

HALTON TRANSPORTATION MASTER PLAN A BEST PRACTICES APPROACH



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ABSTRACT

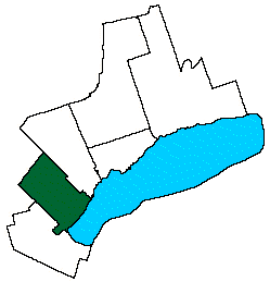
The Region of Halton is a fast growing regional municipality located west of Toronto and east of Hamilton. Halton Region includes the lower tier municipalities of Burlington, Oakville, Milton and Halton Hills.

The recently completed and approved Halton Transportation Master Plan (HTMP) adopted a best practices approach to address sustainable transportation principles. The approach included:

- A **comprehensive consultation approach** that included a Technical Advisory Committee, a Stakeholders Advisory Committee, three rounds of public meetings (a meeting in each of the four municipalities each round), numerous separate meetings with stakeholders including a stakeholders visioning session, public opinion surveys of a sample of residents within the Region, Newsletters, and a web page that included all project deliverables throughout the study process.
- An **air quality strategy** for transportation in Halton Region that included not only system wide measures, but also things that the Region of Halton could do to lead by example.
- An emphasis on **Transportation Demand Management (TDM)** that includes a TDM coordinator, a pilot project for active TDM at the Halton Regional Centre and participation in the Greater Toronto SMART Commute initiative.
- A **transit first strategy** that looks to accommodate transit on a priority basis on all Regional Roads and at intersections (transit in Halton Region is operated by the lower tier municipalities) through such measures as High Occupancy Vehicle corridors and transit priority at intersections.
- An accommodation for **cycling** on all Regional Roads.
- An **infrastructure plan** with an annual implementation schedule that was developed using EMME/2 based transportation model and following the Master Plan process of the Municipal Class Environmental Assessment, which is approved under Ontario's EA Act.
- Input to a **financial plan** to ensure affordability by calculating the growth component of the HTMP that was eligible for Development Charges funding.

The paper will provide more detail on each aspect described above, including the methodology followed for the analyses undertaken and the results leading to the development of the HTMP.

INTRODUCTION



The Region of Halton is located in the western edge of the Greater Toronto Area, encompassing a land area of approximately 967 square kilometres with a 25-kilometre frontage along Lake Ontario. The Region is comprised of four municipalities that vary in size, population, and character; they are the City of Burlington, the Town of Oakville, the Town of Halton Hills, and the Town of Milton. The City of Burlington and the Town of Oakville make up the urban area to the south of the Region, while the Town of Halton Hills and Town of Milton make up the largely rural area in the north end of the Region.

The purpose of the Halton Transportation Master Plan (HTMP) study was to develop a dynamic integrated transportation strategy that considers all modes of travel. The study provides the Region with the strategies, policies and tools needed to manage traffic safely, effectively, and cost efficiently, and to offer a range of transportation choices to meet the needs of Halton residents in conformity with the Official Plan and Region's Strategic Plan.

The HTMP integrates transportation and land use planning and is founded on the notion of *sustainable development*, which “*meets the need of the present without compromising the ability of future generations to meet their own need.*” The transportation network is based on a proper balance between providing transportation alternatives, protecting the natural environment, enhancing economic competitiveness, and fostering a healthy, equitable society.

The HTMP was designed to integrate municipal transportation planning and environmental assessment objectives and requirements into a comprehensive planning process.

Key features of the Master Plan include:

- Key principles of successful environmental planning;
- The first two phases of the Municipal Class EA;
- An integrated process with other planning initiatives;
- A strategic level assessment of various options to better address overall system needs and potential impacts and mitigation;
- A long term assessment;
- A system wide approach to planning which relates infrastructure either geographically or by a particular function;
- An infrastructure master plan which can be implemented through the implementation of separate projects; and
- A description of the specific projects.

BACKGROUND

Regional Growth

In 2001, the Region of Halton had a population of 375,229 and employment of 188,900. The largest concentration of population in the Region is in Burlington and Oakville respectively, making up 79 percent of the population of Halton, while encompassing only 34 percent of the land area. Within the Town of Halton Hills and Milton, the majority of the population is clustered around smaller urban areas, including urban Milton, Georgetown, and Acton.

Between 1996 and 2001, the Region of Halton grew in population by approximately 10 percent. *Exhibit 1* presents the growth in population in the Region by municipality. By 2021, the Region anticipates a population of 592,300 and employment of 308,000. *Exhibit 2* presents the anticipated population (by 2021).

Exhibit 1 - Population Growth Between 1996 and 2001

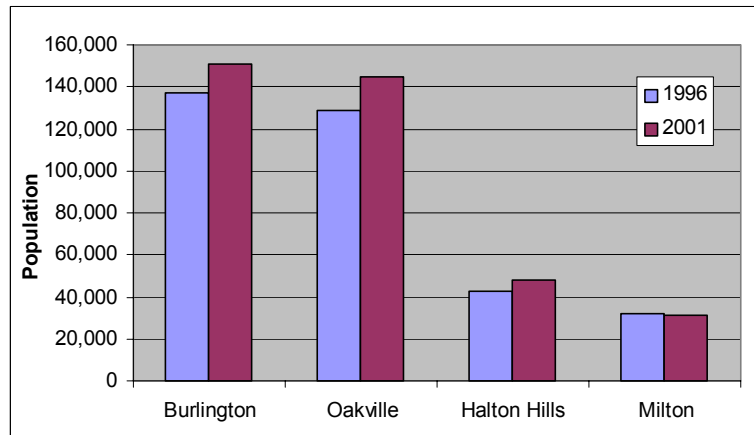
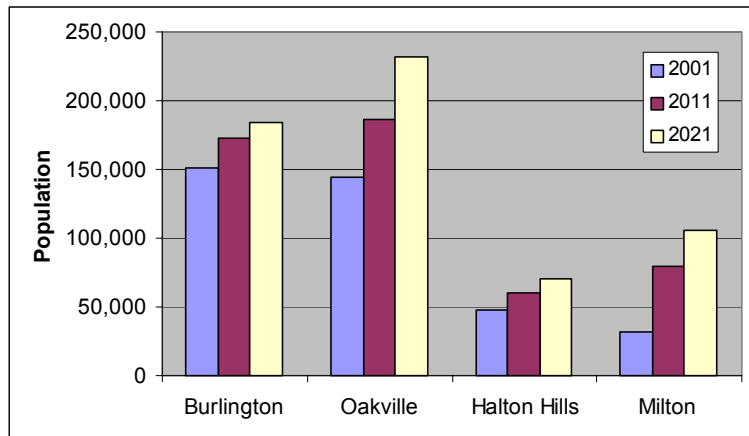


