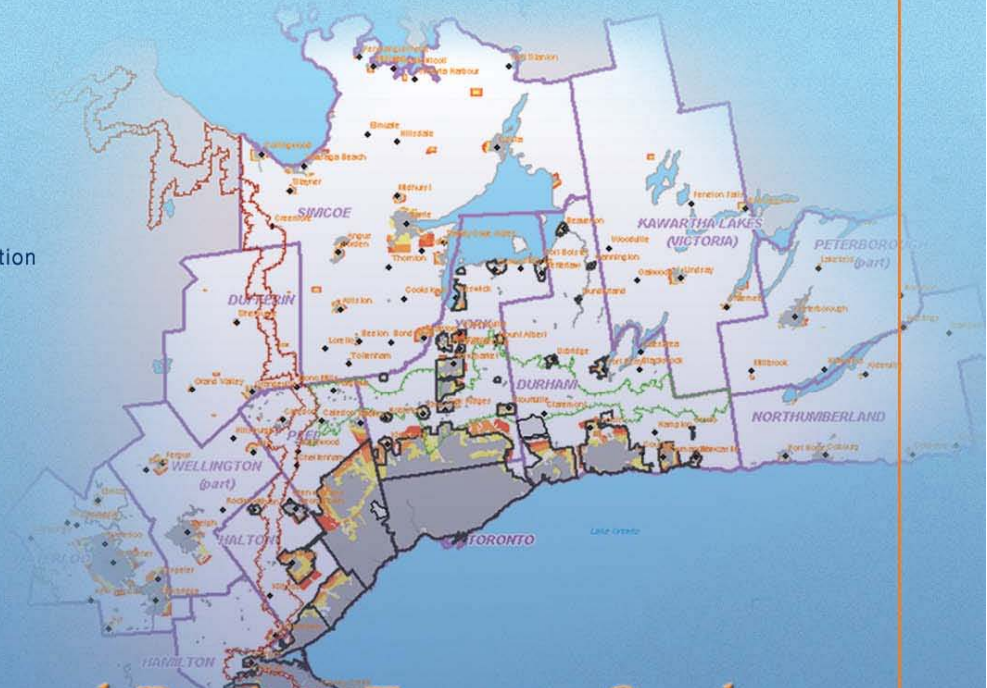


neptis foundation



Toronto-Related Region Futures Study

Interim Report: Implications of Business-As-Usual Development

AUGUST 2002

IBI GROUP in association with **DILLON CONSULTING LIMITED**



August 19, 2002

Mr. Anthony C. Coombes
Executive Director
The Neptis Foundation
50 Park Road
Toronto, Ontario M4W 2N5

Dear Mr. Coombes:

***Toronto-Related Region Futures Study
Interim Report: Implications of Business-As-Usual Development***

As commissioned by the Neptis Foundation, we have prepared this study of a possible future scenario for the Toronto-related region. The report examines the way urbanization may occur in this major region if current development planning and implementation processes remain in place and the region's rapid growth of people and jobs continues over the next three decades. It is also intended to provide an objective basis for subsequent work to consider possible alternative policy scenarios and compare them with Business-As-Usual. It is, therefore, an interim report as part of a larger study contemplated by Neptis to explore alternative development and infrastructure scenarios and their implications.

Owing to the length of the report, an Executive summary is included which presents a reasonably comprehensive summary of the study approach and findings. More details are presented in the main body of the report.

The study team acknowledges with thanks the advice and input of the staff and advisors of Neptis and of members of the wider planning community, while accepting responsibility for the findings and conclusions of this report.

Respectfully submitted,

IBI GROUP

A handwritten signature in black ink, appearing to read "Neal A. Irwin", written over a horizontal line.

Neal A. Irwin
Managing Director

NAI:cl

**Toronto-Related Region Futures Study
Interim Report: Implications of Business-As-Usual Development**

EXECUTIVE SUMMARY

E.1 INTRODUCTION

THE URBAN FUTURES STUDY

As Canada's largest urban area and most diverse economy, the Toronto-related region continues to generate and attract rapid growth in population and jobs, with related economic and social benefits. At the same time, rapid growth creates challenges in terms of required infrastructure, land consumption and related environmental issues. The manner in which the opportunities offered by growth are realized and the challenges are addressed will greatly affect the region's ongoing success, both as a dynamic growth centre and a good place to live.

Building on the area's strengths while addressing its challenges is a complex process. If the area's citizens and leaders are to make intelligent, informed decisions, they will require objective and reliable information on the likely future implications of their policy, planning and management decisions. Individual municipal jurisdictions and government departments regularly prepare forecasts and plans for their respective areas of interest, but it is rare that a comprehensive approach is taken to assess consequences for the entire urban and urbanizing region, dealing strategically with both urban development patterns and major infrastructure systems.

In this context, the Neptis Foundation commissioned IBI Group in the fall of 2001 to undertake a major study of the future of the urban region. Pamela Blais of Metropole Consultants has acted as a special advisor to Neptis for the study, focusing in particular on urban structure aspects of the work. IBI Group retained Dillon Consulting Limited to carry out the water/wastewater infrastructure component.

STUDY PURPOSE AND SCOPE

The Toronto-related region has experienced for many years a net population growth of about 100,000 persons per year, of which about two-thirds results from net immigration and the remaining one-third represents natural increase. This study addresses the following question: What would the likely outcome be if this substantial rate of population growth and related economic growth continues for the next three decades? The "Business-As-Usual" scenario presented in this report is based on the premise that this ongoing growth will be accommodated by a continuation of current consumer behaviour and market conditions, public policies and approval processes, and the

planning and delivery of physical infrastructure, during the period to 2031. The study focuses on settlement patterns and requirements for new urban land, infrastructure to serve transportation and water/wastewater needs, and related measures of infrastructure performance and cost.

The scenario is described and analyzed at a strategic level. This is not a planning study but rather a “What If” assessment of the urban structure and major infrastructure implications 30 years from now under particular assumptions. As such, the Business-As-Usual scenario helps to provide an understanding of one possible “future” for the entire Toronto-related region. It also provides a basis for considering other possible scenarios based on alternative urban structure and infrastructure assumptions and is a benchmark against which alternative scenarios may be compared.

This report presents the study’s findings for the Business-As-Usual scenario only. Drawing in part on the results presented here, Neptis plans to extend the study to describe several alternative future scenarios and the implications of each scenario in terms of urban structure, physical infrastructure, and various performance and cost implications of the alternatives.

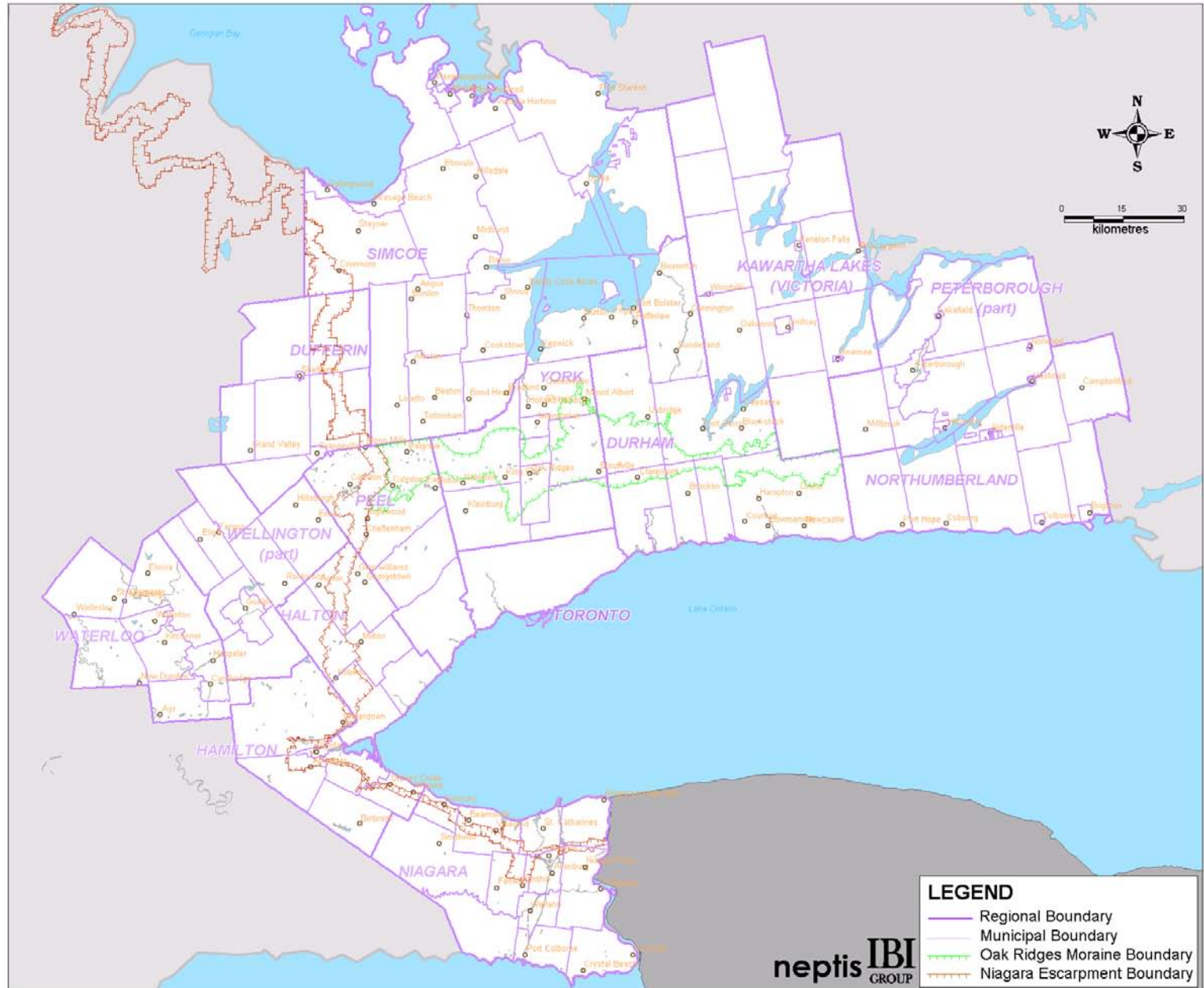
The study will not produce policy or planning recommendations, but will provide an objective description of several alternative futures for the Toronto-related region as “food for thought” and to help inform discussion by the public and its decision-makers regarding policy and planning choices.

STUDY AREA

The study area for this work is illustrated in Exhibit E.1. It is considerably larger than the area made up of the city of Toronto and the four regional municipalities (Durham, Halton, Peel and York), which together constitute The Greater Toronto Area (GTA), plus the new City of Hamilton. This area is referred to herein as the inner study area. The outer study area comprises eight upper-tier municipalities: the Regional Municipalities of Niagara and Waterloo; the Counties of Wellington (south part), Dufferin, Simcoe, Peterborough (south part) and Northumberland; and the City of Kawartha Lakes, formerly the County of Victoria.

The study area was extended beyond the GTA and Hamilton in order to include interactions with urban centres such as St. Catharines, Kitchener/Waterloo/Cambridge, Guelph, Barrie and Peterborough, while also considering the “urban shadow” implications affecting more rural parts of the study area. People throughout the entire urban region are interconnected in terms of their social, economic and recreational activities, their need for – and use of – transportation and water/wastewater infrastructure, and the performance and cost implications of ongoing growth.

