

NIAGARA GO TRANSIT EXPANSION FEASIBILITY STUDY

Using a GIS approach to identify GO Transit route alternatives to service between the GTHA and Niagara region, and measuring their return-on-investment.





Project Overview

The primary issue that serves as the fundamental basis for carrying out this project is that the current public transit services between the GTHA and Niagara regions are inadequate. Currently, there are three existing options for those who wish to travel between the GTHA and Niagara Region: VIA Rail, GO Bus, and a Seasonal GO Train/Bus service. These services are not satisfactory and as a result, people tend to opt to drive their own vehicles leading to increasing traffic congestion along the QEW.

Our Goal

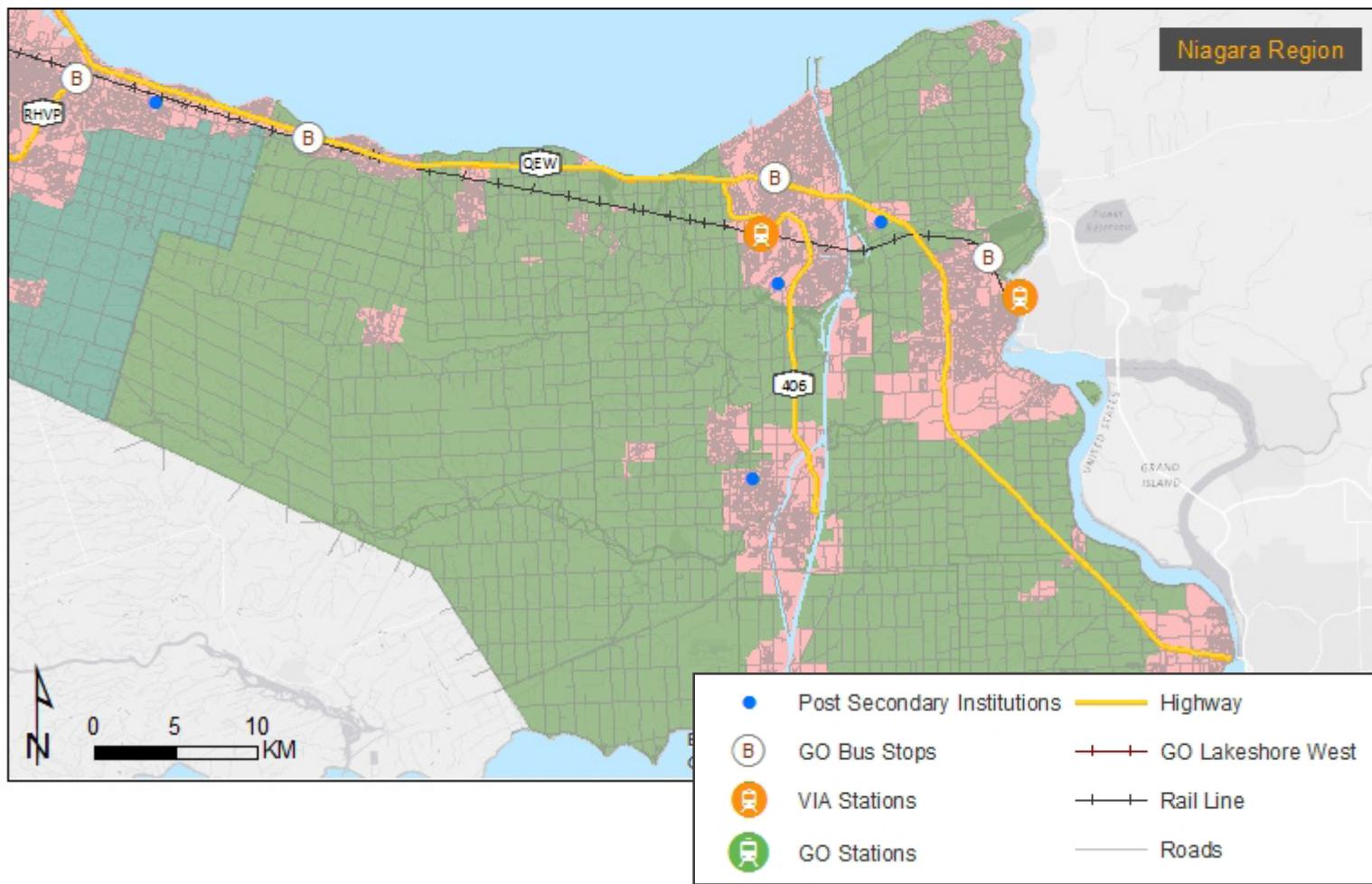
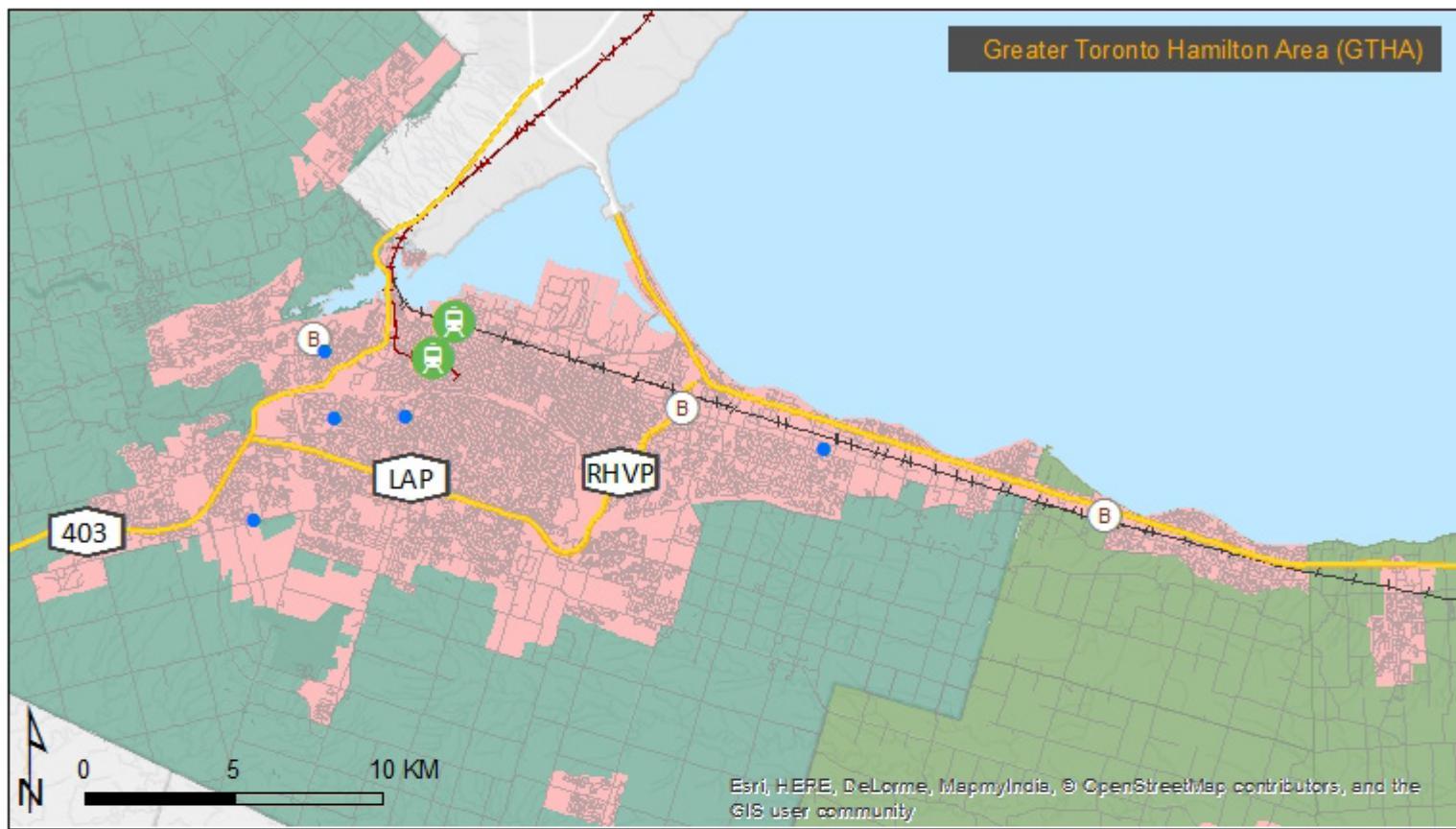
The goal of this project is to identify ridership potential within the GTHA and Niagara Region.

Our Objectives

- Identify and assess factors affecting ridership potential, and determine its potential within the GTHA and Niagara Region;
- Develop and apply a GIS-Based model to assess the factors affecting ridership potential within the GTHA and Niagara Region;
- Develop route options based on the GIS-Based model and conduct a cost-benefit analysis on the feasibility of those alternatives;
- Identify and evaluate the most cost-effective route option for the GTHA and Niagara Region;

GO TRANSIT EXPANSION TO NIAGARA

Core Urban Areas in GTHA & the Niagara Region



Project Assumptions

- No new railway tracks will be built;
- Existing tracks have been maintained and that there are no new additional cost for major repairs;
- Freight trains are not a factor in determining level of service;
- Service will not interfere with the schedule of the St. Lawrence Seaway at the Welland Canal;
- GO Transit will utilize/lease times on existing track infrastructure owned by CN Pacific Railway;
- Environmental Assessment has been completed and all associated costs are covered;
- Published annual/financial reports that are publically available are accurate in its statistical models;
- Project funding for expansion/extension has been approved by the Government of Ontario.