Exhibit 2 - Population Growth to 2021



Existing Transportation Network

The Region of Halton contains a network of roads from Provincial freeways to local roads. The Provincial freeway network consists of:

- Highway 401 - running east-west through Halton Hills and Milton, between Highway 6 and the City of Mississauga;
- The Queen Elizabeth Way (QEW) - running east-west through Burlington and Oakville, between Hamilton and Mississauga;
- Highway 407 electronic toll route (ETR) - running primarily east-west in Burlington, Oakville, and Halton Hills, between Hamilton and Mississauga; and
- Highway 403 - spans the southern limits of the Region – east/west through the City of Burlington and the Town of Oakville and then north/south along the eastern boundary of Oakville to Highway 407. The section between the Freeman Interchange (at QEW/Highway 403/Highway 407) and the east limit of Oakville commonly referred to, as the “QEW” is actually QEW/403 – as these facilities run concurrently in this section of the Region.

The Region of Halton is responsible for maintaining and operating the Regional road system for the transport of goods and people in a safe and efficient manner as well as delivering physical improvements to the Regional road system that meet growth needs and improve the level of service.

The Regional road network connects both rural and urban centres to each other as well as the Provincial highway system. The primary east-west Regional arterials include Dundas Street through Burlington and Oakville; and Derry Road and Steeles Avenue through Milton. The primary north-south Regional arterials include Regional Road 25, Trafalgar Road and Guelph Line. These roadways provide connectivity to Highways 7, 401, 407 and the QEW/403.

The Region of Halton does not operate a transit service; although it is actively promoting and provides the necessary infrastructure to accommodate this service as the majority of transit routes utilize the Regional road network of major arterials. Three local municipalities Burlington, Milton and Oakville offer transit service in the Region of Halton.

GO Transit is the interregional transit system that operates commuter train and bus services centred on the Greater Toronto Area, with operations extending into Hamilton, Orangeville, Guelph, and Barrie.

Within the Region of Halton, GO Transit provides modern commuter rail and bus service to the City of Toronto and other destinations in the Greater Toronto Area and City of Hamilton from Burlington, Halton Hills, Milton, and Oakville.

GO Transit statistics in Halton Region include 27,044 daily passengers on the rail services and 1,510 daily passengers on the bus services.

Three GO Rail lines provide services within Halton Region:

- Lakeshore West GO Rail line;
- Georgetown GO Rail line; and
- Milton GO Rail line.

GO Bus routes provide interregional express services within the Greater Toronto Area, typically operating on the provincial highway network and major arterials. There are five GO Bus routes that provide service within the Region of Halton.

VIA Rail operates passenger rail services through Halton Region, which allows passengers to travel by train across Canada and to the United States through connections with AMTRAX. The rail line operates on the same corridor as the GO Train Lakeshore West Line, with stations at Aldershot station in Burlington and Oakville station in Oakville. A line also runs along the Georgetown line with stops at the Brampton GO station and Guelph.

Halton Residents' Travel Behaviour

Halton Region has the highest auto driver modal split in the Greater Toronto Area, at 80 percent. This is followed by transit ridership at 9 percent (including GO Transit), auto passenger at 6 percent and an estimated seasonal 2 percent by cycling.

Compared to the other GTA municipalities, Halton Resident's:

- Have one of the highest car ownership (0.82 cars per driver);
- Use transit least frequently;
- Are increasing their usage of the automobile for travel;
- Use transit the most, along corridors with the highest frequency and fastest service; and
- Have longer work trips – primarily to the City of Mississauga and downtown Toronto.

Within the Region of Halton, there is also a trend towards an increase in:

- Discretionary trips;
- The number of trips per day; and
- The number of trips made by seniors.

These trends can be attributed to the fact that transportation is a key to social interaction within a community. Viable transportation choices are required to allow for seniors, the disabled, and low-income families to integrate within the community and access required services.

DEVELOPMENT OF STRATEGIC DIRECTION

Breaking the “Vicious Cycle”

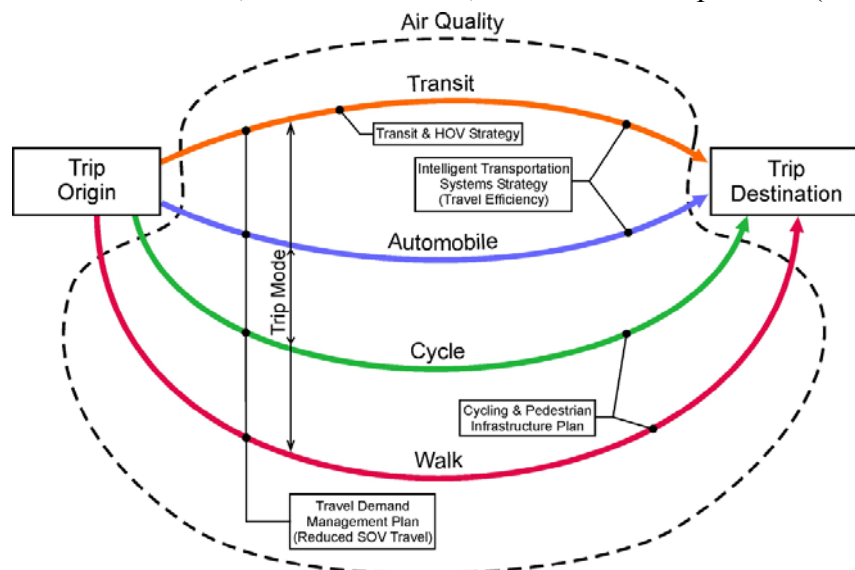
Development in the Greater Toronto Area (GTA) has traditionally followed a predictable cycle. Acres and acres of uniform lower density housing is developed further and further away from where residents work; leading to more dependence on auto use and low efficiencies of transit services. This leads to congestion, which leads to building and maintaining more roads, which leads to extending development -accommodating more auto use, and so on. This “Traditional approach” (building more roads and providing less transit) encourages low transit use and single occupant vehicle (SOV) travel.