Exhibit E.1: Study Area



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E.2 URBAN STRUCTURE

Chapter 2 of the report outlines the approach and assumptions associated with estimating the extent and distribution of urbanization to 2031 for the Business-As-Usual (BAU) scenario.

BUSINESS-AS-USUAL: KEY ASSUMPTIONS

The following assumptions were used for the BAU scenario.

Demography:

- International immigration will remain steady at recent levels (i.e., about 200,000 per year, of which the study area is projected to continue to attract about 45%).
- The rate of natural population growth will decline as fertility rates remain low (i.e., at about 1.5; the replacement rate is 2.1).
- Population will increase from 7.4 million to 10.5 million (i.e., by 3.1 million or 100,000 per year, a continuation of past trends).
- Household size will continue to decline slightly, consistent with long-term trends.

Cultural/Economic:

- Strong employment growth will continue and jobs will grow from 3.5 million to 5.5 million.
- Employment growth will be higher than population growth in percentage terms, reflecting a continuation of increasing participation rates.
- Consumer preferences in housing types and modes of travel will stay as they are.
- Capital investment will be available for the expansion of road, transit, water, and wastewater infrastructure at levels consistent with recent experience; almost three-quarters of this investment will be required for rehabilitation and renewal to maintain these systems in a state of good repair and will therefore be largely unaffected by alternative urban structure and infrastructure policies.
- The economics of development – land and housing costs and prices, property taxes, development charges, etc. – will not fundamentally change.
- Redevelopment and infill development in existing urban areas will continue at current levels.

Land Use:

- Urban development in new urban areas (formerly rural) will occur first on land designated “urban” in official plans.
- Urban development will next occur beyond designated urban boundaries, with municipal approval, in places where the market demands it and the physical infrastructure permits it. As a consequence, currently rural land, including agricultural land, will become urban, reflecting a transition to the urban economy from the rural/agricultural economy.
- Environmentally sensitive lands protected in upper-tier official plans will not be available for urban development.
- Development on the Oak Ridges Moraine will generally be restricted according to recent Ontario government policy.
- Rural land, including land classified as agricultural, will be available for urban development, with municipal approval.

Density:

- Average residential densities in new urban areas will continue to rise slightly.
- Development densities in new employment lands will remain constant.
- As the urban area expands, overall residential and/or non-residential densities will tend to increase as a result of infill and redevelopment, reflecting economic pressures to use land more intensively in established areas.

DETERMINATION OF APPROPRIATE FORECASTS

Drawing on census data, historic 25-year population trends (1971-1996) were examined and extrapolated in a linear fashion; the results of this trend analysis were compared with the range of available forecasts for each of the five GTA upper-tier municipalities (UTMs). The charts in Appendix A show graphically the past trends compared to a number of available population forecasts for the GTA municipalities.

In terms of the GTA upper-tier municipalities (UTMs), a number of population projections were reviewed, including those prepared by/for the following:

- Office for the Greater Toronto Area (OGTA);
- Greater Toronto Co-ordinating Committee (GTCC);
- Central Ontario Study (Ministry of Transportation – Ontario);
- Ministry of Finance (Government of Ontario);

- the UTM official plans; and
- a market-based forecast prepared for and used by IBI Group for a range of transportation-related analyses; this is referenced as the “market forecast”.

It is of interest to note that all these forecasts have similar overall total projections for the GTA to 2031. The differences among the various forecasts relate primarily to the distribution of population among the UTMs.

Based on the review of alternative population projections for the GTA UTMs as well as the results of comparative analyses for other parts of the study area, it was concluded that the UTM forecasts should be based initially on the market forecast. Generally, a key differentiating factor in this forecast is that slightly lower population and employment forecasts for Toronto are estimated, to reflect trends that targets for potential infill and intensification development may have been over-estimated. **The market forecast most closely replicates a linear extrapolation of the historic population trends and is considered to be most representative of the BAU scenario principles.**

FUTURE URBANIZATION PATTERNS

In order to estimate future population, employment and land consumption for each of the municipalities in the study area, a typology of municipalities in the study area was developed, reflecting five different stages in the urbanization process viewed at the scale of the entire urban and urbanizing region. The five categories, and a prototypical example of each one, are:

1. ***Already Urbanized Municipalities (Type 1)*** are communities that are largely built-out or have significant compact, mixed-use areas and contain full transportation/public transit systems largely supported by subcentres or nodes throughout their geographic area; prototype example: City of Toronto.
2. ***Rapidly Urbanizing Municipalities (Type 2)*** are communities currently experiencing a rapid rate of growth (residential and non-residential) primarily on rural land (typically through Plan of Subdivision) contiguous to existing urbanized areas; prototype example: Markham.
3. ***Newly Urbanizing Municipalities (Type 3)*** are communities that lie beyond the current wave of rapid suburban development but are starting to experience moderate levels of residential and non-residential growth through the Plan of Subdivision process; prototype example: Halton Hills.
4. ***Rapidly Growing Leapfrog Municipalities (Type 4)*** are similar to Rapidly Urbanizing Municipalities (Type 2) as they are communities experiencing a rapid rate of growth primarily on rural lands (typically through Plan of Subdivision); however, they are at some distance from the current growth concentration and there remain intervening lands that are currently undeveloped; prototype example: Barrie.

5. **Urban Shadow Areas (Type 5)** are communities located in largely rural areas beyond the rapidly developing fringe. They have not experienced significant development but, over the course of the study period, may be faced with pressures to accommodate future growth (residential and non-residential); prototype example: Shelburne.

For analysis purposes, it was assumed that a municipality would remain in its category throughout the forecast period. As a municipality evolves, however, it will eventually exhibit characteristics of a more mature municipality.

An analysis similar to the estimation of population and employment projections for the UTMs was carried out for the prototype municipalities selected, also shown graphically in Appendix A. The result of that analysis was the decision to adopt the market forecast at this level of analysis, as it reflects a continuation of the historic trend.

DEVELOPMENT DENSITIES

Having adopted the BAU forecasts, each prototype community was reviewed to determine appropriate assumptions for development density and household size trends to yield generic population and employment densities per gross acre for each prototype. These are summarized in Exhibit E.2.

Exhibit E.2: Density Assumptions for Development on New Land by Municipal Prototype Category

Municipal Prototype Categories	Gross Density for Growth (persons per gross acre, p.p.a.)					
	2000-2011		2011-2021		2021-2031	
	Population	Employment	Population	Employment	Population	Employment
Type 1 Already Urbanized	22.0	25.0	22.0	25.0	22.0	25.0
Type 2 Rapidly Urbanizing	16.5	18.0	17.5	18.0	18.5	18.0
Type 3 Newly Urbanizing	10.0	14.0	13.0	14.0	15.0	14.0
Type 4 Rapidly Growing Leapfrog	14.0	15.0	16.0	15.0	18.0	15.0
Type 5 Urban Shadow	7.0	7.0	8.0	7.0	9.0	7.0

Population density consists of two components: (1) residential units per gross acre, and (2) household size. **Gross** residential density is the number of residential units divided by the total amount of primarily residential lands.¹ Gross residential densities are assumed to be increasing through the forecast period. Consistent with historic trends, household size will continue to decline slightly. Therefore, the combination of these two factors will result in overall gross population density increasing slightly. It is of interest to note that **net** residential densities have generally been increasing in the latter 1990s. However, this increase in net residential densities has been substantially offset by increasing amounts of land used for infrastructure and public uses (e.g., stormwater management ponds, wide streets, parks, schools, etc.). Thus, **gross** residential density is not increasing at the same rate as **net** residential density. Gross employment density excludes Environmental Sensitive Area (ESA) lands but includes all other uses found on non-residential lands.

As illustrated in Exhibit E.3 (on the following page), all single-tier municipalities in the study area were classified according to the typology. Combining the assumptions of the market forecasts of population and employment and the generic growth characteristics of each category, the amount of land to be urbanized over the forecast period was estimated. These results are summarized for each of the five categories in Exhibit E.4.

Exhibit E.4: Growth Allocation to 2031 by Municipal Category

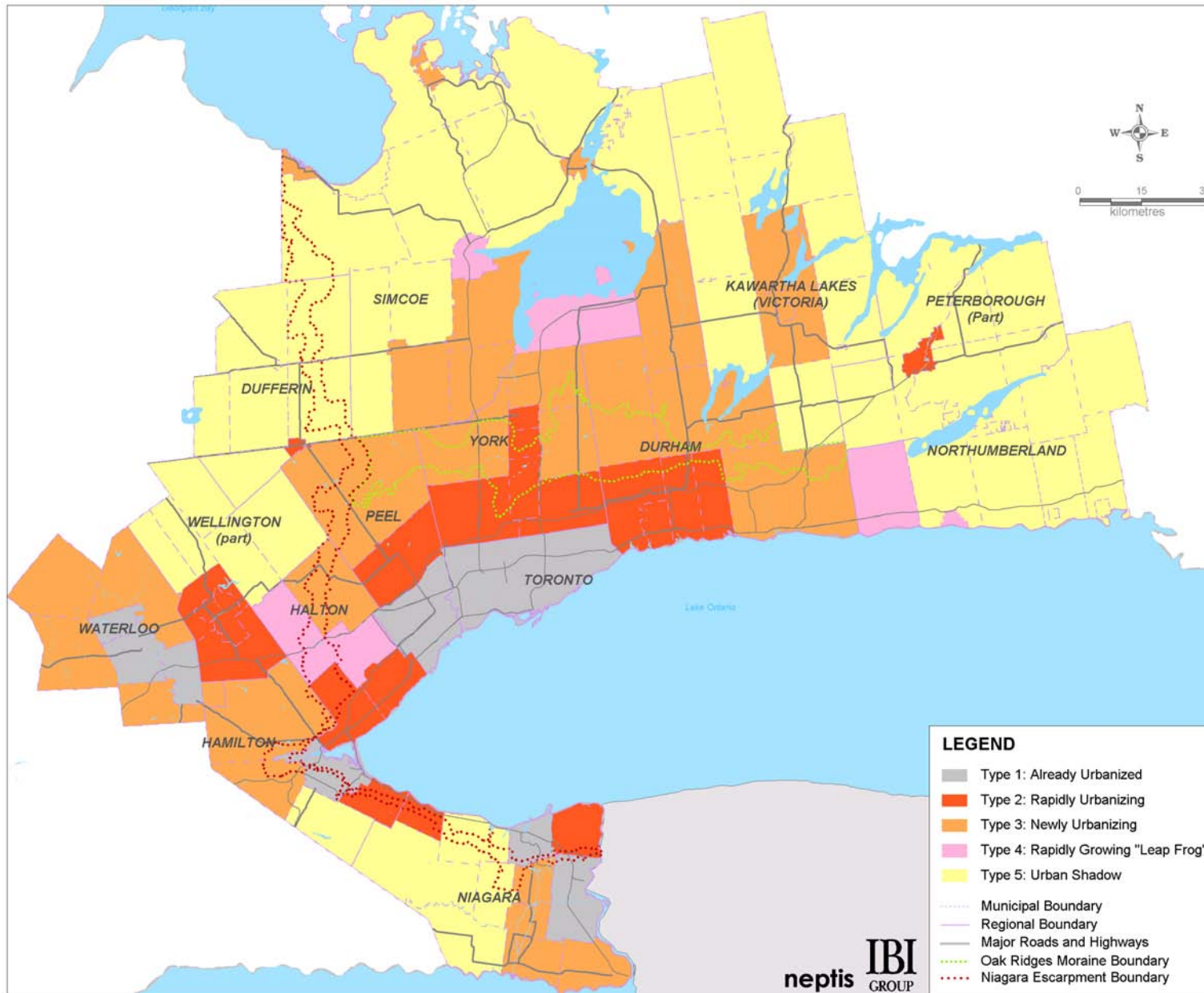
TYPE OF MUNICIPALITY	2000 to 2031 GROWTH						
	Absolute Growth		Percentage Growth		Urbanized Land		
	Population	Employment	Population	Employment	acres	km ²	%
Type 1 Already Urbanized	695,826	719,696	21.9%	37.6%	26,058	105	9.9%
Type 2 Rapidly Urbanizing	1,466,015	781,771	46.2%	40.8%	126,765	513	48.0%
Type 3 Newly Urbanizing	519,400	202,152	16.4%	10.6%	53,911	218	20.4%
Type 4 Rapidly Growing Leapfrog	316,318	159,230	10.0%	8.3%	29,337	119	11.1%
Type 5 Urban Shadow	175,120	51,764	5.5%	2.7%	27,967	113	10.6%
TOTAL GROWTH	3,172,679	1,914,613	100%	100%	264,038	1,069	100%