Methodology Approach

1

Assess Current Landscape

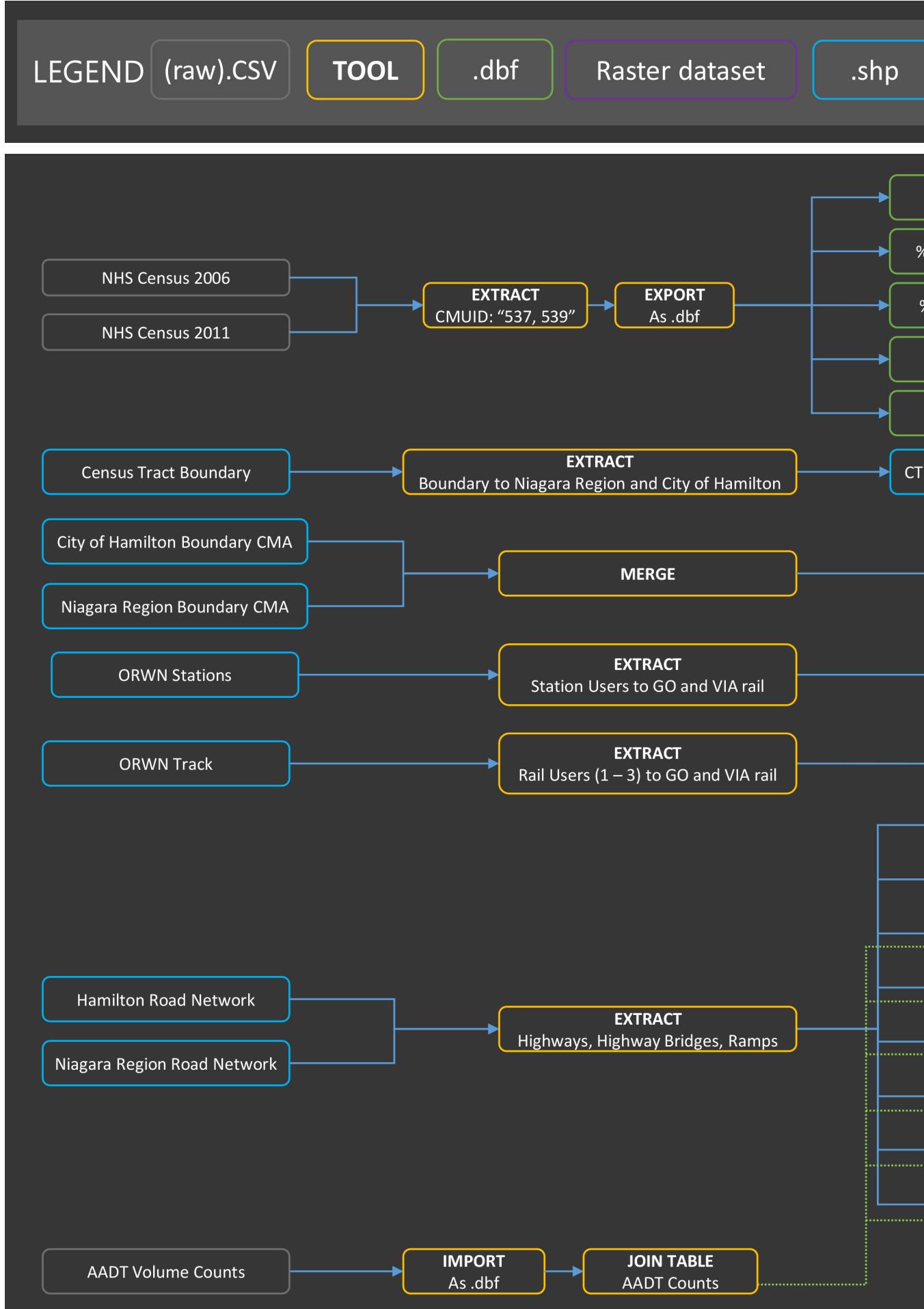
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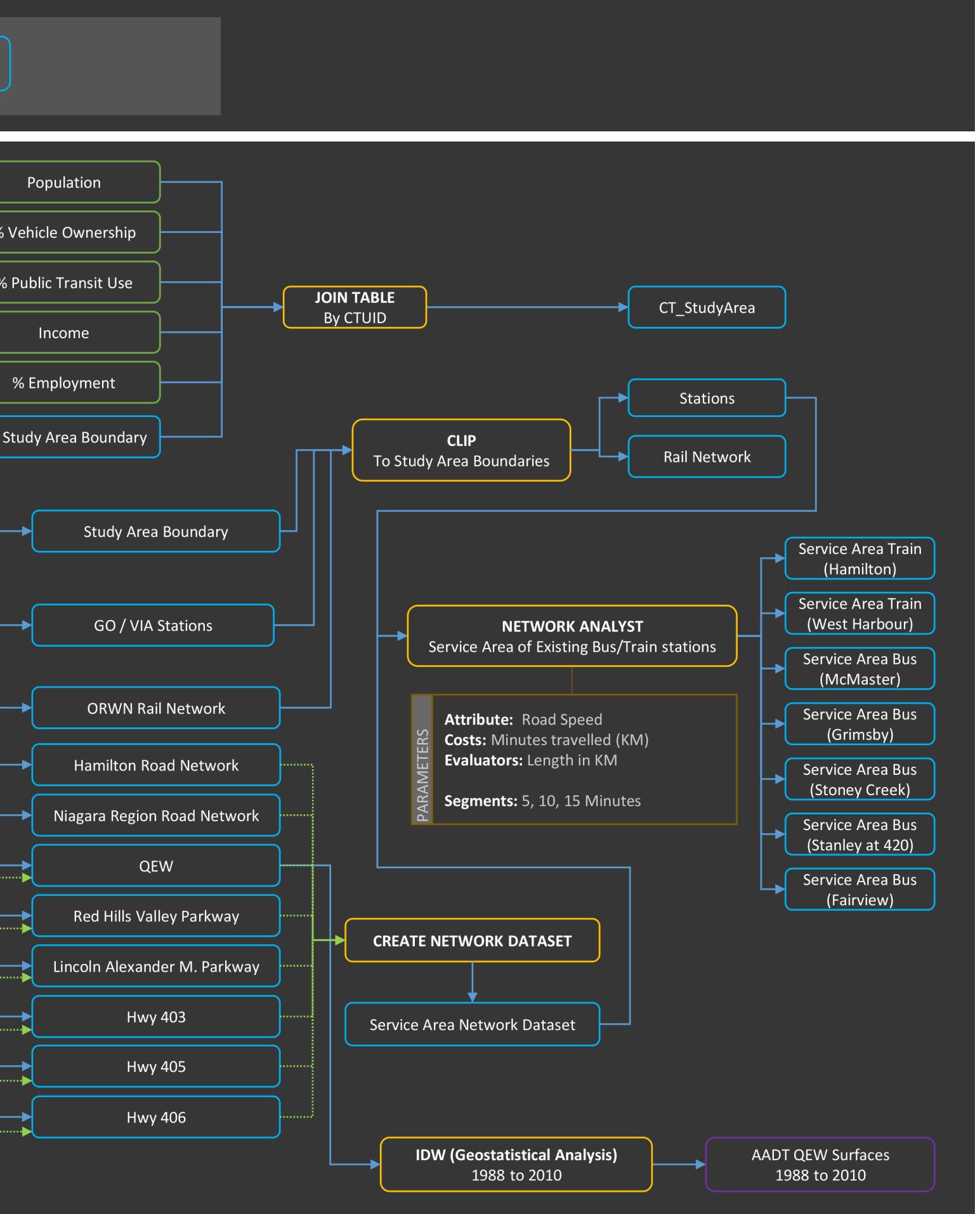
Assess Factors Affecting Ridership