A new Growth Management transportation approach, which encourages and supports pedestrian-friendly developments, provides more cost-efficient service and higher transit usage, and provides transportation choices, is required. Alternative non-auto travel choices, such as transit and cycling, need to be made more competitive (i.e. convenient, cost effective) with the automobile.

A change (or evolution) to the current thinking is required. To some degree this is happening through the Growth Management/Smart Growth initiatives, which encourage pedestrian friendly developments, which provide more cost efficient services and provide more transportation choices. Alternative non-auto travel choices, such as transit, are made competitive (i.e. convenient, cost effective) with the automobile. The Growth Management/Smart Growth approach does not look only at transit revenue-to-cost ratios. It provides for improved transit service, which leads to higher usage, which results in increased ridership per capita.

In reality, while the automobile is here to stay, for ride sharing and commercial activity, with the anticipated residential

and employment growth, the transportation system in Halton cannot continue to rely on single occupant auto travel as the dominant transportation choice, especially in the peak periods. Halton residents and the community at-large need to recognize they are part of the vicious cycle and the key to the solution.



Halton Transportation Master Plan Vision

In terms of a "vision", the HTMP was different than traditional master plan studies and encourages people to change their travel characteristics and be aware of the consequences if they do not change. The HTMP was driven by Goals, Constraints, and Consequences. It followed an alternate approach on how to prioritize the Region's capital program and ensure that transit and other alternatives to the single occupant vehicle are maximized.

On the development and policy side, the Region is in a position to influence development and services to development. It must recognize that although "sprawl" development has been the norm to-date, this cannot continue – it is not sustainable. Halton has recognized that this continued type of development will drive higher levels of congestion and a consumption of the landscape. The recent Halton Urban Structure Plan put in place requirements for a land use form that would help us curtail this predictable cycle.

However, changes in the way in which we travel cannot be successful if the full range of transportation solutions is not utilized. Policy and development decisions must support non-auto modes and must withstand the "not-in-my-backyard" concerns from the existing community about higher density and pedestrian friendly developments. Major employers and commercial nodes need to be concentrated and easily accessible to transit and other alternatives to the single occupant auto.

Strategic Direction

The HTMP outlines the Region's strategic direction for the development of its transportation network, programs, policies and priorities. The HTMP is a critical policy document that will influence every trip taken by residents and non-residents over the next 20 years. Within the Region's boundaries, the HTMP policies will determine the convenience and attractiveness of the different travel modes as manifested by regional/local government cooperation, municipal investment priorities, system performance targets, and supporting programs and infrastructure.

The HTMP developed a strategic direction for the transportation system to guide the development of networks, policies, programs and priorities that adhered to the stated preferences of the community. The strategic direction focuses on minimizing impacts on the environment and satisfying travel demand by making efficient use of the existing infrastructure and by providing the facilities and services to encourage non-auto modes such as walking, cycling and transit, as priority modes. Encouraging multi-occupant use of the auto is a positive measure, as is facilitating commercial travel particularly in the off peak.

To facilitate a transportation vision in Halton that responds to growth in the Region, the transportation system will need to evolve to accommodate the efficient movement of people and goods, and ensure accessibility within the Region and the Greater Toronto Area. The plan will need to manage projected increases in traffic and congestion by providing a continuous and inter-connected network that is also enhanced by alternative modes of travel, both utilitarian and recreational, and that support compact urban form and encourage close live/work relationships.

The HTMP is a product of significant amount of public consultation. Key events in the development process of the HTMP included:

- Two Visioning Sessions (one with senior Regional staff and one with the public at-large);
- Three newsletters;
- A transportation survey of regional households;
- Three rounds of Public Consultation Sessions, with public consultation meetings in each local municipality per round;
- A segment on the Chairman’s Cable talk show “People Speak in a Place Called Halton”;
- Three Technical Advisory Committee meetings;
- Information releases on the project website; and
- Four Citizen Liaison Committee meetings.

The Citizen Liaison Committee was established as a mechanism to keep Council and key stakeholders informed and involved in the process and to assist in the Halton TMP by advising on the consultation process, providing feedback on the Transportation Vision and strategies and providing input on new policies, programs and infrastructure resulting from the Halton TMP process. Membership on the committee included key community representatives such as Regional Councillors (one from each municipality); two representatives from Halton’s Chamber of Commerce; and representatives from the Elderly Services Committee, Halton Regional Police Services, the cycling community, the local aggregate trucking industry, the development industry; and four citizen’s at large.

These events and consultation sessions have yielded valuable information, specifically with respect to direction on the transportation vision. The public has confirmed the Region, and more specifically the HTMP, must respect the following nine principles:

- 1. Plan communities with an appropriate level of mixed use and higher densities to create an environment where there are opportunities for Transportation Choices;*
- 2. Promote and integrate walking and cycling and other non-auto modes as Alternative Travel Modes;*
- 3. Make Reducing Travel Demand a priority in the Region, emphasizing TDM alternatives such as ride sharing, flexible work hours, etc.;*
- 4. As a priority, provide transit that conveniently and affordably serves where people need to go, both locally and inter-regionally, and promotes an Integrated and Accessible Transit System;*
- 5. Promote Cost Effective New Technology to better move goods and people;*
- 6. Maintain and improve the road system to Make the Best Use of the Existing Transportation Infrastructure;*
- 7. Ensure transportation decisions Protect and Respect the Environment;*
- 8. Foster Political Support for transportation solutions that recognize the needs of Halton as well as adjacent communities; and*
- 9. Create new Innovative Ways to pay for future urban transportation systems.*

Through the implementation of the HTMP and the ongoing interaction with the local and surrounding municipalities, the Region must work hard to address road and transit issues, the need for more innovative funding approaches, the need for broad public and political education and incentives to adopt a less car oriented society, and management of interrelationships between transportation and planning.