As shown, the largest share of growth, most of it on rural land, goes to Type 2, Rapidly Urbanizing Municipalities. Land consumption varies significantly reflecting the differing development densities shown in Exhibit E.2.

Appendix B shows the classification and the estimated new urbanized land areas for each municipality.

¹ Lands used for residential lots, streets, parks and other infrastructure, and other uses included in a plan of subdivision.

Exhibit E.3: Municipal Typology



MAPPING AND GROWTH PATTERNS

The results of the above analyses provided estimates of requirements for newly urbanized land in each area municipality resulting from the population and employment growth forecasts for the study area. These results were plotted on a base map of the broader study area. Existing urbanized land was identified on the base map using information obtained and analyzed by the University of Toronto Cartography Department from satellite imagery. Exhibit E.5 shows the distribution of urbanized land as of late 1999; this was used as the starting point for mapping anticipated future urban development patterns. Also shown on Exhibit E.5 are the designated urban area boundaries for local municipalities.

ALLOCATION OF NEWLY URBANIZED LAND

Generally, newly urbanized land was assumed to occur adjacent to existing urbanized land. This analysis drew from the collective knowledge of the study team in terms of the plans and approvals status in various municipalities, consultation with municipal planning staff, the location and anticipated influence of existing, committed and planned water/sewer infrastructure and transportation infrastructure, and trends in land use planning and development. Development was projected to occur largely within the designated urban boundaries shown on Exhibit E.5, but also outside the designated urban boundaries in cases of overspill, as described in the body of the report.

Development on the Oak Ridges Moraine was projected in accordance with the Oak Ridges Moraine Act; it was assumed that development on the Moraine that received municipal approval prior to the passage of the Act will occur as originally planned.

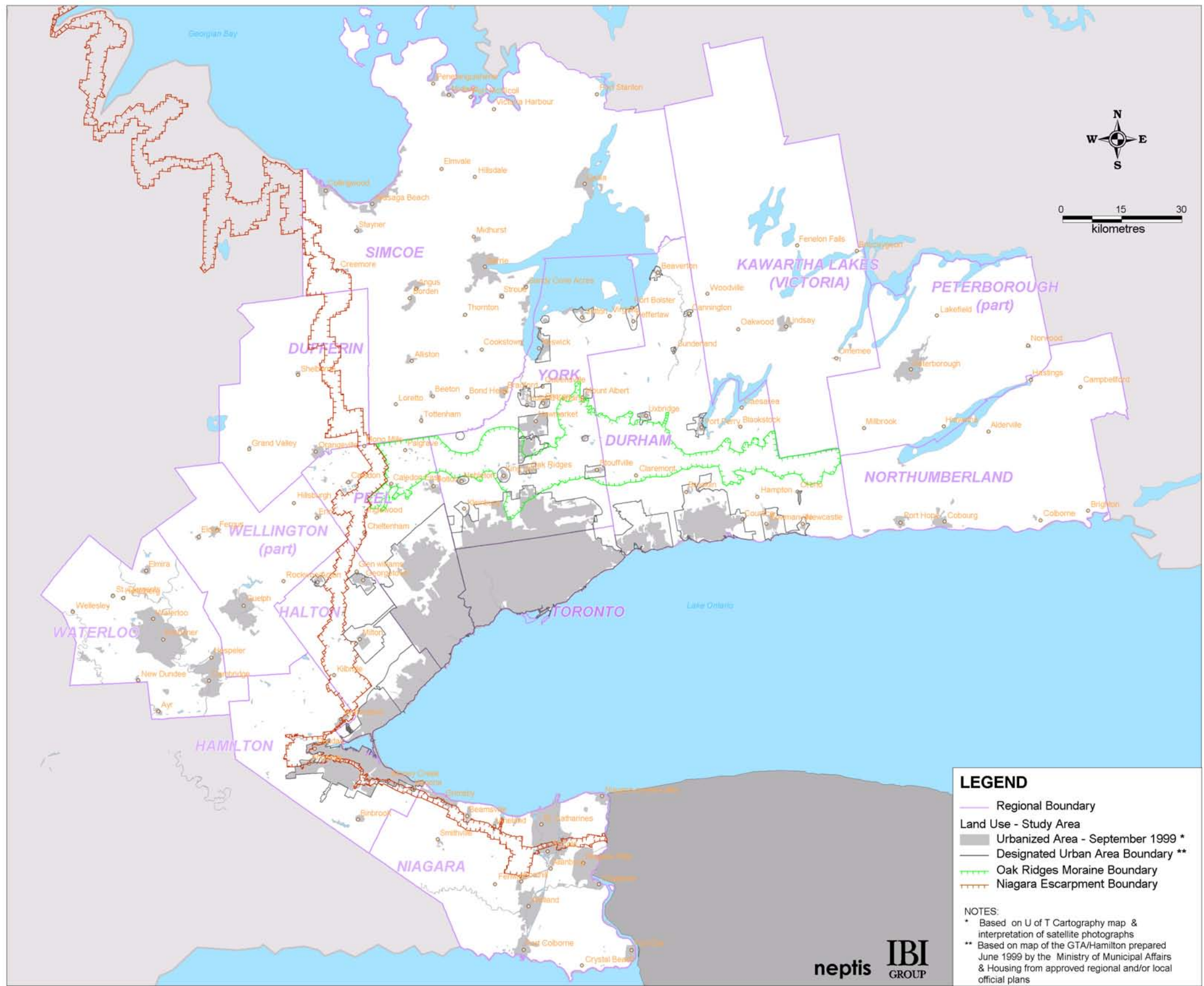
Development in more rural areas was anticipated to occur adjacent to smaller settlement areas such as towns, villages, etc., but also along township roads as rural non-farm development. In some rural areas where such growth is anticipated and there are no sizeable communities, newly urbanized land is shown as a representative rectangle illustrating the overall area of newly developed land but not its actual location. Examples of this can be seen in the more rural parts of the study area in Exhibit E.6.

GROWTH AND LAND REQUIREMENTS TO 2031

Exhibit E.6 shows the anticipated urban structure of the Toronto-Related Region to 2031. This map should be viewed in association with Exhibit 2.7 in the body of the report, which provides an overview of population, employment, activity rate, urbanized land and urban density by upper-tier municipality within the study area.

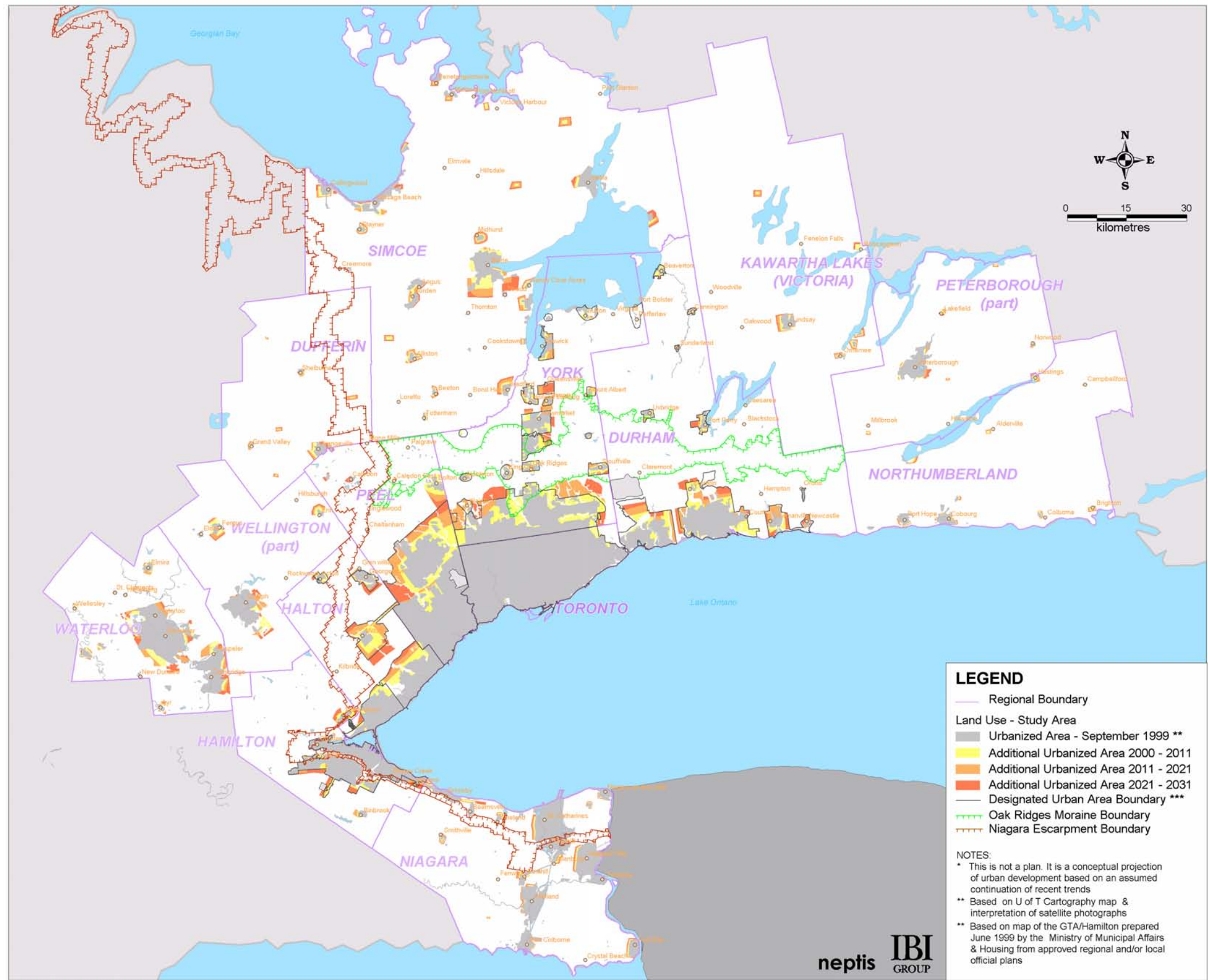
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Exhibit E.5: Existing Urban Land and Designated Urban Boundaries



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Exhibit E.6: Urbanized Land 2000 – 2031 Under the Business-As-Usual Scenario *



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POPULATION GROWTH VERSUS ANTICIPATED URBAN LAND CONSUMPTION

A comparison of the population growth rate relative to the rate of land urbanization provides a useful measure to ascertain trends. The projected population growth and the anticipated growth in urban land in each of the three decades is as follows:

- 2000 to 2011: urbanized land growth 18.6%; population growth 15.8%;
- 2011 to 2021: urbanized land growth 12.4%; population growth 12.2%;
- 2021 to 2031: urbanized land growth 8.8%; population growth 10.2%.

