR2) controls along freeway corridors and key intersections throughout the City. This would enable the central traffic control system to respond to freeway incidents and unforeseen changes in traffic patterns in a dynamic and effective manner.

- Consolidation of all traffic signals under the control of one agency is also desirable, for effective co-ordination of signal operations. The implementation of Traffic Adaptive Control such as SCOOT should be a longer-term initiative, once TR1 and TR2 controls are well established. As much as possible, the City/Region should learn from the efforts of other jurisdictions in the GTA, especially the City of Toronto. This will preclude the need to develop and test technology that has already been well researched elsewhere. This will minimize costs and speed the installation of enhanced control algorithms to the benefit of City taxpayers and the travelling public. The City should review whether the City or Region should have sole responsibility.

- With respect to intermodality, the rail-truck intermodal terminal operators are likely maintaining currency in terms of updates to freight management tools. The City should monitor truck activity in terms of its impacts on City streets, to determine if special signal control systems or operational strategies should be introduced.

- Tolls are a complex issue. Expanded tolls on the expressway or arterial network have benefits as a TSM strategy, and they can be a way to fund expressway development. (The Province has recently announced that tolls will be considered on any new expressway construction.) As the City's multimodal network develops and demand continues to grow, they may become more viable and more accepted by the community and governments. Options such as selected toll lanes on highways or major arterials may be attractive strategies. The City should develop a position with respect to tolls once the future road and transit demands from the TTMP are defined.

The City should also consider whether development of toll roads or links is an effective way to advance construction of needed facilities.

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