REGIONAL TRANSPORTATION STRATEGY

In the preparation of a transportation strategy to the year 2021, emphasis was placed on the development of this strategy based on the principles identified through the master plan process. In defining the mobility needs for the Region, it is important to note that roadway improvements were identified as secondary priority to transit, cycling, walking, transportation demand management and transportation system management measures.

For each of the problem areas identified in the regional system by 2021, the potential for alternative roadway improvements was considered and where appropriate, alternatives were identified. The need for roadway improvements was identified taking into consideration the potential for transit, cycling, walking, TDM and transportation system management alternatives to help solve the problem. The roadway improvement alternatives were assessed based on a set of evaluation criteria and a preferred alternative selected for each problem area. The preferred roadway solutions for each problem area were then knitted together with the proposed transit and other considerations to form a total network solution.

The end product of this technical and public process, is a transportation master plan that supports:

- Programs that promote alternatives to single occupant automobile use;
- Measures that pro-actively optimize the road network and the allocation of roadway rights-of-way, and minimize the impact of increased congestion;
- Strategic expansion of the road network to ensure minimum Level of Service standards;
- Allocation of some roadway space to priority elements for non-auto modes (e.g. cyclists);
- Design, operating and maintenance practices that strategically manage roadway rehabilitation and minimize environmental impacts; and
- Reconstruction to extend the useful life of roadway investments as much as possible.

The HTMP is a compilation of a number of strategies, guidelines and plans that address the goals and principles established by the Region and regional stakeholders. These strategies, guidelines and plans include a:

- TDM/TSM Plan – Managing Transportation;
- Pedestrian and Cycling Infrastructure Plan;
- Public Transit/HOV Strategy;
- Regional Right-of-Way Dimension Guidelines;
- Air Quality Management Strategy;

- Intelligent Transportation Systems; and
- Regional Road Network 2021.

TDM/TSM Plan – Managing Transportation

A dual focus Transportation Demand Management (TDM) program for the Region of Halton has been developed as a key component of the HTMP:

- A TDM policy statement for the Regional Official Plan and Transportation Master Plan that outlines Regional Council’s commitment to considering TDM in all planning and operational decisions; and
- A TDM strategy for the Halton Regional Centre to demonstrate leadership in trip reduction initiatives for employment areas.

TDM can contribute to the reduction of peak period roadway congestion. It is also the primary mechanism for promoting alternative travel modes and educating the public about the numerous issues associated with transportation. Given this, the following goals have been established for TDM in the Region of Halton:

- ***Reduce auto demands in the commuter peak periods as a contributing strategy for reducing congestion.*** Reduction in peak period auto demands would delay or possibly eliminate the need for some roadway modification projects, reduce the air quality impacts of congestion, and improve the safety of all transportation system users during the commuter peak periods.
- ***Promote walking and cycling as alternatives to travel by private auto.*** Such a shift would improve equity of transportation service, reduce the environmental impacts of travel in the Region, and provide health benefits to all residents.
- ***Promote public transit as an alternative to travel by private auto.*** Such a shift would improve the equity of transportation service, reduce the environmental impacts of travel in the Region, and improve the economic self-sustainability of public transit.
- ***Participate with other GTA municipalities in the GTA Smart Commute initiative.***
- ***Encourage development to provide TDM measures in site design.***

These goals represent a fair and reasonable role for TDM in Halton and are consistent with the overall direction of the Transportation Master Plan. TDM policy statements for the Official Plan/Transportation Master Plan were developed and a TDM Implementation Strategy was initiated.

Pedestrian And Cycling Infrastructure Plan

The utilitarian cyclist is of greatest interest to the Halton Transportation Master Plan from the point of view of travel demand management, as these cyclist have the potential to reduce the number of vehicles on the roadway system during peak periods of travel.

Cycling currently represents a minor proportion of the modal split (less than 2% of seasonal urban trips). The goal is to provide the incentives to increase this mode share. Although it does not provide a transportation solution on its own, cycling could contribute to a reduction of the problems inherent in an auto-based system. These goals need to be achieved through a combination of measures, which include education, promotion of improved facilities and more.

The Transportation Master Plan consultation process revealed that cyclists are a vital, growing road user group within Halton. Cyclists in Halton fall under several categories, as follows:

- Utilitarian cyclists;
- Local families, largely recreational users;
- Fitness cyclists; and
- Racing cyclists.

It should be noted that Halton is also a destination for out-of-region cyclists, due to the rural, scenic nature of Halton Region, combined with the elevation changes of the Niagara Escarpment, which are an attraction to both on and off road cyclists across southern Ontario.