These trends suggest that newly urbanized land will increase more rapidly than population during the first decade, newly urbanized land and population will increase at roughly the same rate during the second decade and population will increase more quickly than land consumption during the third decade. **In other words, a continuation of current policies, plans and programs, coupled with overall growth in line with past trends, is projected to lead to a gradual decrease in the per capita consumption of land for urbanization over the 31-year study period.**

For the upper-tier municipalities in the study area as a whole, the pattern of population growth relative to urban land consumption is anticipated to be generally similar. Closer analysis, however, suggests that there will be significant differences. For example, many municipalities within the inner study area are likely to experience population growth that is higher than the anticipated urban land growth across all three decades. In all cases, however, the differential between population growth and urban land consumption is projected to diminish through the forecast period.

The upper-tier municipalities in the outer study area are expected to vary substantially in terms of their population and urban land growth rates. The more “urban” municipalities such as Niagara, Waterloo, Simcoe and Wellington tend to have a narrower differential between population and urban land growth rates. The more “rural” municipalities (Northumberland, Peterborough, Dufferin and Kawartha Lakes), however, have a much wider gap, with urban land growth rates being substantially higher than population growth rates. The gap diminishes through the forecast period, but the pattern of urban land growth exceeding population growth persists.

KEY IMPLICATIONS

In 2000, the study area had an estimated population of 7.4 million and employment of 3.5 million. The urbanized land is estimated at just under 586,000 acres (2,370 km²) yielding a gross density (i.e., for population plus jobs) of 18.6 people plus jobs per acre or 45.9 per hectare. The estimated population and employment in 2031 is 10.5 million and 5.4 million respectively. The urbanized land in the overall study area is estimated at 850,000 acres (3,440 km²), resulting in an overall gross density of 18.8 people plus jobs per acre or 46.5 per hectare, about 1% higher than the existing density.

Anticipated growth through the 31 years will occur primarily on designated urban land close to already urbanized areas. Exhibit E.6 shows the physical extent of projected population and employment growth. The anticipated implications associated with such growth patterns include the following:

- Over the 31-year timeframe an estimated 264,000 acres (1,070 km²) of land will be urbanized. This is almost double the area of the City of Toronto.
- In most municipalities, land already designated as urban in official plans (much of which is currently undeveloped) will be sufficient for urban development until 2021, and in some municipalities until 2031. The region has enough additional land for many more years of urban expansion – if it chooses to continue current development patterns and consumption of non-urban land – even with most of the Oak Ridges Moraine protected from development.
- As shown in Exhibit E.7, the greatest shares of population growth and newly urbanized land – 46.2% and 48.0%, respectively, by 2031 – are expected to occur in rapidly urbanizing municipalities (Type 2). Land consumption per capita in Type 2 municipalities (residential and employment lands) is about 2,500 sq.ft. (288 m²) per person plus job, more than three times that of already urbanized municipalities (Type 1).

Exhibit E.7: Growth Allocation to 2031 by Municipal Category

TYPE OF MUNICIPALITY	2000 to 2031 GROWTH						
	Absolute Growth		Percentage Growth		Urbanized Land		
	Population	Employment	Population	Employment	acres	km ²	%
Type 1 Already Urbanized	695,826	719,696	21.9%	37.6%	26,058	105	9.9%
Type 2 Rapidly Urbanizing	1,466,015	781,771	46.2%	40.8%	126,765	513	48.0%
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TOTAL GROWTH	3,172,679	1,914,613	100%	100%	264,038	1,069	100%

- Although rising residential densities are assumed in new suburban developments, and expected in existing urban areas, the density of population and employment for the overall study area will increase very little – from 18.6 to 18.9 people plus jobs per acre (45.9 to 46.5 per hectare) of urbanized land. This is primarily because the greatest population growth is expected in areas with densities that, although rising, are and will remain below the study area average. As well, density declines are expected in many urban shadow communities, as low-density development is expected to occur outside existing relatively compact rural towns and villages.
- The only upper-tier municipality showing a substantial increase in density is the City of Toronto, where infill and redevelopment are expected to raise density from 31.7

to 37.7 people and jobs per acre (78.2 to 93.1 per hectare). This is the main reason for the slight rise in the overall density of the study area.

- Population growth of some 513,000 will be accommodated through infill or redevelopment. This is most prevalent in built-up urban areas, particularly in the City of Toronto. Of the total growth accommodated through infill/redevelopment, 68% is expected to occur in Toronto. This level of infill or redevelopment may be considered conservative when compared to municipal intensification targets; however, it reflects the BAU principles.
- A number of lower-tier municipalities will need to extend their current designated urban boundaries to accommodate anticipated population and employment growth to 2031. In some instances, the anticipated growth relative to designated urban boundaries in a rapidly growing municipality may cause development to occur in adjacent municipalities. In the BAU scenario a relatively small proportion of newly urbanized land was reallocated for this reason.
- The study area is located within an area that has comparatively high agricultural capability. According to an analysis carried out by the University of Toronto Cartography Department on behalf of the Neptis Foundation, about 92% of the future urbanized land requirement – approximately 244,000 acres (987 km²) – is Class 1, 2 or 3 agricultural land as classified by the Canadian Land Inventory; about 69% – approximately 181,000 acres (733 km²) – is Class 1, top-quality, agricultural land. This 181,000 acres is about 7.2% of all the Class 1 agricultural land in the study area, which totals about 2.5 million acres (10,200 km²). Much of the 181,000 acres is located within designated urban boundaries and may or may not be actively farmed at present.
- The activity rate² provides an indicator of expected trends in jobs/worker balance. Overall, modest increases are anticipated in the activity rate from .48 to .52. The inner study area has, as expected, slightly higher activity rates relative to the outer study area, suggesting that the six upper-tier municipalities in the inner study area will continue to have a higher level of jobs per capita, with continuing net in-commuting from the outer study area to fill those jobs.
- Declining rates of new urban land consumption per capita are projected over the study period such that, while new urban land is expected to grow in percentage terms more quickly than population during the decade to 2011, the growth rates will be approximately equal in the following decade, and new urban land is expected to grow more slowly than population in the third decade, 2021 to 2031.

² The activity rate is a derived number based on employment (jobs) divided by population.

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E.3 TRANSPORTATION

Transportation is a major factor in shaping and serving urban development patterns. An important element of this study, therefore, is to estimate future transportation demand levels, system performance, transportation costs and community implications for the Business-As-Usual land use concept and, in future phases which Neptis may carry out, for alternative land use/transportation scenarios. The focus in this work is on the transportation of persons rather than goods, reflecting the important peak period pressures imposed on the urban transportation system by the movement of people.

BUSINESS-AS-USUAL: KEY ASSUMPTIONS

The following transportation assumptions were used for the Business-As-Usual scenario.

Transportation Supply

- Government spending levels and funding sources for transportation in the study area will remain largely unchanged from those of the 1990s.
- Existing limited-access highways, comprising some 6,110 lane-km, will be expanded by an additional 1,910 lane-km or about 30%.
- The existing arterial road network of some 41,500 lane-km will be expanded by about 2,500 lane-km, or about 6%.
- The number of buses, streetcars and rapid transit vehicles will be increased in proportion to population growth, and service coverage will be extended into newly urbanizing areas.
- No new rail rapid transit lines are assumed (the Sheppard Subway is expected to open in 2002), but priority transit (e.g., faster, more reliable services expedited by transit lanes, queue-jumping arrangements and/or signal priority) will be introduced on a limited basis.
- Commuter rail service will be expanded by implementing GO Transit's 10-year capital program and 2021 plan.
- Auto operating costs and transit fares will remain unchanged in real terms (non-inflating dollars).

Transportation Demand

- Increases in daily trips per capita, average work trip length, and car ownership per capita will continue, but at rates lower than those experienced during the past three decades (see Exhibit E.8).

Exhibit E.8: Study Area Growth 1964– 1996: Population, Employment and Travel

	1964	1996	1964-1996 % Increase
Population	3,766,000	6,756,000	79%
Employment	1,508,000	3,042,000	102%
Adult Daily Trips	4,059,000	12,900,000	218%
Daily Trips/Capita	1.4	2.48	77%
Avg. Work Trip Length (straight-line kilometres - GTA trips)	11.4	14.1	24%
Car Ownership/Capita	0.32	0.51	60%

Sources: Metro Toronto and Region Transportation Study; Transportation Tomorrow Survey; Census data.

Transportation Policy

- Existing levels of transportation demand management and transportation system management will continue throughout the study period.
- No additional transportation taxes or user charges (e.g., road pricing, parking surcharges) will be introduced.
- No new transportation funding arrangements will occur: shortfalls in capital and operating funds will be a continuing challenge, only partially offset by one-time grants from the provincial and federal governments.

The transportation supply assumptions, in particular, reflect the continuation of ad-hoc transportation funding arrangements among the various government levels and a lack of adequate revenue sources at the municipal level. It should be recognized that the above assumptions regarding future expansion of the municipal transit and GO Rail modes reflect funding levels more typical of those experienced in the 1970s and 1980s rather than the more constrained levels of the 1990s.

TRAVEL DEMAND FORECASTS

A computer-based transportation model was used to estimate future transportation demand levels (in 2011, 2021 and 2031). The forecasts include future travel volumes and system performance levels on roads and transit facilities (including commuter rail) serving the study area. The forecasting process is sensitive to settlement patterns, population and employment distribution, and transportation system characteristics including capacities, travel times and costs, and transit service levels.

As part of this process, the study area was divided into 2,052 traffic zones and future population and employment in each zone were projected as inputs to the model.