3

Assess Ridership Potential

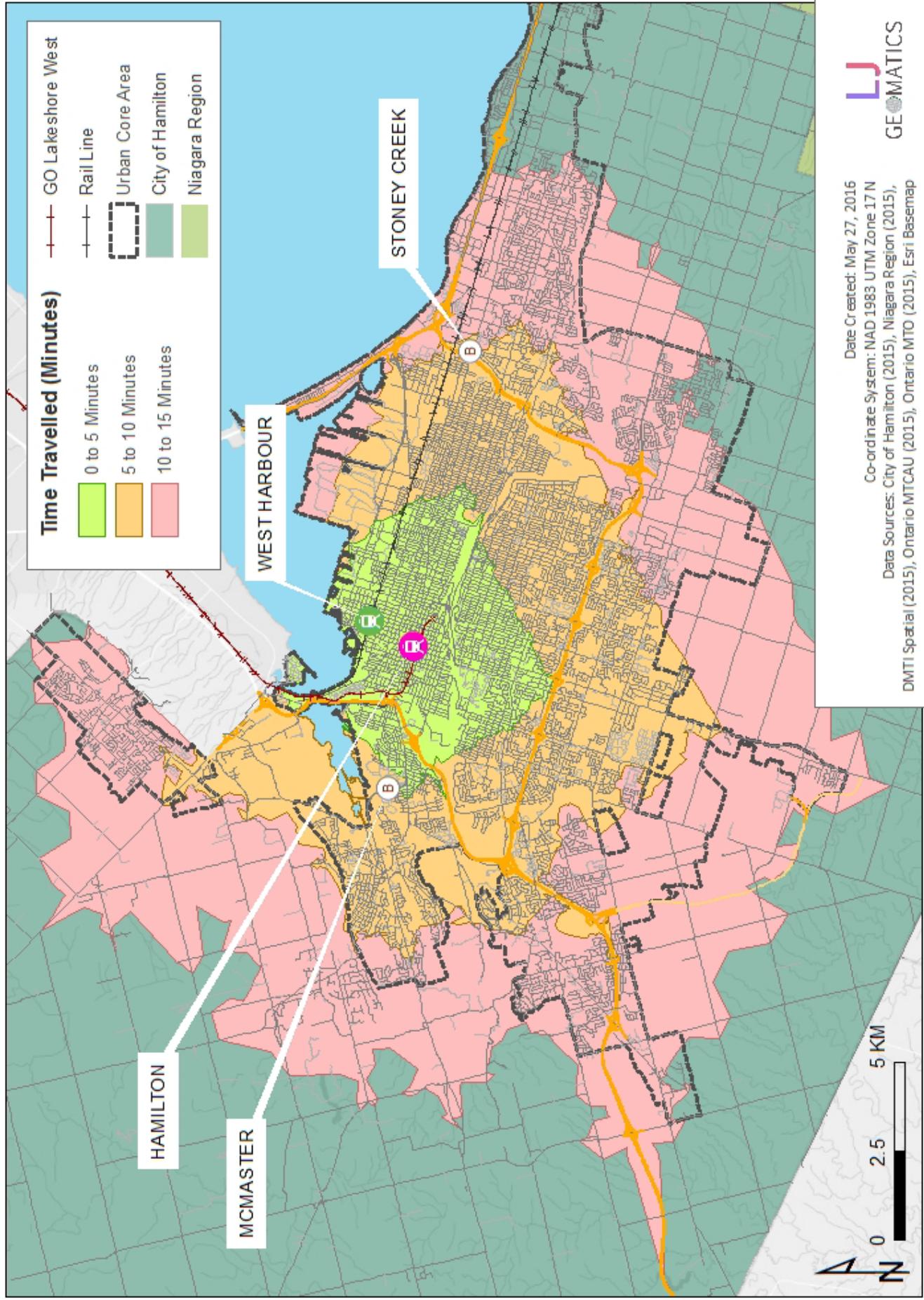
Depiction of GIS-Based Model Applied





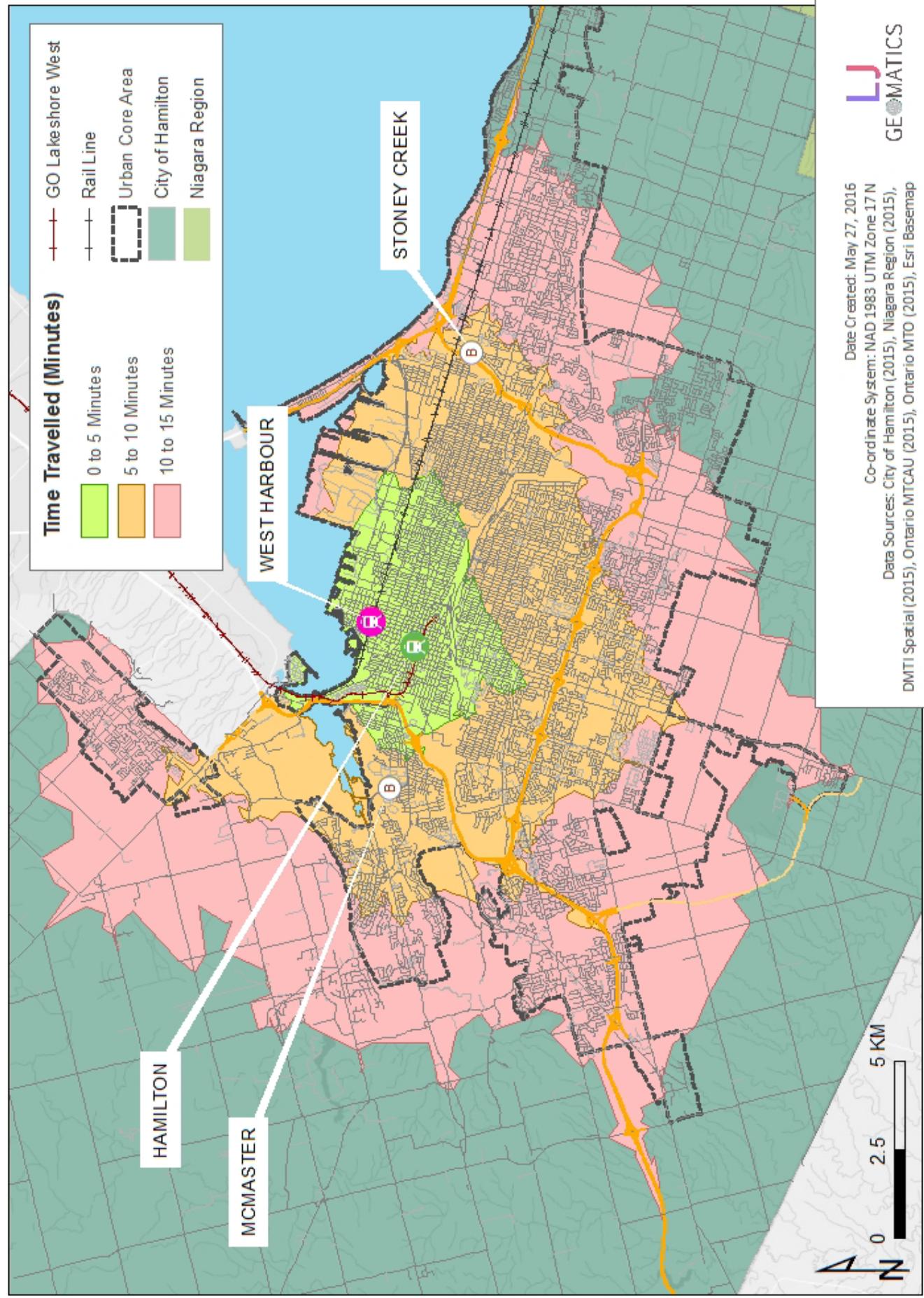
SERVICE AREA MAP 5, 10, 15 Minute Breaks

Hamilton Train Station (Hamilton, ON)



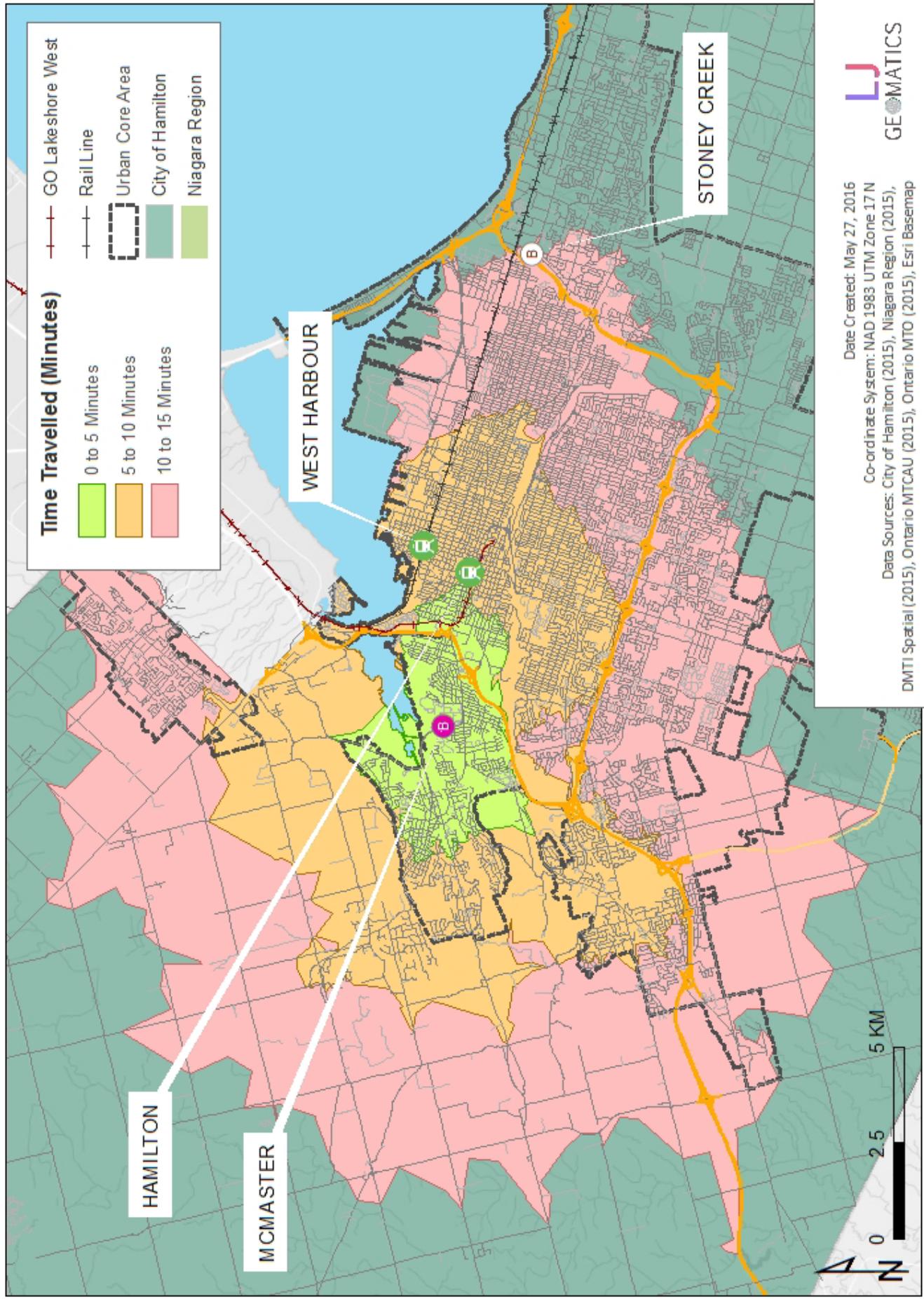
SERVICE AREA MAP West Harbour Train Station (Hamilton, ON)