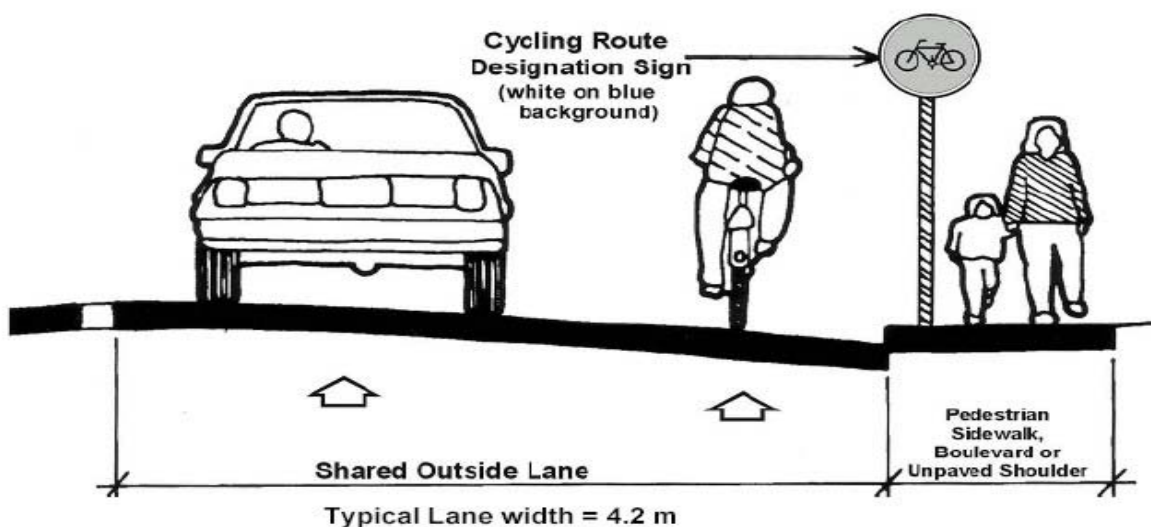
The range of alternatives for encouraging cycling include:



- Do nothing. “Fend for yourself”, which is effectively the status quo;
- Encourage cycling through education, promotion and enforcement support programs;
- Over time, implement a cycling network composed of designated linear facilities (i.e. exclusive-use cycling lanes), built to accepted industry standards; and
- Over time, upgrade all arterial roadways to meet industry standards (i.e. wide outside shared-use lanes).

As part of the HTMP, the Region has made provisions in its right-of-way dimension guidelines to make Regional roads “friendlier” to cycling – specifically utilitarian cycling; as the goal is to reduce auto trips in the peak periods of travel. As a minimum, regional roadway dimension guidelines incorporate a minimum 4.2 m curb lane in urban settings and a 1.0 m paved shoulder in rural settings.

A delineated cycling lane in an urban setting is an option for those roadways that are likely to have high cycling traffic and where delineation is seen as a prudent/beneficial measure to cyclists. It is important to be consistent with industry standards as it pertains to the provision of on-road cycling facilities. Consistency will provide a reasonable level of safety for users and help reduce the Region’s liability in the provision of cycling infrastructure.



In addition, the Regional right-of-way guidelines provide for alternative uses such as recreational cyclists and in-line skating through the use of multi-use pathways.

The HTMP also provides for the creation of a Regional Cycling Committee (RCC) to promote, educate and encourage the increased use of cycling. As part of fulfilling this role it is envisioned that they would provide an advisory role on relevant Region of Halton projects.

Public Transit/HOV Strategy

The transit and HOV strategy component of the Halton Transportation Master Plan addresses the long-term goal of reducing the public's reliance on the private automobile as the principal mode of travel. This shifting of travel habits is viewed as an essential element for sustainable growth in the Region. Transit can contribute to an improved quality of life in the Region by:

- Making more efficient use of the existing road capacity by conveying more passengers per vehicle;
- Reducing the number of auto vehicle trips, with a corresponding reduction in congestion, travel time, fuel use and vehicle emissions; and
- Contributing to a more liveable community by promoting pedestrian activity.

A key component of the transit and HOV strategy is to build ridership by initially implementing effective local transit services in support of emerging employment and activity centres, and targeted to specific market segments.

In strategic corridors, new services can be introduced over time and initial steps can be taken to support future higher frequency transit service.

Emerging and planned centres of employment and activity throughout the Region will create new transit demands in some corridors. In other parts of the Region, transit opportunities are emerging as new development areas expand and travel patterns change. Emerging travel patterns represent new opportunities for transit to meet the needs of travellers in areas where there is presently little, if any, transit service.

As ridership builds, service levels can be increased accordingly. Where warranted, additional services and possible infrastructure solutions (such as transit priority measures and intersection treatments) can be introduced to give higher priority to transit, increase the attractiveness of transit and incrementally build ridership to the levels projected twenty years from now.

The transit and HOV strategy component of the Halton Transportation Master Plan includes the use of some widened roads for the use of high-occupancy vehicles and transit vehicles.

It is recommended that the implementation of the transit and HOV network over the period to 2021 follow an incremental approach. This begins with the necessary EA implementation studies to ensure the protection of adequate Regional Road right-of-way and appropriate roadway design, where HOV implementation is identified. Upon completing construction, it is envisioned that new curb lanes would be immediately designated for HOV use. While there is likely to be pressure to introduce new lanes as general-purpose travel lanes, with the intention of converting to HOV use at a later date (when volumes have increased), this approach does not clearly establish transit and ridesharing as advantageous travel options. This is particularly critical for residents and workers of newly expanding urban areas of the Region.

To encourage and support travel by transit and HOV in the Region, while at the same time trying to avoid the empty-lane syndrome (and the negative public perception that can accompany it), it is proposed that consideration be given to introducing new lanes on Regional Roads as HOV lanes with 2+ eligibility in the short-term.

Based on the results of annual monitoring of traffic volumes, HOV lane utilization, and transit services in the corridors, HOV lane eligibility would be increased to 3+ occupants across the network by 2021.

When transit ridership and service frequency in an individual corridor reach the levels warranting reserved bus lanes (RBL), then HOV lanes in the corridor or corridor segment would be converted to RBLs. The success of this strategy is highly dependent on the implementation of land use strategies that support transit, supporting local transit and network support elements such as:

- Inter-modal transfer locations supporting, both regional and inter-regional markets;
- Transit network linkages at transit nodes;
- Connections to higher order transit facilities in adjacent regions, along with fare and service integration across boundaries;
- Introduction and expanded use of new technologies;
- Travel Demand Management (e.g., ridesharing, and preferential parking programs); and
- Transportation Systems Management (TSM).

Enhanced service coordination is also required to make transit attractive to potential customers. Service coordination comprises coordinating local schedules, and reducing transfers, where possible, or establishing timed transfers to minimize inconvenience for passengers. It also includes identifying customer interface opportunities and working towards selection and implementation of coordinated customer interface through integrated passenger information systems and technologies. Service coordination can also consider increased use of vehicle location systems and on-board passenger information systems to provide daily and real time information to customers.