Exhibit E.9: A.M. Peak period Trip Growth 2000 - 2031
for the Business-As-Usual Scenario

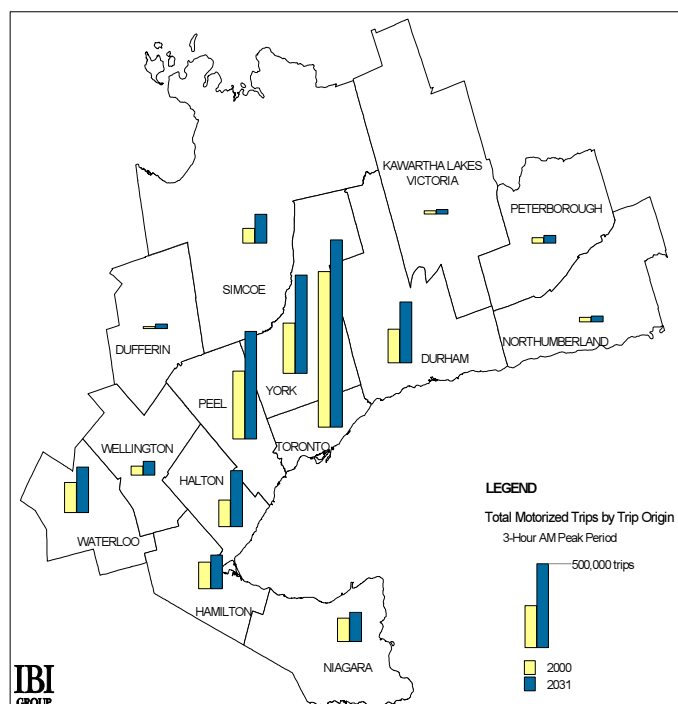
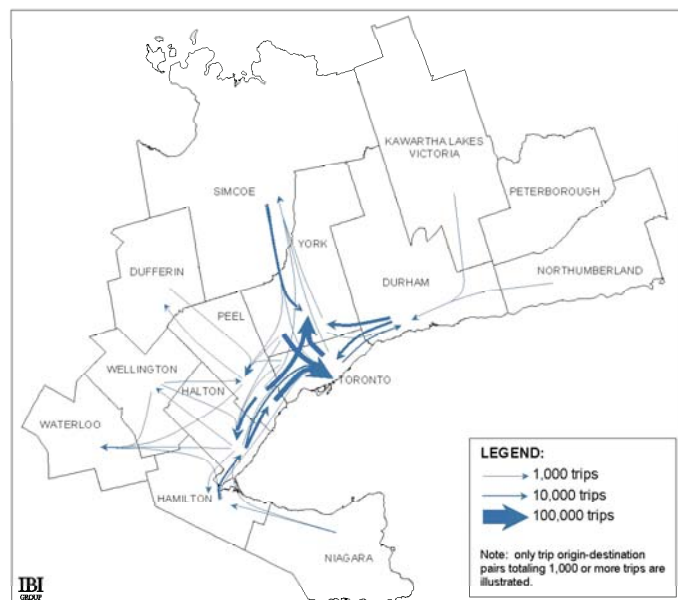


Exhibit E.10: Growth in A.M. Peak period Inter-Regional Travel Volumes (2000 – 2031)



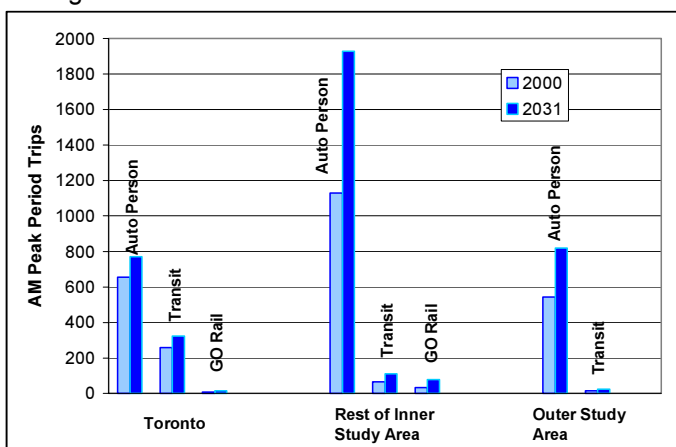
TRANSPORTATION OUTLOOK TO 2031

Overall, the study area will see significant growth in travel demand in the next three decades under the BAU scenario. Total motorized person trips in the three-hour a.m. peak period are forecast to increase from 2.7 million to 4.0 million, an increase of about 50%. As illustrated in Exhibit E.9, the majority of this growth will occur outside the City of Toronto, especially in York, Peel, Halton and Durham. There will be significant growth in interregional travel volumes between pairs of upper-tier municipalities, as shown in Exhibit E.10. Other significant transportation indicators by 2031 include the following:

- Travel Mode Trends:** Between 2000 and 2031, automobile trips are expected to increase by 51% for the overall study area; of this increase, about 10% is accounted for by trips originating in Toronto, 67% by trips from the rest of the inner study area, and 23% by trips from the outer study area. Municipal transit ridership will increase by approximately 35% based on the service increases assumed under the BAU scenario. In contrast, GO Rail ridership is forecast to increase by 140% or 2.4 times, with the majority of the growth coming from the inner study area outside of Toronto. In absolute terms, municipal transit trips will continue to exceed GO Rail trips in 2031 by a large margin for trips originating in Toronto, but GO ridership will close the gap significantly for trips originating in the rest of the inner study area (see Exhibit E.11). The estimated modal split in 2031 for the entire study area is about

86.5% auto, 11.2% municipal transit (including GO bus ridership) and 2.3% GO Rail. In the inner study area these modal shares are about 84%, 13% and 3%, respectively. Auto shares are essentially unchanged from 2000 levels, and declines in municipal transit are offset by increases GO Rail ridership.

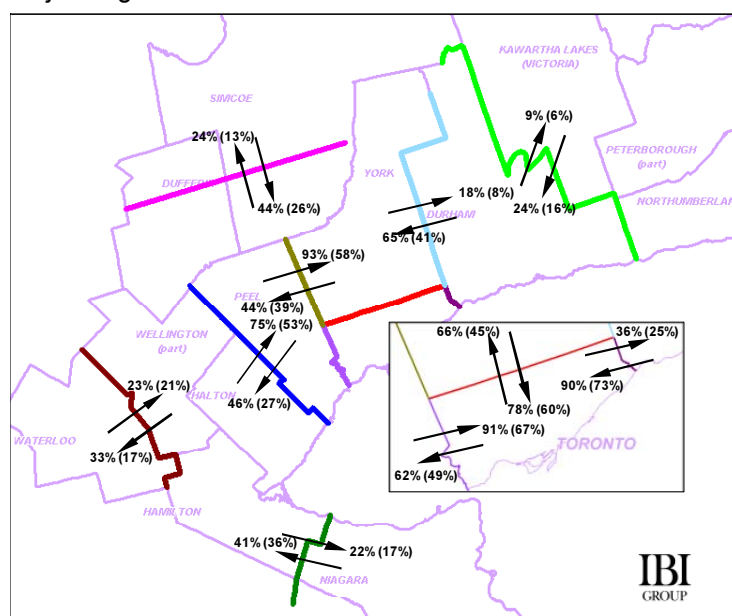
Exhibit E.11: A.M. Peak period Trips by Mode and Area of Origin



Transportation Demand/Supply Balance: The percentage increase in the municipal transit fleet is projected to keep pace with population growth. Average service levels will decline, however, as transit service coverage is extended into new urban areas which tend to have lower densities and less mixed-use development than established areas and are more difficult to serve cost-effectively with transit. GO Rail is currently operating at 110% of capacity and there is a latent demand which it cannot meet owing to capacity restrictions at Union Station and other parts of the rail network, resulting from budget limitations. By 2031, the much larger GO Rail ridership will continue to fully use the available capacity of the

expanded system. Daily vehicle-km of automobile travel are estimated to grow by approximately 64% between 2000 and 2031. This will significantly outpace the increase in transportation capacity that can be expected under the BAU scenario, which is projected to produce a 30% increase in highway lane-km, a 6% increase in arterial road lane-km, and an overall increase of 9% for highways plus arterial roads. As illustrated in Exhibit E.12, the ratios of road traffic volume versus road capacity crossing key screenlines will grow substantially, particularly in the inner study area.

Exhibit E.12: 2000 and 2031 A.M. Peak period Volume/Capacity Ratios across Major Regional Screenlines



LEGEND: () = 2000 Ratios

- **Congestion Levels:** As a result, substantial increases in traffic congestion (defined as a volume/capacity ratio of 80% or greater) are projected under the BAU scenario. By 2031 it is projected that arterial roads in the inner study area will experience congestion on 51% of the lane-km (up from 30% in 2000) and on 67% of highway lane-km (up from 48% in 2000). In the outer study area, 21% of the arterial road and 24% of the highway lane-km will be congested (up from 8% and 5% in 2000, respectively).
- **Transportation Capital Costs:** Estimated public-sector capital costs for transportation infrastructure associated with the BAU scenario are about \$44 billion to 2031 (an average of about \$1.4 billion per year), of which about 71% applies to the inner study area and the remaining 29% to the outer study area. This reflects a continuation of recent capital expenditure levels, which have been in the range of \$1.0 – 1.5 billion during the 1993 – 2000 period. About 57% of the projected investments in the inner study area are for highways and arterial roads, and the remaining 43% are for municipal transit, rapid transit and GO Rail. By contrast, almost 98% of the outer study area investments are projected for highways and arterial roads, with the remaining 2% on municipal transit. All costs are expressed in 2000 dollars. About one-quarter of projected transportation capital costs are for expansion and three-quarters for system rehabilitation and renewal over the 31-year study period. The rehabilitation and renewal costs are not unique to the BAU scenario and will be required under any scenario in order to maintain the transportation system in a state of good repair. Under the projected continuation of current policies, most of the rehabilitation and renewal investment will be funded by municipalities from property taxes, with periodic one-time contributions from the provincial and federal governments. System expansion costs will be funded partly by development charges and partly by governments.³
- **Transportation Operating Costs:** By 2031 operating and maintenance costs experienced by transportation providers (transit costs net of fare revenues) will total some \$850 million per year, of which about 72% will be experienced in the inner study area and the remaining 28% in the outer study area. In contrast, the annual operating costs for auto drivers in 2031 are projected at about \$7.5 billion, of which 78% applies to the inner study area and 22% to the outer study area. While the transportation provider expenditures represent a continuation of past trends, transportation **users** will experience a very substantial increase in annual operating costs (up 63% from year 2000 levels), reflecting the increased congestion levels and increased travel effort projected for those travelling by automobile. Increasing gridlock for auto travellers will also translate into substantially increased delays and costs for goods movement by truck, although these are not included in the present study.

³ Development charges cover 100% of growth-related capital costs of regional roads, 90% of the cost of growth-related capital transit equipment (e.g., vehicles and shelters) and (at present) one-third of 90% of growth-related capital expenditures for GO Transit infrastructure.