5, 10, 15 Minute Breaks



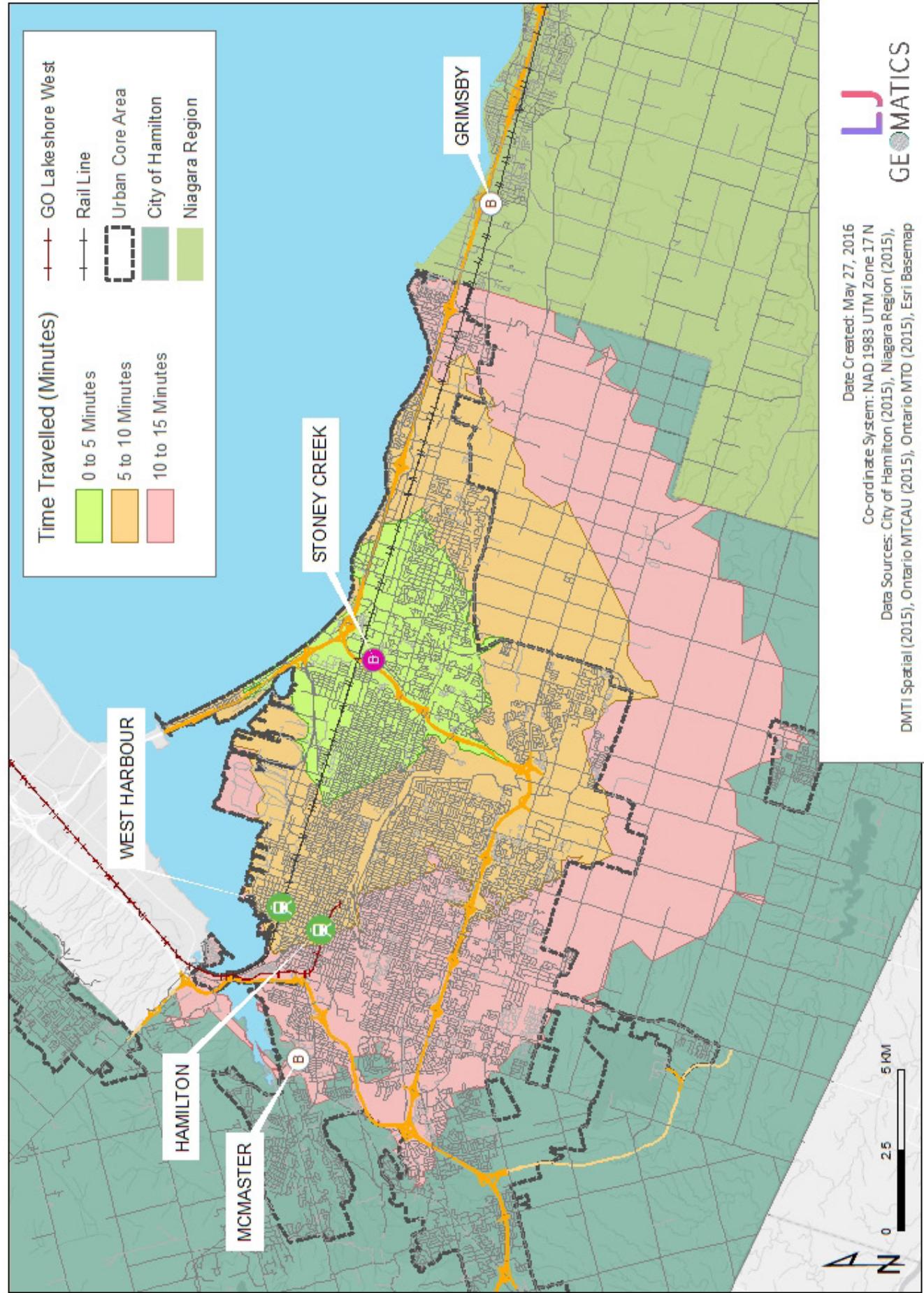
SERVICE AREA MAP 5, 10, 15 Minute Breaks

McMaster Bus Station (Hamilton, ON)



SERVICE AREA MAP 5, 10, 15 Minute Breaks

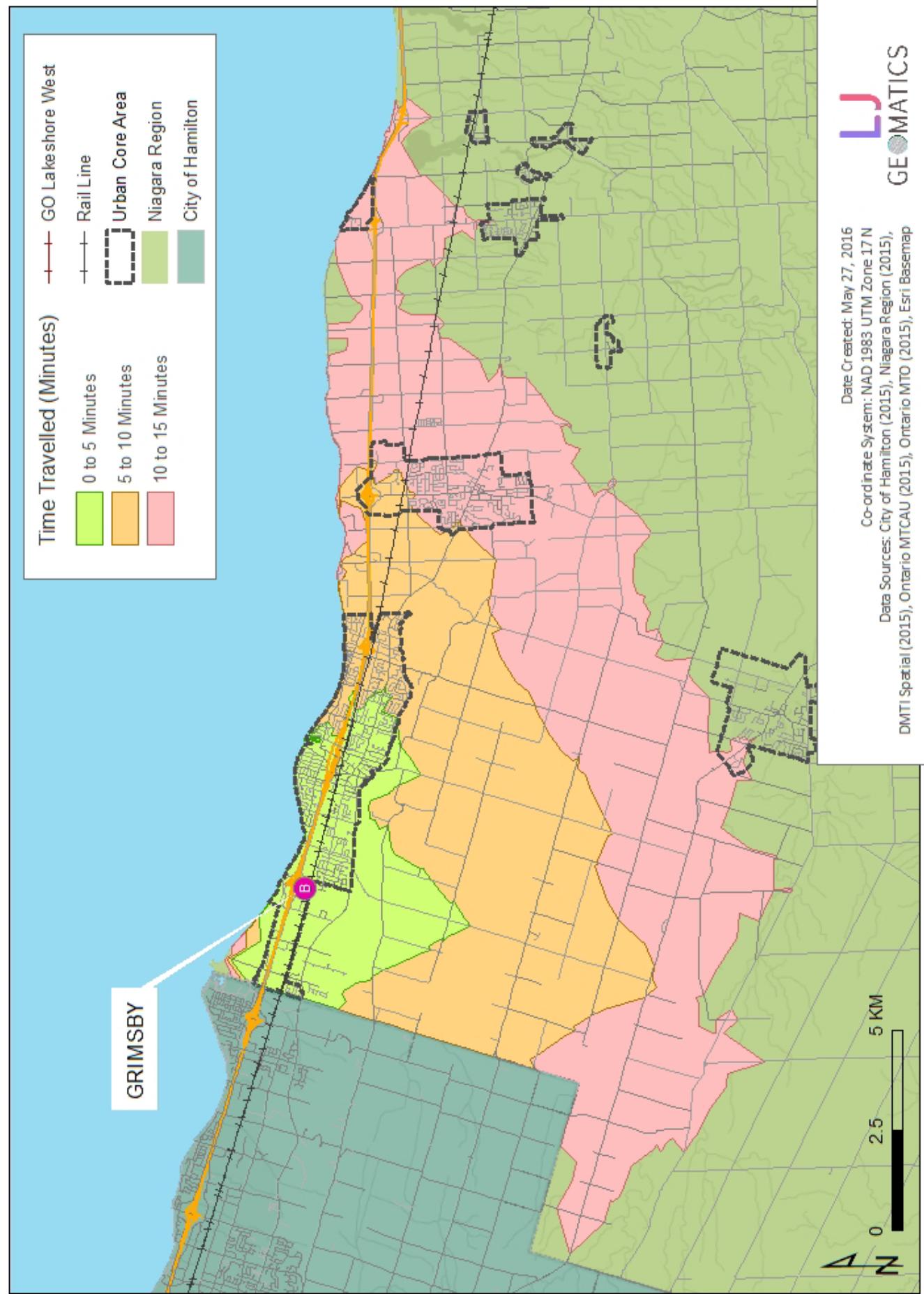
Stoney Creek Bus Station (Hamilton, ON)



SERVICE AREA MAP

Grimsby Bus Station (Grimsby, ON)