Implementation of consistent and complementary TDM/TSM policies in the Region can also help encourage reduced travel by single-occupant automobiles by supporting increased transit use and parking management strategies related to the provision of park-and-ride and commuter lots, preferential parking, parking supply controls and parking pricing.

Transportation Systems Management measures that can be effective in reducing traffic congestion including providing priority or HOV lanes, signal priority and/or optimization, and using Intelligent Transportation System (ITS) technologies for such things as incident management.

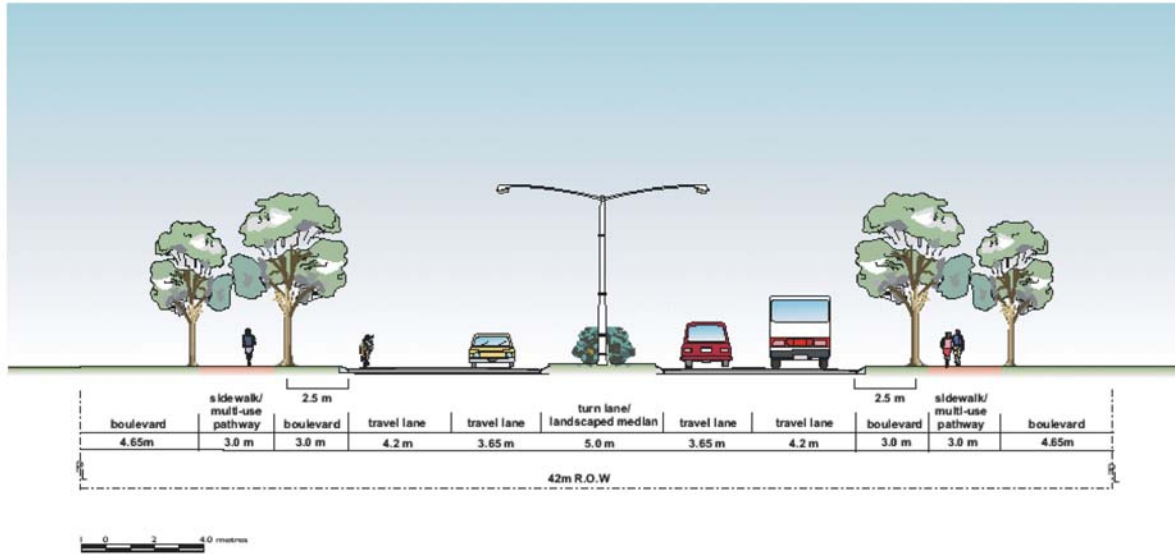
To improve the transit service and diminish traffic delays at key major intersections on the inter-regional transit corridors, transit priority measures, such as transit priority signals and queue-jump lanes at intersections, were identified for implementation.

Regional Right-of-Way Dimension Guidelines

The Regional Right-of-Way Dimension Guidelines provide a comprehensive illustration and coordination of the elements within the regional road right-of-ways that have been proposed as part of the HTMP. This includes the proposed width and number of travel lanes, median characteristics, the accommodation of cycling strategies, elements on the roadway edge, such as landscaping and lighting, as well as the overall dimensions of the right-of-ways themselves. There is a multitude of existing and proposed street and roadway types within Halton Region. This diversity of character and qualities of roadways should be enhanced and protected. The guidelines illustrate what should be considered as the functional “base-case” conditions from which more detailed street and public realm designs can be created.

The design of urban roadways can have the greatest impact on the appearance of the street and the comfort of pedestrians. The boulevard area adjacent to the curb edge contains lighting and landscaping that contributes to this. Landscaping can give each street a distinctive identity. Mature trees will provide shade in winter and reduce the apparent visual width of the right-of-ways. It creates a buffer zone separating pedestrians from the movement of vehicles.

All urban roads should have sidewalks and multi-use paths on both sides of the street, as pedestrian comfort and safety is a paramount objective in the design of regional streets. Sidewalks and multi-use paths provide access to development along the streets as well as connections between neighbourhoods. The provision of sidewalks and multi-use paths on all regional streets will accommodate the young, elderly, handicapped and others reliant on transit and walking.



Commercial main streets are the most public and pedestrian oriented of all Regional streets. They can range in form from historic streets in hamlets to large-scale arterials and in most cases require specific and detailed design. In particular, the spatial relationships between building, vehicle and pedestrian must be carefully and closely integrated. This will ensure the right environment to support and balance the needs of commercial development, pedestrian safety and vehicular circulation.

Rural streets and roads will continue to play a significant role in Regional transportation. In addition to their functional characteristics, these roads also are one of the primary elements defining the Region's visual character. As development expands within Halton, the character and quality of rural roads will become even more highly valued.

Air Quality Management Strategy

The Region of Halton has included an air quality component as part of its HTMP. The issue of air quality is a concern for Halton residents. As part of the HTMP, the Region has proactively addressed air quality as part of its overall roadway system rather than on a project specific basis. There were no ambient air quality measurements collected for this study. The conclusions and recommendations are the result of a strategic level analysis, based on published reports and data from the Ontario Ministry of the Environment and Environment Canada.

Criteria air contaminants (e.g., carbon monoxide, particulate matter, volatile organic compounds) are a subset of urban pollutants that may affect human health and contribute to air pollution problems, such as smog. These emissions originate from a number of sources, which include industrial production, fuel combustion, vehicular traffic, incineration, paved and unpaved roads, and forest fires. The air quality management strategy focuses on these pollutants, as they are associated with increased risk to human health. Any initiatives that reduce contaminants related to combustion will typically reduce greenhouse gas emissions as well.

Criteria air contaminants, associated with increased risk to human health, that are typically found in an urban environment include:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO_x);
- Sulphur Dioxide (SO₂);
- Volatile Organic Compounds (VOCs);
- Particulate Matter (PM); and
- Ground Level Ozone (O₃).