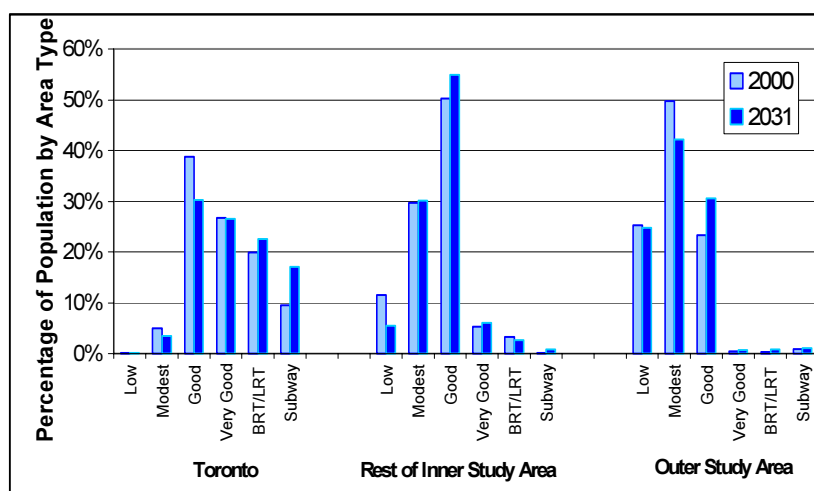
- **Energy Consumption and Vehicular Emissions:** Under the BAU scenario there is a mixed result in terms of future trends in energy consumption and vehicular emissions from transportation operations. These projections are affected by the increase in vehicle-km of travel (estimated at 64% between 2000 and 2031) and reductions in fuel consumption and vehicular emissions per vehicle-km as a result of technological improvements. For example, it is estimated that there will be a 15% improvement in fuel efficiency over the study period and a slightly larger reduction in the emissions rate per vehicle-km of greenhouse gases (primarily carbon dioxide [CO₂]), which are implicated in global climate change. Fuel consumption and CO₂ emissions are closely related, since CO₂ results from the combustion of carbon, which is a major constituent of most existing fuels. Taking into account these factors and interactions results in an estimated increase of about 2 billion litres annually in automobile fuel consumption between 2000 and 2031, an increase of 44%. The emissions of greenhouse gases are projected to increase by 42% over the same period. In contrast, technological improvements are projected to decrease the emissions rates (grams per vehicle-km) for other major contaminants: an 82% reduction for nitrogen oxides (NO_x), a 75% reduction for volatile organic compounds (VOCs) and a 70% reduction for carbon monoxide (CO). When combined with the projections of increased vehicle-km and decreased travel speeds, the overall emissions of these three contaminants are expected to decrease under the BAU scenario by significant amounts: a 68% reduction of NO_x, a 49% reduction for VOCs and a 35% reduction for CO. Since NO_x and VOCs are the precursors of urban smog, which is implicated in a significant increase during the past decade in respiratory ailments, this is an encouraging trend. In contrast, however, the World Health Organization has stated that emissions of nitrogen oxides and VOCs need to be reduced by 90% to minimize impacts on human health and eco-toxicity.
- **Travel Effort:** Average a.m. peak period automobile trip distances are projected to increase by 9%, from about 15.7 km to 16.9 km. Work trip distances will show a smaller increase of 6%, from 17.9 to 18.5 km, reflecting improvements in the job/worker balance within individual municipalities. The average a.m. peak period trip distance by transit will increase from 11.0 to 12.1 km for the overall study area. The average GO Rail trip length, currently about 32 km, will remain essentially unchanged under the BAU scenario, which assumes more trains operating on the existing network. Average automobile travel times for the study area will increase by 44%, from approximately 15 to 22 minutes. This is primarily due to increased congestion. Average travel speeds during peak periods under the BAU scenario are forecast to decrease by 25%, from an average of 61 km/h to 45 km/hr.
- **Transit Viability:** As noted in a number of reports, density is a key determinant of the viability of transit.⁴ In order to understand how transit viability would change under the BAU scenario, each traffic zone was categorized according to transit

⁴ Transit-Supportive Land Use Planning Guidelines, Ministry of Municipal Affairs and Ministry of Transportation, Ontario, April 1992.

potential based on development density measured in terms of people plus jobs per hectare. Generally, transit potential, as measured by this density variable, decreases with distance from the downtown core of Toronto or from other urban centres in the study area, as shown in Exhibits 3.31 and 3.32 in the main report.

Using these maps of transit potential, a weighted average of the percentage of the population in each category can be calculated. The results are shown in Exhibit E.13. In general, under the BAU scenario, there will be little or no gain in the percentage of population living in areas that are viable for high-order transit based solely on the

Exhibit E.13: Population by Transit Potential Area



criterion of development density.

There will, however, be marginal gains in areas suitable for bus service, which could include priority transit on some routes, as noted earlier. Service in such areas could also include high-order transit routes with appropriate feeder/distributor connections. GO Rail with park-and-ride access is an example. As discussed in Chapter 2 of the main report, the viability of transit in these areas (in terms of both ridership and cost-efficiency) can be increased by a more transit-supportive urban structure, for example, greater emphasis on

compact, mixed-use subcentres and corridors which can be effectively served and shaped by improved trunk and local transit services. This would have the important related effect of reducing the required subsidy per passenger carried.

KEY IMPLICATIONS

Summarized below are major transportation implications of the Business-As-Usual scenario, including some implications for individual residents and travellers in the study area:

- About 66 % of the 2000 – 2031 population growth and 73% of the employment growth under the BAU scenario is projected to occur in the inner study area, excluding the City of Toronto. Reflecting a continuation of relatively low transit service levels under the BAU scenario, residents of this area will depend heavily on automobile travel, as will those living in the outer study area. Auto ownership in the study area is projected to increase by about 1.9 million vehicles to 2031.
- A public-sector capital investment of about \$44 billion, or \$1.4 billion per year, is projected for transportation, drawing on a combination of government expenditures

and development charges. Of this, about one-quarter is for system expansion; the remaining three-quarters is for system rehabilitation/renewal and will be required regardless of alternative urban structure/infrastructure policies in order to keep the transportation system in a state of good repair. This overall level of capital investment by government in the transportation system represents a continuation of average investment levels during the past decade.

- Notwithstanding this investment, hours of delay experienced by auto drivers on a typical weekday are projected to increase from about 300,000 hours per day to about 1.2 million. At a conservative value of drivers' time of \$10 per hour, the total cost of delay to auto drivers in 2031 would be \$12 million per day or \$3.8 billion per year, the latter up from about \$1 billion in 2000.
- The average commuting time spent each month in 2031 by a household located in the north central GTA with two workers, each driving to work, is estimated to be about 38.5 hours in 2031, up from 30.8 hours in 2000, a 25% increase.
- The average monthly auto operating cost of commuting for a similar household in 2031 is estimated to be \$195, up from \$144 in 2000, an increase of \$51 per month or over \$600/year in constant dollars, up by 35% from year 2000 costs. If vehicle ownership costs are included, monthly vehicle ownership and operating costs for both vehicles would total \$1,303 in 2031, an increase of 4.1% from \$1,252 in 2000.
- The lack of attractive transit service for most households in suburban areas deprives them of a travel mode choice which might otherwise save the cost of purchasing and operating an additional automobile if, for example, one of the breadwinners could commute by transit.
- A through trip passes through a municipality and uses its transportation infrastructure, thereby placing a non-beneficial burden on the municipality. Considering through trips at the scale of upper-tier municipalities, in 2000 there were approximately 144,000 a.m. peak period through trips or 5.3% of all study area trips. By 2031, UTM through trips are estimated to increase by 85% to 266,000 trips. Peel Region presently has the highest number of through trips at just over 50,000 trips in 2000, growing to about 82,000 by 2031. As discussed in the main report (Section 3.6.3) the implications of through traffic for the "host" municipality depend on whether such trips can be accommodated on trunk transportation facilities (e.g., expressways, GO Rail) and whether there is sufficient capacity on those facilities to accommodate both through and locally generated traffic.
- As traffic volumes increase, the costs associated with traffic accidents can also be expected to increase; for example, the cost of traffic accidents in the study area, estimated at some \$3.8 billion in 2000, is projected to increase to \$6.3 billion per year by 2031, an absolute increase of \$2.5 billion or approximately \$75 per capita.

- Emissions of greenhouse gases (implicated in global climate change) are estimated to increase by some 42% between 2000 and 2031 under the BAU scenario. In contrast, vehicular emissions of other major contaminants are projected to decrease significantly, as improved vehicular technology more than compensates for increased vehicle-km of travel: emissions of nitrogen oxides are projected to decrease by 68%, volatile organic compounds by 49%, and carbon monoxide by 35%. Since the former two contaminants are the precursors of urban smog, which is implicated in significant increases in respiratory ailments, this is a promising trend, although the World Health Organization has stated that considerably greater reductions are required to minimize impacts on human health.

Under subsequent phases of the Futures Study, Neptis plans to explore the extent to which alternative land use and transportation scenarios may hold the promise of improved transportation system performance and cost.

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E.4 WATER/WASTEWATER

Chapter 4 of the report, prepared by Dillon Consulting Limited, describes water and wastewater systems which will be required to serve the Business-As-Usual scenario, and the costs and other implications of such systems. Owing to differences in the level of urbanization, scale of water/wastewater systems and other factors between the inner and outer study areas, these are described separately in the chapter and in this Executive Summary.

PAST SYSTEM DEVELOPMENT

Inner Study Area

In the GTA and Hamilton, the development of water and wastewater infrastructure goes back decades.

While much of the focus has been on growth-related infrastructure, the older parts of the water/wastewater systems in the inner study area are now facing critical renewal challenges. As an example, much of the City of Toronto's system is over fifty years old and in need of rehabilitation. Increased public concerns regarding water quality are leading to new regulations requiring municipalities to upgrade their water treatment plants. As well, there is pressure to upgrade wastewater plants to improve effluent quality and Toronto is undertaking a Wet Weather Flow Master Plan to address combined sewer overflows and the need for storm water quality improvement to clean up polluted rivers and beaches.

The challenges facing Toronto region's water/wastewater infrastructure today may be somewhat different from those of the past fifty years, but are no less important; it is critical that the systems be upgraded, older infrastructure renewed, and growth accommodated.

Outer Study Area

The urban centres of the outer study area face water/wastewater infrastructure challenges similar to those in the inner study area (i.e., infrastructure renewal, system upgrades and new infrastructure to accommodate growth), but to a lesser extent. Generally, the systems are newer and many upgrades have been undertaken because of the sensitive nature of the sources of water supply and the receiving bodies for wastewater effluent. These activities are likely to be reinforced as a result of the events in Walkerton and recommendations of the subsequent inquiry.

Most of the urban centres in the outer study area do not have large lake-based systems like the inner study area, with the exception of the Region of Niagara and southern Northumberland County (Cobourg, Port Hope). Many of them rely (or mostly rely) on groundwater for their water supply, e.g., Barrie, Guelph and Kitchener/Waterloo/Cambridge (Tri-Cities). Many of the urban centres discharge their treated wastewater

effluent to smaller, more sensitive receiving bodies compared to Lake Ontario, e.g., Peterborough to the Otonabee River, Barrie to Lake Simcoe, Guelph to the Speed River, and the Tri-Cities to the Grand River. As a result, they have had to apply a higher level of wastewater treatment compared to cities with large lake-based systems.

MAJOR INFLUENCING FACTORS

Inner Study Area

The discussion of the inner study area in Section 4.1 identifies the following major factors that have influenced development of water/wastewater infrastructure.

- **Governance Structure:** the creation of regional governments, first Metro Toronto and subsequently the surrounding Regions, was a major factor in infrastructure development, providing the broad geographic scale, expertise and financial resources necessary for an integrated and effective infrastructure development program.
- **Provincial Funding:** the creation of the Ontario Water Resources Commission (OWRC) made available provincial resources to front-end finance the large lake-based schemes in South Peel and York-Durham. In addition to the write-off of millions in capital for the York-Durham Sewer System, there were also significant provincial subsidies for the scheme.
- **Developer Funding:** in the initial development of the Metro system, developers partially funded the trunk systems; for development in the surrounding regions, developers primarily paid for the local systems. More recently, developers have paid for virtually all growth-related infrastructure.
- **Inter-Municipal Servicing Agreements:** examples of these include the water supply agreements between York Region and Peel Region/City of Toronto and the wastewater agreements between York Region and Peel Region/Durham Region.
- **Environmental Regulation:** regulations affect water and wastewater treatment requirements.
- **Aging infrastructure:** large investments are required to restore older infrastructure to current standards.