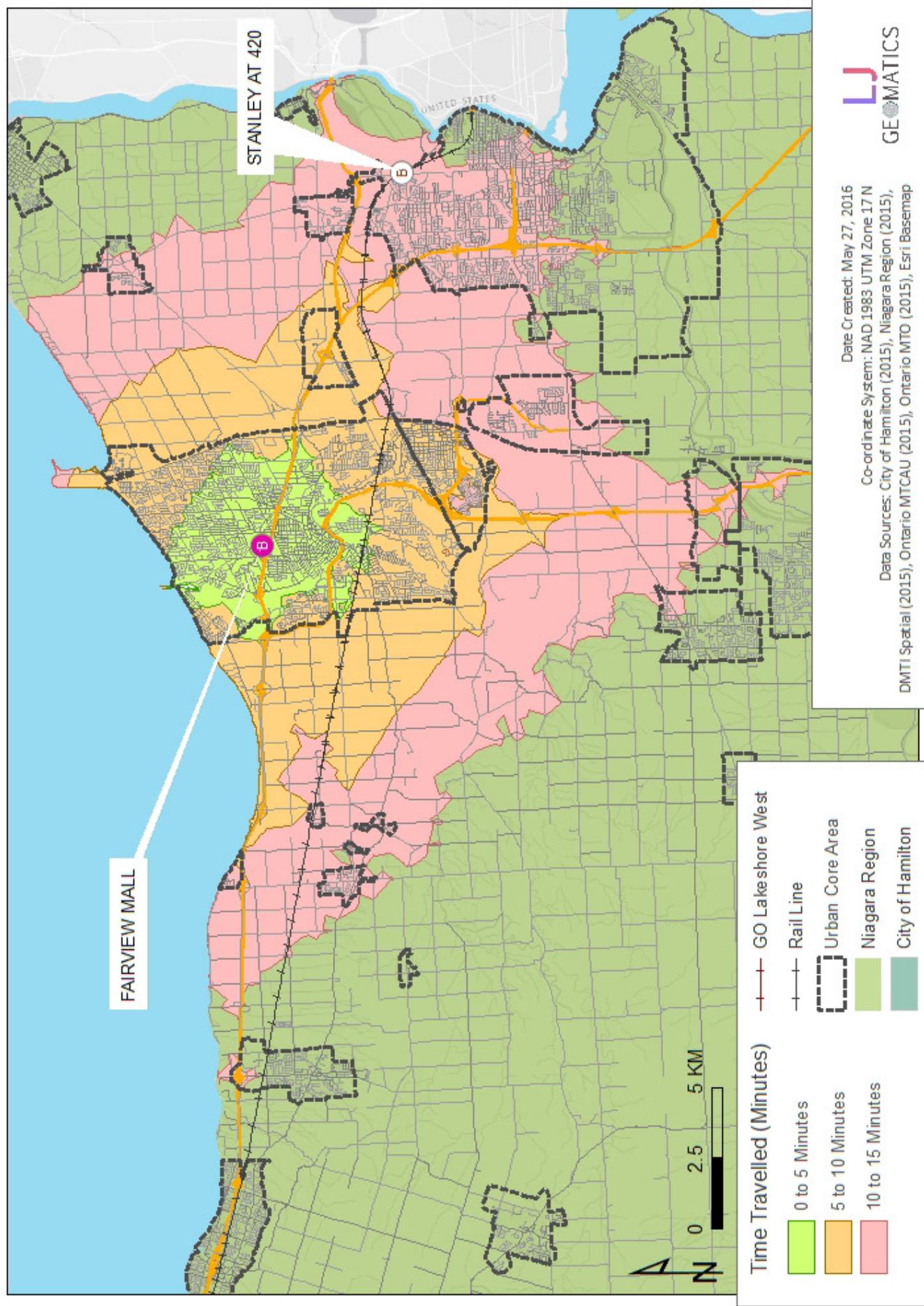
5, 10, 15 Minute Breaks



SERVICE AREA MAP

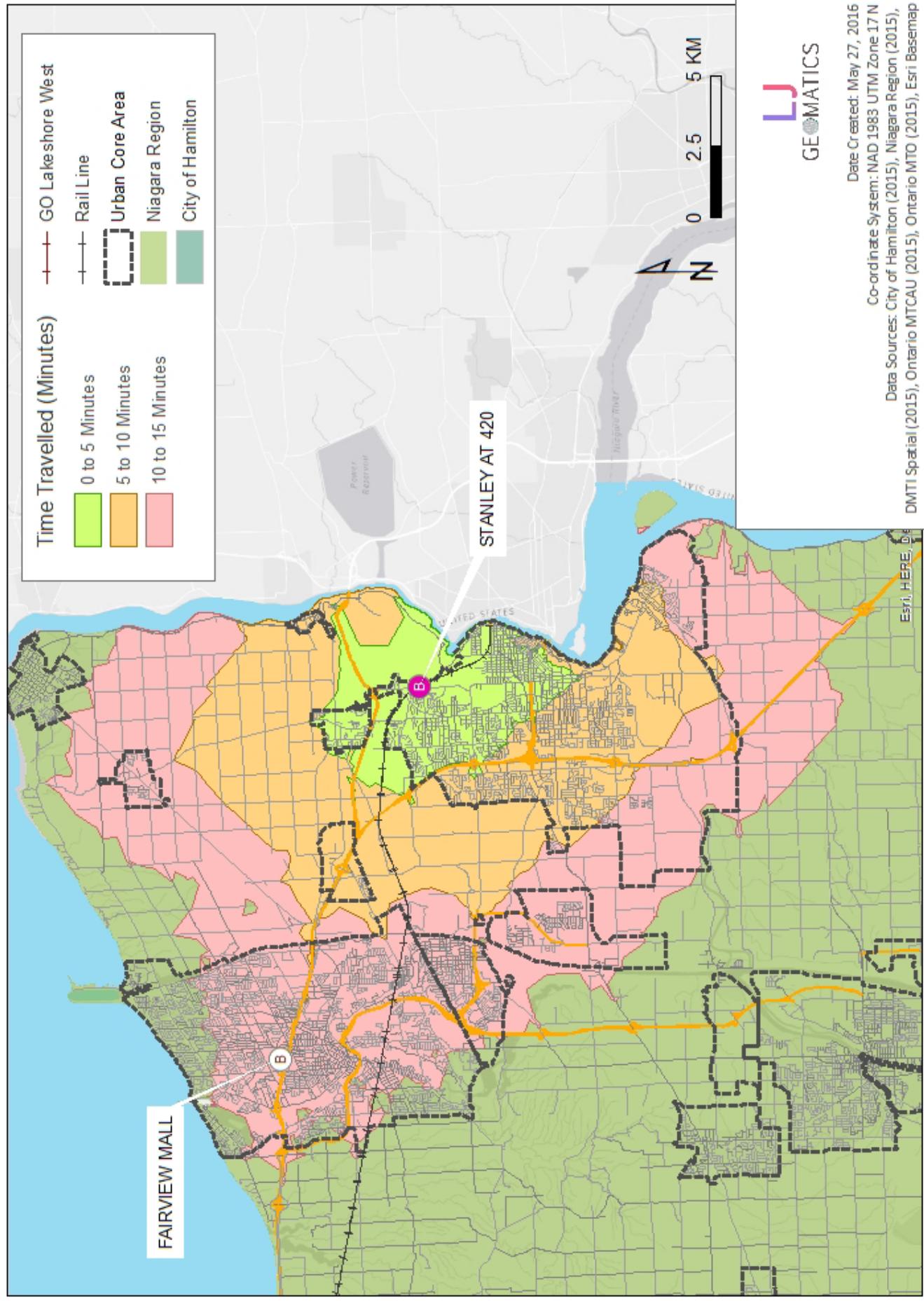
Fairview Bus Station (St. Catharines, ON)

5, 10, 15 Minute Breaks



SERVICE AREA MAP Stanley at HWY 420 Bus Station (Niagara Falls, ON)

5, 10, 15 Minute Breaks



How to Assess Ridership Potential

Transit ridership cannot be explained by transit service level. This approach will reveal nothing about what causes transit use as there are a multitude of factors that are difficult to be quantified. However, it is important to assess them in order to obtain a better understanding of who, what, when, where, why people use transit (Armbruster, 2010; Kohn, 2000; Miller ,2001; Taylor et al., 2003).

Our Approach

Identify external factors that encourages ridership within the GTHA and Niagara Region. The assessment will allow us to have a better understanding of the commuter profile within the study area. Having this information will then help Metrolinx identify how to service and supply for the demand that exists within the GTHA and Niagara Region.

Factors Encouraging Ridership

- ✓ Increasing Population Density;
- ✓ Rising Cost of Car Ownership;
- ✓ Increasing Public Transit Use;
- ✓ Increasing Employment;

Other Factors Affecting Commuter Behaviour

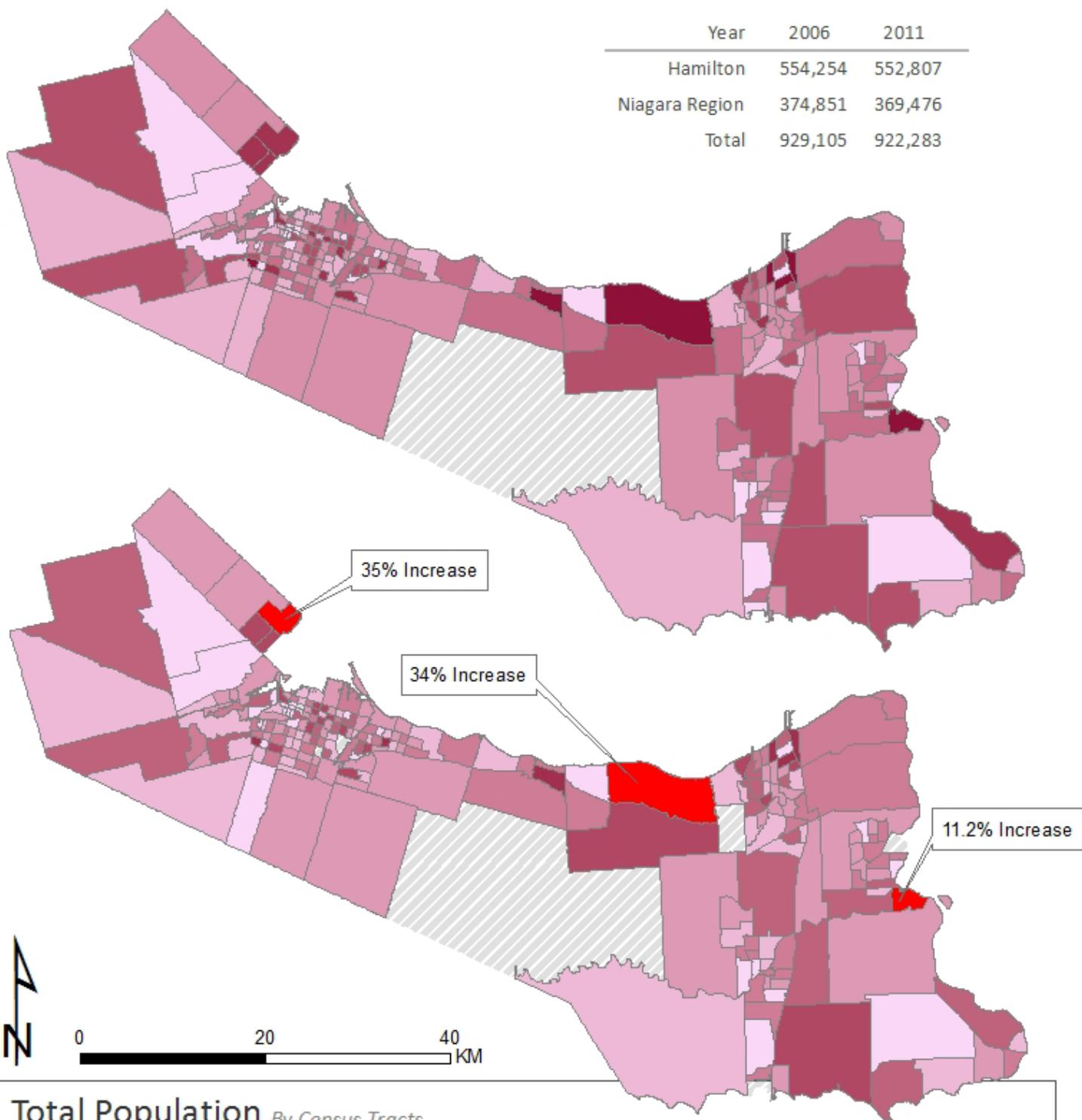
- * Commuting Time;
- * Public Policies (i.e. Parking Fees, Area Specific Lane Restrictions, HOV Lanes, Tolls, Bike Lanes...etc);
- * “The Last Mile”- the distance one has to travel to-and-from their mode of transportation, to work, and then back home;