The transportation sector is a major contributor of air emissions in Ontario. When expressed in terms of emissions from human activity, road vehicles in Ontario are responsible for:

- 45% of all CO emissions;
- 35% of all NO_x emissions;
- 19% of all VOC emissions;
- less than 1% of all SO₂ emissions; and
- 12% of all PM₁₀ emissions.

Historical ambient air quality monitoring measurements between the years 1980 and 2000 indicate a decreasing trend for most pollutant concentrations in Ontario, except for ground level ozone. Increasing ozone levels is a multi-regional issue since its precursor substances may have been emitted into the atmosphere several hundred kilometres upwind.

The Region of Halton provided preliminary statistics from their transportation model to be used in conjunction with MOBILE6.2 emission factors in order to estimate vehicular emissions in Halton for the Base Case, Future Do-nothing and 2021 Recommended Roadway Scenarios.

The transportation model statistics correspond to a typical weekday during the peak PM hour (e.g., 4:00 PM to 5:00 PM), along the Regional road system (i.e., Provincial roads and highways, Regional roads, and high order local roads).

MOBILE6.2 model results run for the Region of Halton indicate the following:

- Tailpipe emissions of CO are expected to be reduced by 51% between 2003 and 2020;
- Tailpipe emissions of NO_x are expected to be reduced by 77% between 2003 and 2020;
- Tailpipe emissions of Total Organic Compounds (i.e., VOCs, methane, and ethane) are expected to be reduced by 73% between 2003 and 2020; and
- Tailpipe emissions of SO₂ are expected to be reduced by 91% between 2003 and 2020.

The conclusions from this analysis are based on air quality strategic level modelling, published reports and emissions estimates and measurements from the Ontario Ministry of the Environment and Environment Canada, as well as a review of municipal, provincial, and federal initiatives.

The main conclusion is that emissions from the transportation sector are expected to decline by 2021, despite the projected increase in the number of vehicles and vehicle use in the Region, due to the proposed HTMP strategies, proposed improvements in vehicle technologies, and stricter fuel and emission regulations.

To reduce air quality impacts from transportation, the Region cannot just implement one programme, but must implement a number of initiatives that together should have a positive effect. As part of its Air Quality Management Strategy, the Region must:

- Promote use of transit, car pooling, cycling and other non-SOV trips to reduce vehicle kilometres travelled and minimize road traffic congestion;
- Increase fuel efficiency in regional fleet management (e.g., alternative fuels, hybrid engines);
- Implement street sweeping and flushing near construction and industrial activities to minimize dirt track out and subsequent suspension in the atmosphere;
- Maintain posted driving speeds (e.g., 50 - 80 km/h) to minimize tailpipe emissions, where possible;
- Improve the on-street and off-street bicycle and walking trail network, especially where public transit services are spatially or temporally inadequate;
- Develop design and roadway maintenance guidelines that reduce air pollution, such as wider paved shoulders and appropriate street and shoulder flushing to reduce dust emissions;
- Increase tree planting across the Region as an effective means of removing airborne contaminants;
- Develop a Corporate model to lead by example in the reduction of air quality impacts from transportation sources; and
- Develop an education campaign to promote air quality. Such programmes as commuter challenges, tree planting events, and walk/cycle days to work have successfully been implemented in other municipalities.

It is important to note that many of these types of programmes are already included/integrated in the other strategies and guidelines discussed in the Halton Transportation Master Plan.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) include a broad spectrum of technologies, systems and strategies designed to optimize the use of available and planned roads and other transportation infrastructure at a fraction of the cost of additional infrastructure. ITS can provide useful and timely information to operators (for effective management of transportation resources and emergency service providers) and to travellers (for reduced travel time and cost). This information allows both operators and travellers to make timely decisions.

The purpose of the Halton ITS Strategic Plan is to identify transportation needs and corresponding ITS opportunities and measures that will improve mobility, reduce delays, help the environment, and provide benefits to travellers and other citizens living in Halton Region or those using roads to cross Halton Region. The ITS Strategic Plan considers not only the applications of ITS within the Region itself, but also how they might be connected with or extended into adjacent municipalities, for maximum effectiveness.

This ITS Strategic Plan developed a comprehensive "roadmap" setting the direction and pace of ITS investments in the Region, and identifies a list of viable, cost-effective projects fitting the Region's deployment program and meeting short, medium, and long-term goals.

ITS needs and priorities of the Region and other stakeholders were identified through this study. ITS applications have been identified to meet these needs and are summarized in *Exhibit 3*.

Exhibit 3 - Summary of High and Medium Priority ITS Opportunities

Category	Opportunity	Level of Interest
1. Traffic Management Systems		
1.1	Traffic Flow Monitoring	High
1.2	Traffic Signal Coordination	High
1.3	Incident Management Systems and Coordination	High
1.4	Signal Priority/Pre-emption for Emergency Vehicles	High
1.5	Travel Demand Management (TDM)	High
1.6	Real-time Tracking (Emergency Vehicles)	Medium
2. Traveller Information		
2.1	Emergency Route Diversion	High
2.2	Road/Weather Information Systems (RWIS)	High
2.3	Real-time Congestion Information	High
2.4	Ride-sharing Program	High
2.5	Public Information on Emergencies and Delays	Medium
3. Public Transportation Systems		
3.1	Signal Priority/Pre-emption: Transit	Medium
4. Emergency Management Systems		
4.1	Signal Priority/Pre-emption: Emergency Vehicles: See 2.4	High

Regional Roadway Network 2021

One of the objectives of the Halton Transportation Master Plan (HTMP) was to identify the network expansions required to accommodate future transportation demands and transportation initiatives such as the strategies, plans and guidelines discussed previously.

The network expansion was defined based on previous studies undertaken by the Region, including transportation planning and operations studies, Class Environmental Assessments, Secondary Plans and the modelling component of this assignment. With regards to the modelling undertaken, the HTMP assumed a performance standard for screenlines (for planning purposes) of volume/capacity ratio of 0.90. The need for roadway solutions was identified once the screenline or link volume/capacity exceeded 0.90, accounting for all of the planned improvements in non-auto mode performance. Each link and screenline was analyzed in detail to ensure the appropriate amount of improvements is incorporated to 2021. Based on these analyses, the required roadway infrastructure, by time horizon, was identified.