Outer Study Area

The discussion of the outer study area in Section 4.2 identifies the following major factors that have influenced development of water/wastewater infrastructure.

- **Reliance on Groundwater:** because of the limitations on quantity, and concerns with quality, there has been more investment in demand management and source protection.
- **Sensitive Receiving Bodies:** because of the smaller and more sensitive receiving bodies, these municipalities have built wastewater treatment plants with higher levels of treatment than those of cities with large lake-based systems.
- **Inter-Municipal Servicing Agreements:** examples of these include the water supply agreement between Collingwood and New Tecumseth. Further consolidation of municipal systems is expected among smaller communities to achieve more favourable economies of scale with respect to facilities, operations and management capacity.
- **Environmental Regulation:** regulations affect water and wastewater treatment requirements.
- **Aging infrastructure:** large investments are required to restore older infrastructure to current standards.

OUTLOOK TO 2031

Inner Study Area

For the Business-As-Usual scenario, water/wastewater system requirements were prepared for the inner and outer study areas. The existing system and the required system by 2031 are illustrated in Exhibits E.14 and E.15, respectively, and discussed in Sections 4.6 and 4.7 of the report. Growth related system expansion was based on the population, employment and urban development patterns projected by the study team. Cost estimates were provided in three components:

1. **System Renewal Costs:** costs for upkeep of existing infrastructure through rehabilitation and replacement.
2. **System Upgrade Costs:** costs to improve water quality, including upgrades to existing treatment plants, and to address existing combined sewer overflows and existing stormwater discharges to receiving bodies.
3. **Growth-Related Costs:** costs of new infrastructure to service development growth for the 10-year, 20-year and 30-year horizons.

The needs for plant capacity expansions contained in regional and municipal Master Plans were checked against Ministry of Environment per capita water consumption and sewage generation rates of 750 L per capita per day (Lpcd) and 450 L per capita per day, respectively, multiplied by the projected population in each municipality. No significant deviations were noted with the exception of the Region of York, which was experiencing higher growth rates than that forecast in its Master Plan for water and wastewater.

Exhibit E.14: Water/Wastewater System: Year 2000

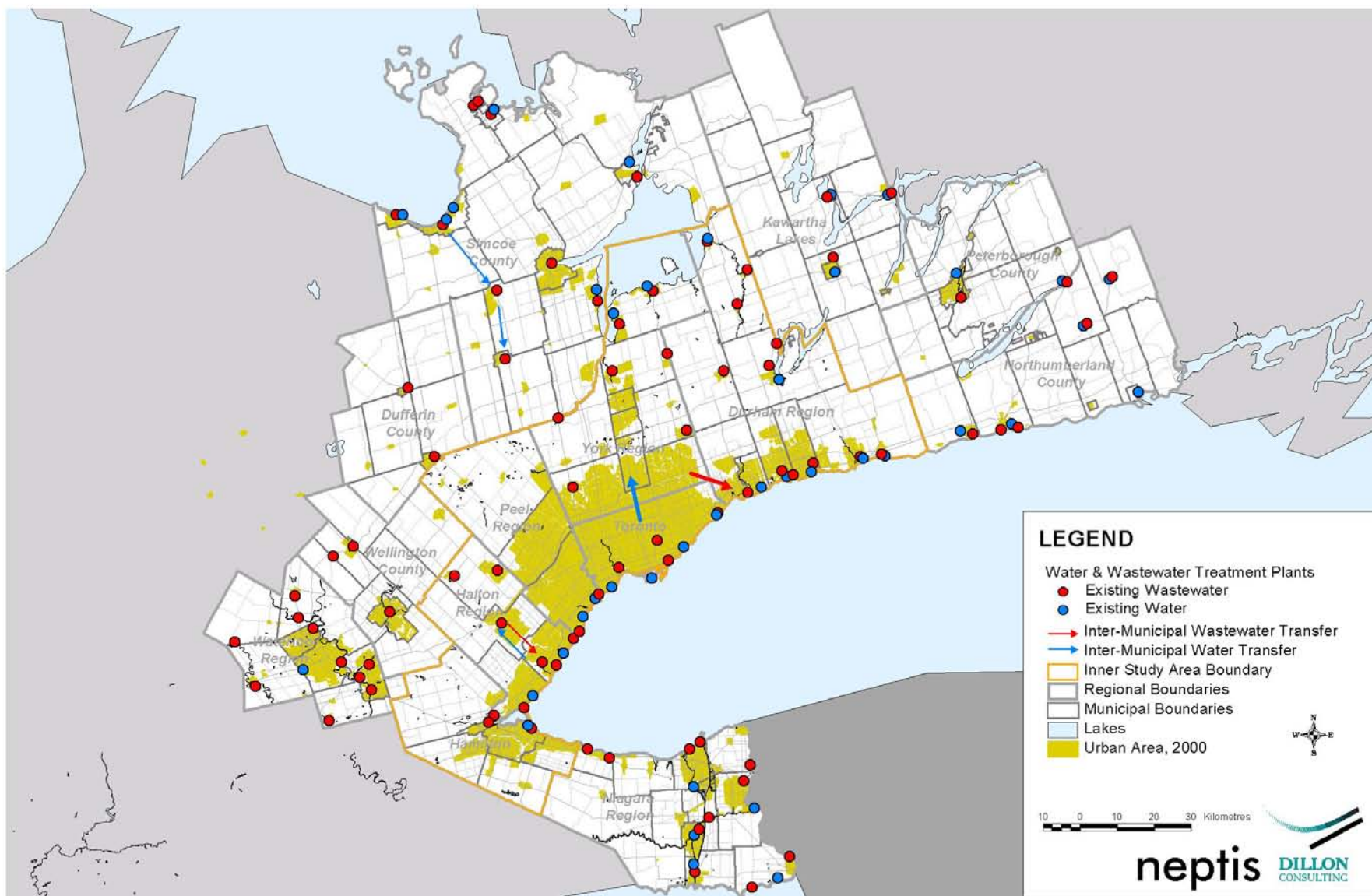
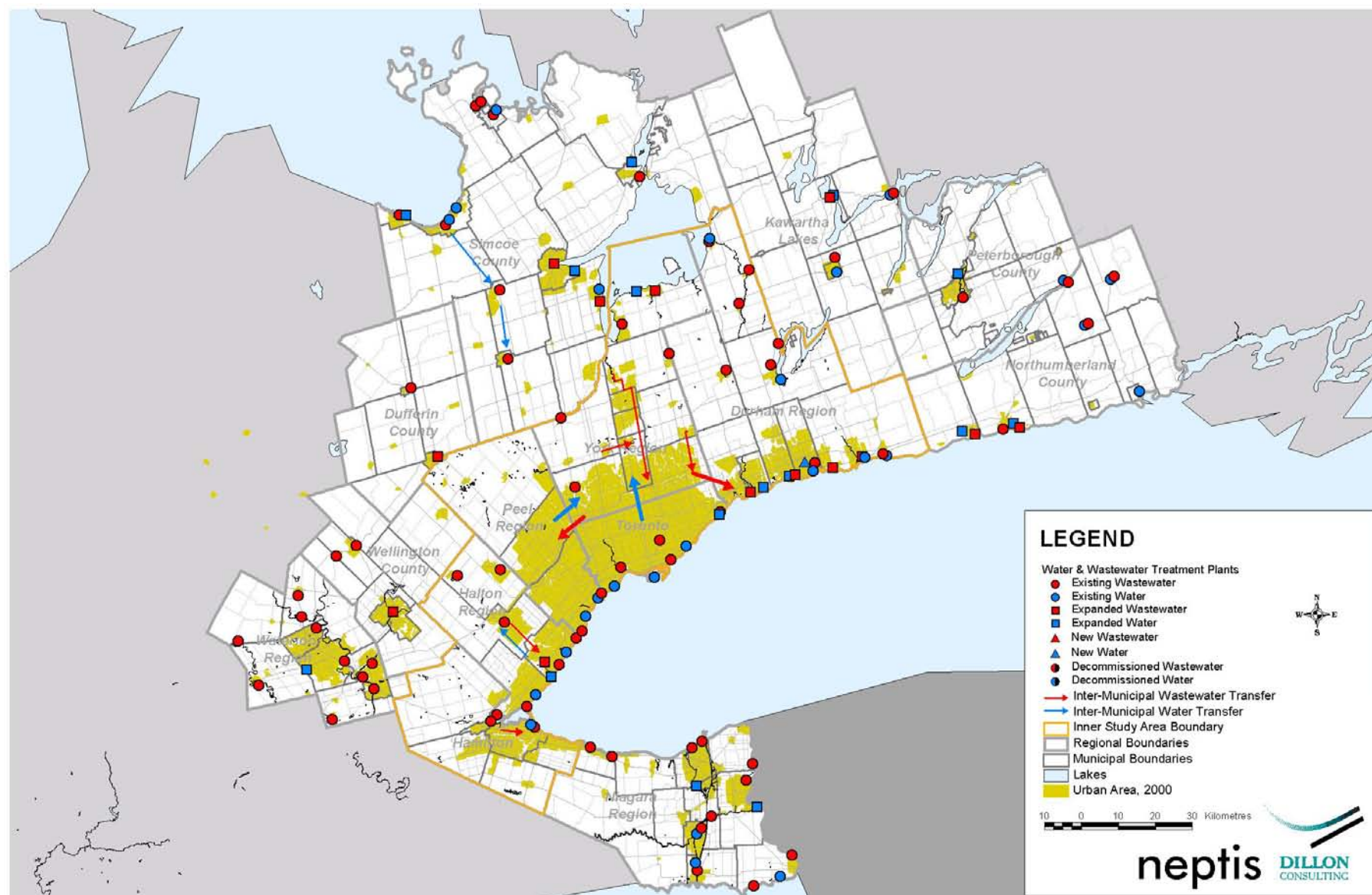


Exhibit E.15: Water/Wastewater System: Year 2031



Additional plant expansion has been included for the Region of York to address this shortfall.

The three water/wastewater system cost estimates for the inner study area are summarized in Exhibit E.16.

Exhibit E.16: Water/Wastewater Cost Summary for the Inner Study Area

	Cost Estimates (\$millions)			
Horizon Year	2011	2021	2031	Cumulative Total (30 years)
System Renewal	5,800	5,800	5,800	17,400
System Upgrades	860	7,90	2,290	3,940
Growth Related	2,280	1,350	1,610	5,240
Total Costs	\$8,940	\$7,940	\$9,700	\$26,580

The cumulative cost for the inner study area is \$26.6B, or almost \$1B per year.

Outer Study Area

The per capita generation rates for water demand used in forecasts for the outer study area are lower than those for the inner study area, reflecting a greater reliance on groundwater in the former. Typically, groundwater systems have lower per capita water demands and lower peak factors (e.g., Waterloo, Guelph and Barrie). Water demand was projected based on approximately 670 Lpcd. The wastewater generation rate was projected based on 430 Lpcd; this was not significantly reduced from the Ministry of the Environment value of 450 Lpcd in order to account for infiltration and inflow, which is often a large component of sewage flows and is difficult to effectively reduce. As in the inner study area, water efficiency has not been specifically addressed in the preparation of these estimates, apart from the reductions noted above.