POPULATION OF GTHA & NIAGARA REGION

FACTOR ANALYSIS MAP

TOTAL POPULATION FROM 2006 TO 2011

Year	2006	2011
Hamilton	554,254	552,807
Niagara Region	374,851	369,476
Total	929,105	922,283



Total Population *By Census Tracts*

No Data	0000 - 2,000	5,000 - 6,000
	2,000 - 4,000	6,000 - 7,000
	3,000 - 4,000	7,000 - 8,000
	4,000 - 5,000	8,000+

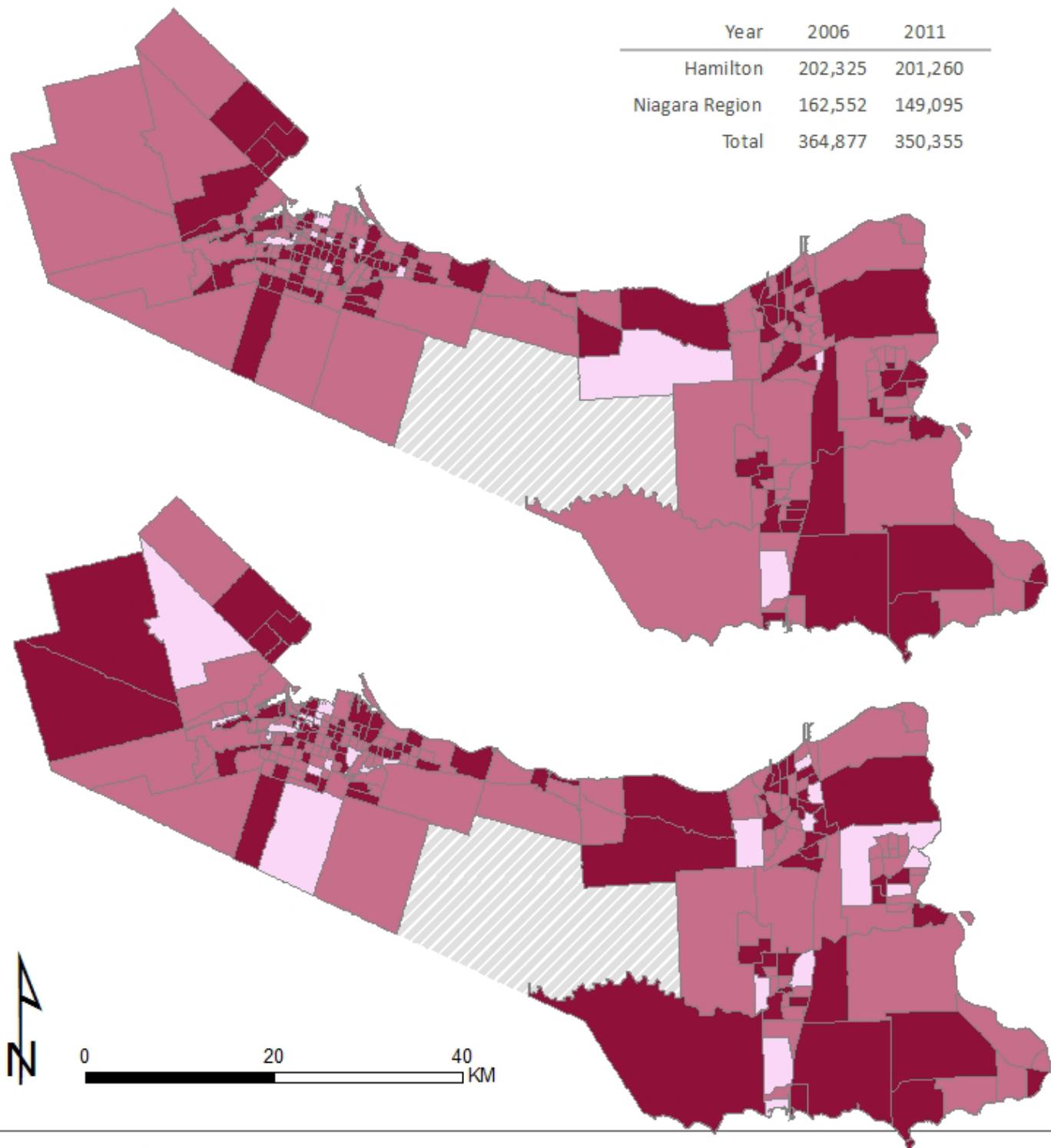


Date Created: May 30, 2016
 Co-ordinate System: NAD 1983 UTM Zone 17 N
 Data Sources: Statistics Canada (2006, 2011)

% VEHICLE OWNERSHIP OF GTHA & NIAGARA REGION FACTOR ANALYSIS MAP

% VEHICLE OWNERSHIP FROM 2006 TO 2011

Year	2006	2011
Hamilton	202,325	201,260
Niagara Region	162,552	149,095
Total	364,877	350,355



% Vehicle Ownership *By Census Tracts*

- No Data
- 20% and below
- 20% to 40%
- 40% and above

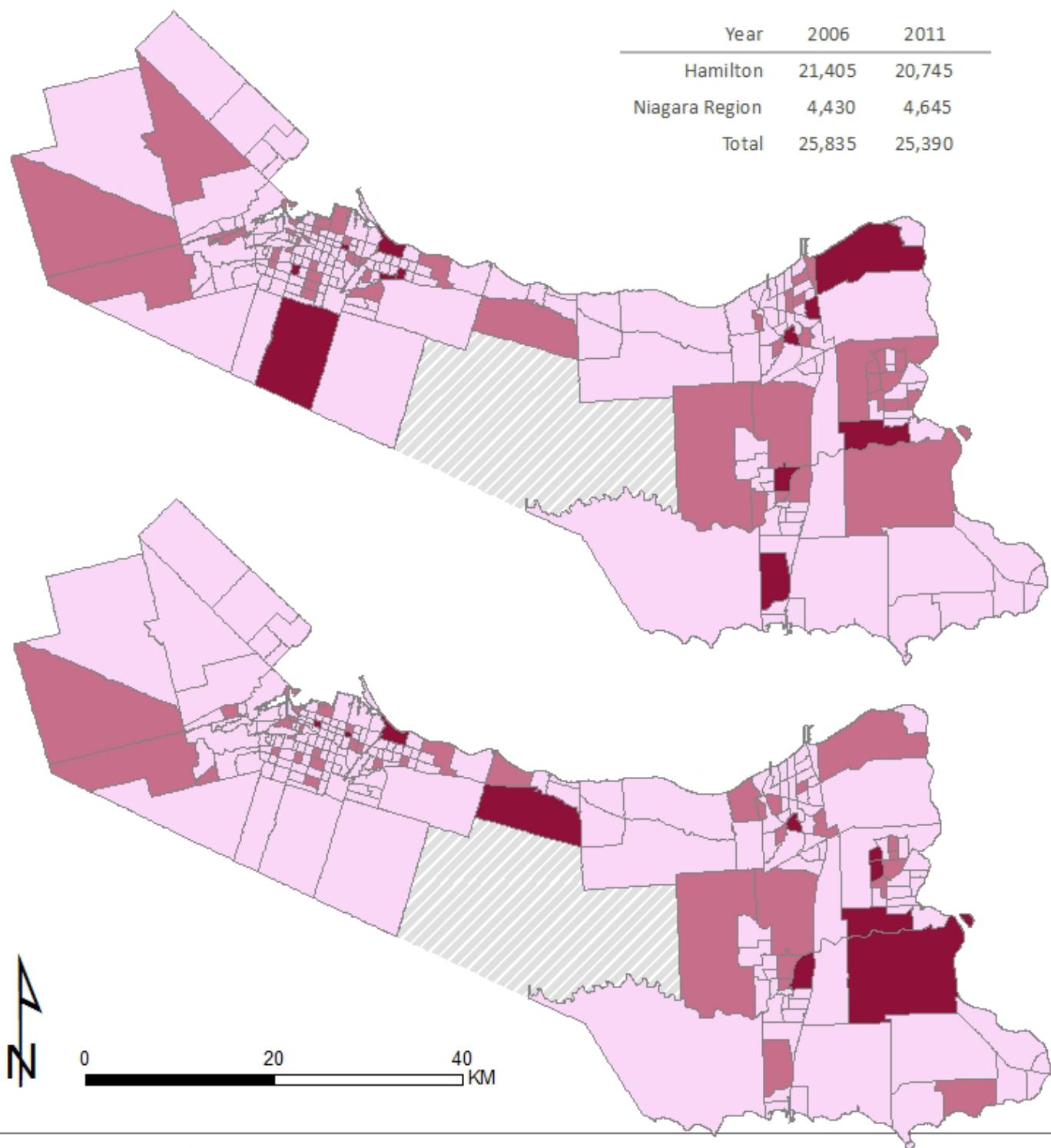
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GEOMATICS