FINANCIAL CAPABILITY

After first recognizing the impacts of the other plans and initiatives that offer alternative transportation choices, a capital expenditure plan for Halton's transportation network to 2021 was developed. The resulting improvements have been used as background to the updating of the Regional Development Charges By-law. The cost of the transportation network plan was incorporated into the by-law so that the costs of the new system are appropriately allocated between the existing community and new development.

Development charges are charges that the Council of a municipality may by by-law (as permitted by Ontario's Development Charges Act, 1997) impose against land to pay for increased capital costs required in a roads program because of increased needs for services arising from development of the area to which the by-law applies.

The roads program is divided into repaving, reconstruction, and road widening/new alignments. The funding for the capital expenditure plan is shared among existing development (current tax base) and anticipated development ("growth"). The repaving program will be funded entirely from existing development. Most new construction will be funded by "growth" via development charges; however, deductions for benefit to existing development are made.

This process of capital financing has helped put in place a user-pay funding approach that allows growth-related capital to be paid for by development and infrastructure improvements and regular maintenance to be paid for by existing development (the Region).

Resurfacing Program

The Repaving Program will be funded entirely from existing development. Most new construction will be funded by "Growth" via development charges, however, deductions for benefit to existing development are made.

Road Reconstruction

For major reconstruction projects (no lane expansion), growth will be allocated 0%, 10% or 25% of costs with the percentage depending on the degree of capacity improvement, the amount of intersection improvements and the degree to which the road base has suffered accelerated damage due to heavy trucks serving new development.

Lane Improvements

For road widening and new alignments, growth will be allocated 100% of the costs after deducting costs for repaving existing lanes. If the widening is over a bridge, the estimated rehabilitation cost of the existing structure will be deducted as a benefit to existing development.

Traffic Management

The Capital Expenditure Plan also includes projects in the traffic management category. These projects are primarily intersection improvements involving new turning lanes (or lengthening of existing turning lanes) and perhaps signalization. To recognize that the traffic management projects will produce smoother riding surfaces, geometric improvements and may update signal technology, a 5% deduction will be applied to projects at existing intersections as a benefit to existing development.

Railway Grade Separations

For grade separation projects, there were four considerations in establishing the benefit to existing development:

- Existing level crossing and road widening (or new alignment);
- Existing grade separation and road widening;
- Existing grade separation without road widening; and
- Existing level crossing without road widening.

The benefit to existing development was a combination of delay benefit and from a safety benefit for existing road users from the construction of the grade separation. The delay benefit was based on a calculated travel time savings while the safety benefit was based on the exposure index. The exposure index is a standard measure that is the product of train movements' times the average daily traffic flow.

Total Capital Program

The total infrastructure investment in the transportation network plan is approximately \$804 million over 17 years. The breakdown of infrastructure improvements is as follows:

Program	Cost
Roadway Widening/New Roads	\$612 M
Road Reconstruction	\$26 M
Grade Separations	\$75 M
Road Resurfacing	\$27 M
Intersection Improvements	\$6 M
New Development Intersections	\$33 M
Annual Programs	\$25 M
Total	\$804

The split between the costs attributed to growth is \$644 M and to non-growth is \$160 M.

IMPLEMENTATION

The vision and principles established for the HTMP emphasize the need to reduce the demand for automobile travel and to optimize the existing roadway network while meeting the infrastructure needs of all modes. The relationship among the various guidelines, plans and strategies and the principles established for the HTMP are summarized in the following table. The achievement of these strategies will help Halton Region accommodate growth in a sustainable manner, which respects the TAC’s New Vision for Urban Transportation.

	HALTON TMP STRATEGIES							
	Transportation Demand Management (TDM) Program	Intelligent Transportation Systems (ITS) Strategic Plan	Air Quality Management Strategy	Cycling and Pedestrian Infrastructure Plan	Transit and HOV Strategy	Regional ROW Dimension Guidelines	Regional Road Network	Implementation of the TMP
Transportation Principles								
Plan communities with an appropriate level of mixed use and higher densities to create an environment where there are opportunities for transportation choices .	√			√	√			√
Promote and integrate walking and cycling and other non-auto modes as alternative travel modes .			√			√		
Make reducing travel demand a priority in the Region, emphasizing TDM alternatives such as ride sharing, flexible work hours, etc.	√							
As a priority, provide transit that conveniently and affordably serves where people need to go, both locally and inter-regionally, and promotes an integrated and accessible transit system .					√			
Promote cost-effective new technology to better move goods and people.		√						
Maintain and improve the road system to make the best use of the existing transportation infrastructure .	√	√					√	
Ensure transportation decisions protect and respect the environment .			√				√	
Foster political support for transportation solutions that recognize the needs of Halton as well as adjacent communities.								√
Create new innovative ways to pay for future urban transportation systems.								√
Key Public Comments								
Need for better transit connections within the Region, especially for senior and student populations					√			
Need better connections between different transportation modes	√	√			√			√
Key way to improve congestion is to get people out of their cars	√				√			√
Incentives and education are needed for both public and politicians to change from the current car-focused culture.								√
Need to create more pedestrian/cycling friendly roads			√			√		
Human health is important issue			√					
Improve the road system recognizing that cars will remain important for Halton							√	√

In conclusion, the HTMP will result in:

- Making the best use of the available capacity using technology where it makes sense;
- A transit system that is integrated within the Region and connected to adjacent municipalities;
- Transit and multi-occupant vehicles in HOV lanes;
- TDM as an active part of daily travel, supported by systems and leadership to make a difference;
- Street design that supports the system and pedestrian mobility;
- A road system where cyclists feel more comfortable; and
- An expanded road system that meets the needs of resident and business traffic.

A complete version of the HTMP plans, public consultation process and financial strategy are available on the project website at:

<http://www.region.halton.on.ca/ppw/PlanningRoads/transp/MasterPlan/default.htm>.