The three water/wastewater system cost estimates are summarized for the outer study area in Exhibit E.17.

Exhibit E.17: Water/Wastewater Cost Summary for the Outer Study Area

	Cost Estimates (\$millions)			
Horizon Year	2011	2021	2031	Cumulative Total (30 years)
System Renewal	1,700	1,700	1,700	5,100
System Upgrades	150	220	190	560
Growth Related	450	450	495	1,395
Total Costs	\$2,300	\$2,370	\$2,385	\$7,055

The cumulative cost for the outer study area is \$7.1B, or almost \$250M per year.

The total water/wastewater costs for the inner and outer study areas are summarized in Exhibit E.18.

Exhibit E.18: Water/Wastewater Cost Summary for Total Study Area

	Cost Estimates (\$millions)			
Horizon Year	2011	2021	2031	Cumulative Total (30 years)
Inner Study Area	8,940	7,940	9,700	26,580
Outer Study Area	2,300	2,370	2,385	7,055
Total Costs	\$11,240	\$10,310	\$12,085	\$33,635

The cumulative cost for the total study area is \$33.6B, greater than \$1B per year.

KEY IMPLICATIONS

This analysis of BAU water/wastewater investment requirements over the 30-year period has several key implications:

- The investments are significant at \$11.2B in the first decade, \$10.3B in the second and \$12.1B in the third; this translates to \$1,320, \$1,080 and \$1,150 per capita in the first, second and third decades, respectively.⁵ **Approximately 80% of the costs are for system renewal and upgrades, and these costs are not unique to the BAU development scenario.** As well, when considering growth-related costs (20% of the total cost), the cost of plant expansions will be common to all development scenarios; therefore, only a relatively small portion of the above total costs will vary by development scenario, i.e., the pipes. These typically account for about 50% of growth-related capital costs.
- In general, investments in the system will become increasingly weighted towards renewing existing infrastructure and upgrading treatment; financing for those types of expenditures will require both higher user fees and related senior government leadership (e.g., the Sustainable Water and Sewage Systems Act and relevant regulations) in order to succeed. Without financing, there would be a continuing and growing problem of deferred renewal and deferred upgrading of the water/wastewater system, leading to increased waste of water and potential reduction of water quality.
- Growth-related capital expenditures, while significant, are recovered from development charges programs.
- The drive to full cost recovery, higher levels of treatment, groundwater protection and more management expertise will likely spur system consolidation, particularly in the outer study area. The higher levels of treatment have been addressed in the

⁵ Based on the projected population at the end of the decade in each case.

above cost estimates under system upgrades. Again, this assumption is not unique to the BAU development scenario.

The investment will result in a greatly improved water/wastewater system, far more sustainable with adequate renewal expenditures, improved drinking water quality, reduced water consumption, improved water quality in receiving bodies through wet weather flow management and improved wastewater effluent quality, and greater water resource protection, especially for groundwater.

E.5 SUMMARY OF FINDINGS

Exhibit E.19 provides a summary of key findings showing anticipated trends estimated for the Business-As-Usual scenario. This provides an array of some of the more important measures selected from those discussed in the body of the report.

Many of the measures show very large growth during the study period to 2031. These include population (up 43%), employment (up 54%), urbanized area (up 45%), through trips (up 85%), daily trips by adults (up 53%), daily vehicle-km of auto travel (up 64%), a.m. peak period GO Rail ridership (up 58%), car ownership (up 50%), GO Rail peak period seat-km per capita (up 40%), average auto trip time in the a.m. peak (up 45%), a.m. peak period delay per auto trip (up 161%), carbon dioxide emissions (up 42%), fuel consumption (up 44%), GO Transit operating and maintenance costs (up 130%) and auto drivers' operating and maintenance costs (up 65%).

Other measures show a substantial downward trend, including a.m. peak period transit modal share for the total study area (down 11%), highway and arterial road lane-km per capita (down 24%), peak period average auto travel speeds (down 25%), nitrogen oxide emissions (down 68%), carbon monoxide emissions (down 35%) and volatile organic compounds emissions (down 49%). Other indicators show smaller degrees of change, either positive or negative.

At this interim stage in the study, the study team has identified the following issues in examining the BAU scenario:

- a large growth in population, employment and related activities, which will result in a significant increase in the urbanized area and related impacts on the uses of rural land including agricultural land;
- the proliferation of relatively low-density, single-use areas on newly urbanized lands which are difficult to serve cost-effectively by transit, walking or cycling and require automobile use;
- major increases in automobile travel, with reductions in municipal transit ridership and in modal choice available to travellers;
- increases in commuting and other travel times and costs due to increasing travel distances and congestion, thus affecting the region's economic competitiveness as goods movement times and costs also increase due to automobile congestion;
- continuing reliance primarily on limited local governmental funding sources and development charges for capital funding of transportation and water/wastewater infrastructure – estimated to total some \$77 billion over the period to 2031 – of which about three-quarters (some \$59 billion) is required for system rehabilitation, renewal and upgrading, and the remainder (some \$18 billion) for growth-related investments. While the latter is driven primarily by overall growth in population

Exhibit E.19: Key Measures for the Business-As-Usual Scenario

INDICATORS	2000	2031	Absolute Change	Percent Change
LAND USE				
Population (millions)	7.4	10.5	3.2	43%
Employment (millions)	3.5	5.4	1.9	54%
Activity Rate (employment/population)	0.48	0.52	-	8%
Urbanized Area (thousands of acres)	586	850	264	45%
Gross Density (pop+emp/ acre of urbanized area)	18.6	18.8	-	1%
Through Trips (passing through Upper Tier Municipalities)	144,000	266,000	122,000	85%
TRANSPORTATION				
Transportation Demand				
Adult Daily Trips (millions)	14.07	21.47	7.4	53%
Daily Trips/Adult	2.48	2.65	-	7%
Daily Vehicle-km of Auto Travel (millions)	157	258	101	64%
A.M. Peak Period Transit Modal Share (of motorized trips)				
Toronto	28%	29%	-	4%
Total Study Area	13%	11%	-	-11%
GO Rail	1.5%	2.3%	-	58%
Transportation Supply				
Car Ownership (millions of passenger vehicles)	3.72	5.60	1.9	50%
Car Ownership per 1000 capita	506	531	0%	5%
Arterial and Highway Lane-km	47,600	52,000	4,400	9%
Arterial and Highway Lane-km per 1000 capita	6.47	4.94	0%	-24%
A.M. Peak Period Transit Seat-km per capita				
Municipal Transit and GO Bus	1.34	1.25	-	-6%
GO Rail	1.02	1.43	-	40%
Transportation Performance				
A.M. Peak Period Average Auto Trip Length (km)	15.6	16.9	-	9%
A.M. Peak Period Average Auto Trip Time (min)	15.3	22.2	-	45%
A.M. Peak Period Average Auto Travel Speed (km/h)	61	46	-	-25%
A.M. Peak Period Delay per Auto Trip (min)	3.6	9.3	-	161%
A.M. Peak Period Transit Trip Length (excl. GO Rail) (km)	11.0	12.1	-	10%
Average Monthly Household Commuting Time (h)	30.8	38.5	7.7	25%
Average Monthly Household Commuting Costs (\$)	144	195	51	35%
Environmental Impact				
Annual Emissions and Fuel Use from Passenger Automobiles				
Nitrogen Oxides (kilotonnes of NO _x)	69.5	22.5	(47.0)	-68%
Carbon Monoxide (kilotonnes of CO)	437.2	283.1	(154.2)	-35%
Volatile Organic Compounds (kilotonnes of VOCs)	51.1	26.0	(25.1)	-49%
Carbon Dioxide (kilotonnes of CO ₂ equivalents)	10,870.9	15,455.5	4,584.6	42%
Fuel (billions of litres)	4.4	6.3	1.9	44%
Transportation Expenditures (2000 \$millions)				
Annual Operating and Maintenance Costs				
Roads and Highways	469	510	41	9%
Municipal Transit	193	249	56	29%
GO Rail	40 *	92	52	130%
Auto drivers	4,580	7,510	2,930	65%
EXPENDITURES (2000 \$millions)		Total Investment	Average/ Year	
TRANSPORTATION				
Capital and Rehabilitation Costs (2000 - 2031)				
Roads and Highways	30,000	970		
Municipal Transit	9,500	307		
GO Rail	4,300	141		
TOTAL	43,800	1,418		
WATER AND WASTE WATER				
System Investment Costs (2000-2031)				
System Renewal	22,500	723		
System Upgrades	4,500	144		
Growth-Related Expansion	6,600	212		
TOTAL	33,600	1,080.00		

* Note that this value is not the actual 2000 value, as the actual value for this year was found to be inconsistent with other recent values. The value presented here represents annual spending throughout the mid- to late-1990s.

and employment, it would also be subject to change if alternative urban structure and infrastructure policies were put in place rather than the BAU assumptions considered in this report.

These issues raise questions regarding the extent to which land consumption for urban development might be reduced by greater reliance on redevelopment in existing built-up areas and more compact, mixed-use subcentres and corridors in designated parts of developing areas. Related to this is the question of the extent to which auto-dependency may be reduced, the choice of alternative modes increased and transportation efficiency improved through such development strategies and patterns integrated with significantly improved transit in key corridors.

A key question in this regard is the extent to which alternative land use and infrastructure policies might effect such changes and the performance and cost implications of attempting to implement these policies.

For example, as noted earlier, the Business-As-Usual scenario is based on the assumption that government capital expenditures on transportation will continue in future at approximately the same levels as in the recent past. On the other hand, levels of capital investment for the water/wastewater system are assumed to be higher in future, reflecting heightened awareness of water quality issues in the wake of the Walkerton events, recommendations from the Walkerton Inquiry for system renewal and upgrading, and recent provincial legislation to achieve full-cost recovery, which would help fund these improvements. In theory, it would have been possible to assume capital investment increases in transportation as well, but the study team concluded that a continuation of existing funding arrangements and investment levels – in the absence of legislative changes or other initiatives signalling a more comprehensive approach to funding transportation in the study area – is more in keeping with the expectations under BAU. Clearly, either of these assumptions could be changed: higher levels of investment in transportation and/or lower levels of investment in water/wastewater could be assumed, and these would have implications in terms of the performance and cost of the infrastructure systems. The team has concluded that the assumptions and results presented in this report are in line with the premises of the BAU scenario and constitute a useful benchmark against which to consider possible alternative policy scenarios. It seems quite likely that any alternative scenarios considered will involve different levels of capital investment in infrastructure, among other differences from the BAU scenario.

The next stage of the study, as being considered by Neptis, would focus on defining two or three alternative development and infrastructure concepts and comparing them with the BAU concept in terms of the types of measures presented in this interim report. The intent will be to compare the implications of the alternatives in terms of land use characteristics and infrastructure performance and costs, using the BAU scenario as a benchmark. In the meantime, the findings of this report provide food for thought on these aspects of the urban region as it might be in 2031 based on a continuation of Business-As-Usual and continuing rapid growth.

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