Date Created: May 30, 2016
Co-ordinate System: NAD 1983 UTM Zone 17 N
Data Sources: Statistics Canada (2006, 2011)

% PUBLIC TRANSIT USERS OF GTHA & NIAGARA REGION FACTOR ANALYSIS MAP

% PUBLIC TRANSIT USERS FROM 2006 TO 2011

Year	2006	2011
Hamilton	21,405	20,745
Niagara Region	4,430	4,645
Total	25,835	25,390



% Public Transit Users *By Census Tracts*

- No Data
- Low
- Medium
- High

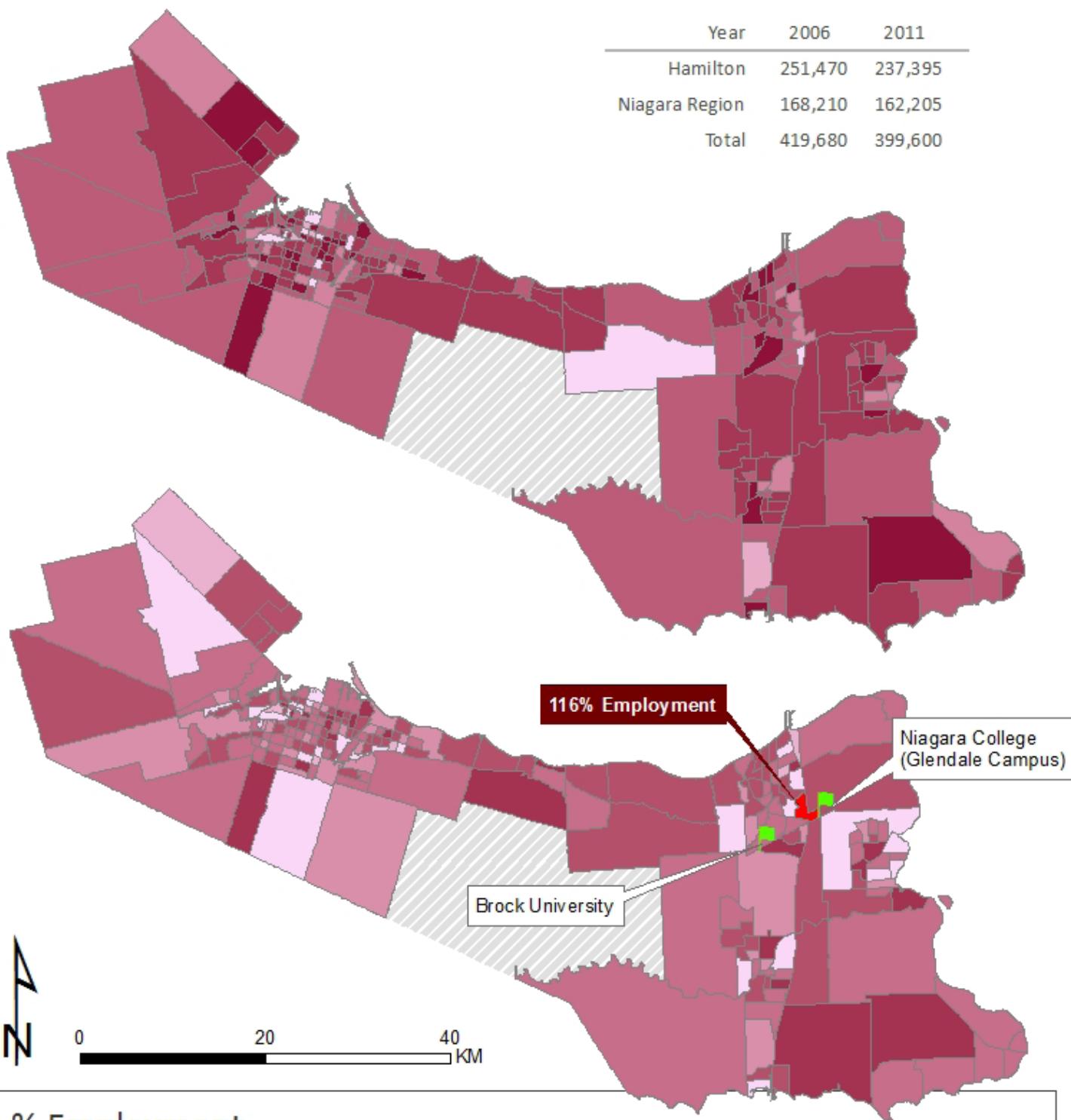


Date Created: May 30, 2016
Co-ordinate System: NAD 1983 UTM Zone 17 N
Data Sources: Statistics Canada (2006, 2011)

% EMPLOYMENT OF GTHA & NIAGARA REGION FACTOR ANALYSIS MAP

% EMPLOYMENT FROM 2006 TO 2011

Year	2006	2011
Hamilton	251,470	237,395
Niagara Region	168,210	162,205
Total	419,680	399,600



% Employment By Census Tracts

No Data	40% to 45%
30% and below	45% to 50%
30% to 35%	50% and above
35% to 40%	100% +



Date Created: May 30, 2016
Co-ordinate System: NAD 1983 UTM Zone 17 N
Data Sources: Statistics Canada (2006, 2011)

Framework to Identify Commuter Profile

WHO ARE YOU?

I AM A STUDENT

I AM A SINGLE PARENT

I AM A SENIOR

I AM BETWEEN 25 – 50 YEARS OLD

ARE YOU EMPLOYED?

YES

NO

WHAT IS YOUR ACCESS TO A VEHICLE?

YES, I OWN A PERSONAL VEHICLE

NO I DO NOT OWN A VEHICLE, BUT I CAR POOL OFTEN WITH OTHERS

NO, I DO NOT KNOW ANYONE OR OWN MY OWN PERSONAL VEHICLE

WHAT IS THE AVERAGE TIME YOU ARE WILLING TO COMMUTE TO WORK?

0 TO 15 MINUTES

15 TO 30 MINUTES

30 TO 50 MINUTES

50 TO 60 MINUTES

WHAT IS YOUR INCOME LEVEL?

LESS THAN \$13,650

BETWEEN \$13,650 AND \$27,300

BETWEEN \$27,300 AND \$41,000

MORE THAN \$41,000

Framework to Identify Commuter Profile

WHO ARE YOU?

4

3

2

1

WHAT IS YOUR ACCESS TO A VEHICLE?

1

2

4

ARE YOU EMPLOYED?

2

1

WHAT IS THE AVERAGE TIME YOU ARE
WILLING TO COMMUTE TO WORK?

3

4

2

1

SCORE

5	Most Likely Will Not Take Transit
6 to 10	Not Likely to Take Transit
11 to 14	Likely to Take Transit
15 to 18	Most Likely to Take Transit

WHAT IS YOUR INCOME LEVEL?

4

3

2

1

GTHA and Niagara Region's Commuter Profile

The profile was established by assessing statistical correlations between certain census demographics (National Household Survey Census, 2006; 2011), regional ridership data, and post-secondary school enrollment student attributes.

Purpose of the Commuter Profile

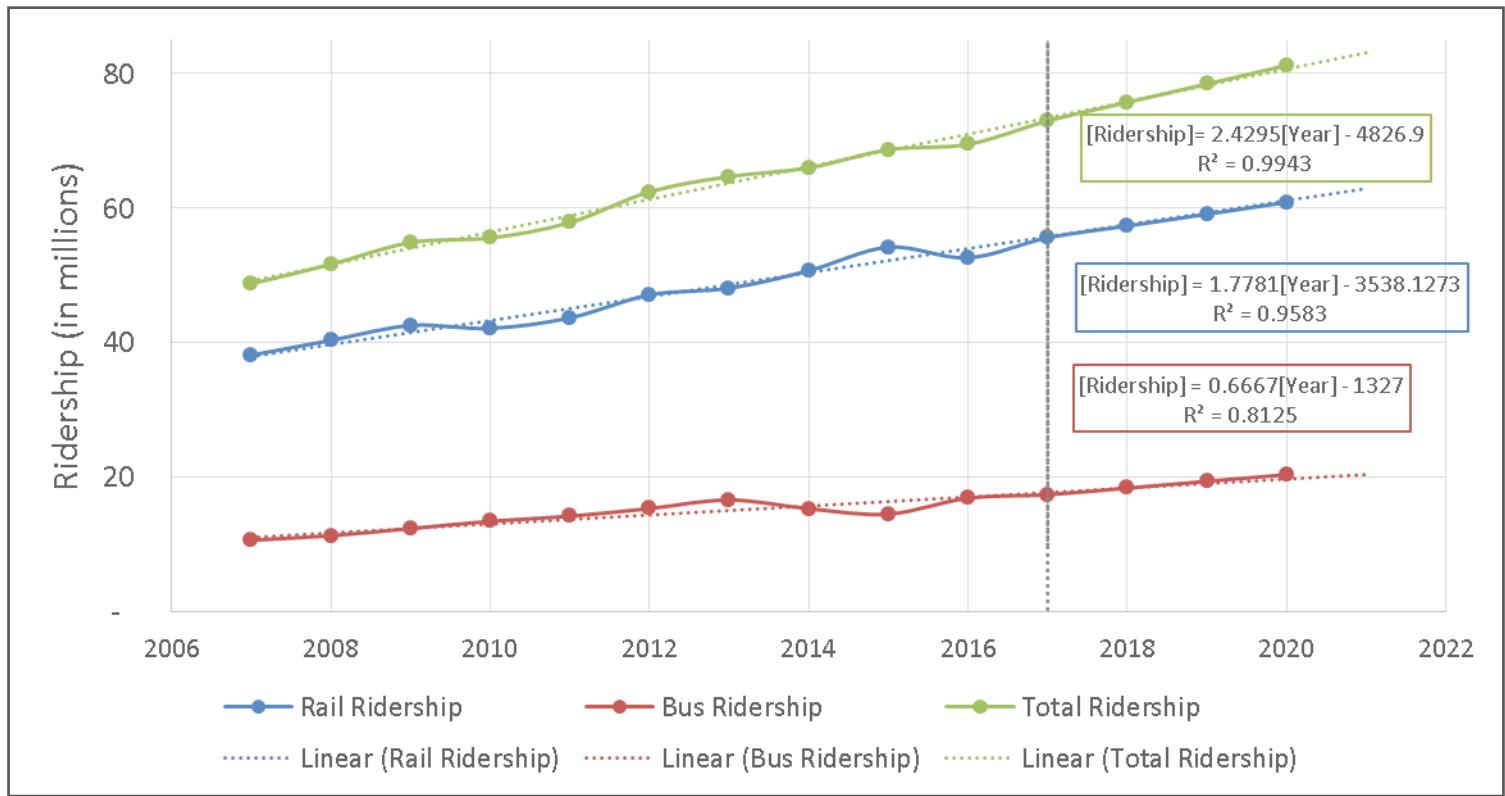
Identifying commuter profile is a component of determining ridership potential. By assessing who is demanding the service, Metrolinx will have a better understanding of HOW to cater their services and determine WHAT to supply.

The next component of evaluating ridership potential, is to quantify the numbers of those that are prevalent and demanding the service. This will then help model the best level of service to cater to the need of the area of interest.

Commuter Profile for the GTHA and Niagara Region

- ✓ A Student;
- ✓ No Access to personal vehicle;
- ✓ Employed / Unemployed;
- ✓ Willing to commute 15- 30 minutes to work;
- ✓ Makes less than \$13,650 annually;

RIDERSHIP FORECAST



Increasing Overall Ridership in the System

After quantifying how much ridership is in the overall system, ridership potential for the GTHA and Niagara Region can then be determined. The following approach was applied to conduct a cost-benefit analysis of options.

Conducting Cost-Benefit Analysis

To provide a comprehensive analysis, alternative routes were developed based on the needs of the commuter profile for the GTHA and Niagara Region. An assessment of expenditures and revenues were then conducted for each option.

OPTION A



OPTION B



OPTION C



OPTION D

Do nothing.

The last option is a do nothing option, where nothing will be expanded, no new routes will take place, and that the existing services between the GTHA and Niagara Region will remain as is.

ROUTE OPTION FINANCIAL ASSESSMENT

ROUTE OPTIONS

Details	A	B	C	D
Distance of Proposed Option (km)	70	94	94	-
No. of Trip per Day	4	4	4	-
Total Distance travelled per Day (km)	280	376	376	-
Annual No. of Trips	1,265	800	800	-
HOV Lane Distances km	-	15	-	-
Total Annual Travelled Distance (km)	88,550	75,200	75,200	-

EXPENDITURES

Equipment Maintenance	\$ 17,710	\$ 90,240	\$ 90,240	\$ -
Train maintenance per km	\$ 0.20	\$ -	\$ -	\$ -
Bus maintenance per km	\$ -	\$ 1.20	\$ 1.20	\$ -
Facilities	\$ 260,000	\$ 65,000	\$ 65,000	\$ -
No. of Stations	4	1 *	1 *	\$ -
Average cost per station	\$ 65,000	\$ 65,000	\$ 65,000	\$ -
Operations Costs	\$ 1,040,463	\$ 564,000	\$ 564,000	\$ -
Operations Cost Range	\$ 1,483,213	\$ 601,600	\$ 601,600	\$ -
Rail costs / km	\$ 11.75	\$ -	\$ -	\$ -
Rail costs / km range	\$ 16.75	\$ -	\$ -	\$ -
Bus costs / km	\$ -	\$ 7.50	\$ 7.50	\$ -
Bus costs / km range	\$ -	\$ 8.00	\$ 8.00	\$ -
Station Site Development	\$ 11,200,000	\$ 5,950,000	\$ 5,950,000	\$ -
Niagara Falls Station	\$ 5,950,000	\$ 5,950,000	\$ 5,950,000	\$ -
site preparation and demolition	\$ 400,000	\$ 400,000	\$ 400,000	\$ -
parking, kiss and ride and access	\$ 2,100,000	\$ 2,100,000	\$ 2,100,000	\$ -
municipal road modifications	\$ 300,000	\$ 300,000	\$ 300,000	\$ -
bus facilities	\$ -	\$ -	\$ -	\$ -
bicycle facility	\$ -	\$ -	\$ -	\$ -
station building	\$ -	\$ -	\$ -	\$ -
station platform and mini platform	\$ 2,900,000	\$ 2,900,000	\$ 2,900,000	\$ -
electrical, its, security, fare equipment	\$ 200,000	\$ 200,000	\$ 200,000	\$ -
utility relocation	\$ 50,000	\$ 50,000	\$ 50,000	\$ -
St. Catharines Station	\$ 5,250,000	\$ -	\$ -	\$ -
site preparation and demolition	\$ 150,000	\$ -	\$ -	\$ -
parking, kiss and ride and access	\$ 2,700,000	\$ -	\$ -	\$ -
municipal road modifications	\$ 600,000	\$ -	\$ -	\$ -
bus facilities	\$ 400,000	\$ -	\$ -	\$ -
bicycle facility	\$ 50,000	\$ -	\$ -	\$ -
station building	\$ -	\$ -	\$ -	\$ -
station platform and mini platform	\$ 950,000	\$ -	\$ -	\$ -
electrical, its, security, fare equipment	\$ 200,000	\$ -	\$ -	\$ -
utility relocation	\$ 200,000	\$ -	\$ -	\$ -

ROUTE OPTION FINANCIAL ASSESSMENT

ROUTE OPTIONS

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Distance of Proposed Option (km)	70	94	94	-
No. of Trip per Day	4	4	4	-
Total Distance travelled per Day (km)	280	376	376	-
Annual No. of Trips	1,265	800	800	-
HOV Lane Distances km	-	15	-	-
Total Annual Travelled Distance (km)	88,550	75,200	75,200	-

EXPENDITURES

Other Costs	\$	-	\$	71,100	\$	-	\$	-
HOV Lanes	\$	-	\$	71,100	\$	-	\$	-
Implementation per km	\$	-	\$	4,740	\$	-	\$	-
<i>Includes painting and signage</i>								
Sub-Total	\$	12,518,173	\$	6,740,340	\$	6,669,240	\$	-
Contingency (10%)	\$	1,251,817	\$	674,034	\$	666,924	\$	-
Grand Total	\$	13,769,990	\$	7,414,374	\$	7,336,164	\$	-

*Stations for Option B and C exists only for Niagara Falls. University institutions have stops with existing university bus loops do not require station maintenance

NOTE: Expenditure grand totals do not include an assessment of supplies, labour and/or benefits.

ROUTE OPTION FINANCIAL ASSESSMENT

ROUTE OPTIONS

Details	A	B	C	D
Distance of Proposed Option (km)	70	94	94	-
No. of Trip per Day	4	4	4	-
Total Distance travelled per Day (km)	280	376	376	-
Annual No. of Trips	1,265	800	800	-
HOV Lane Distances km	-	15	-	-
Total Annual Travelled Distance (km)	88,550	75,200	75,200	-

RIDERSHIP REVENUES

Assessment of Revenue and Ridership Outlook (2017)

Public Transit Users	
Total Population	940,000
12% use public transit	112,800
Commuters during peak time	9,000
Seasonal Ridership	
Low	19,000
High	25,000
Ridership Projections	
Rail low	28,000
Rail high	34,000
Bus low	8,500
Bus high	10,325
RIDERSHIP OUTLOOK	31,000
REVENUE OUTLOOK	~ \$ 444,850

Revenue Assessment

Fare per Passenger Boarding	\$ 14.35	\$ 12.65	\$ 12.65	\$ -
Low Level	\$ 401,800	\$ 107,525	\$ 107,525	\$ -
High Level	\$ 487,900	\$ 130,611	\$ 130,611	\$ -
REVENUE OUTLOOK	~ \$ 444,850	~ \$ 119,068	~ \$ 119,068	\$ -

Assessment of Revenue and Ridership Target (2017)

Ridership	188,516	115,921	115,921	-
Revenue	\$ 2,705,203	\$ 1,466,400	\$ 1,466,400	\$ -
Fare per Passenger Boarding	\$ 14.35	\$ 12.65	\$ 12.65	\$ -

Government Approved Funding for Expansion / Extension Projects

Station Site Development	\$ 11,200,000	\$ 6,021,100	\$ 5,950,000	\$ -
Niagara Falls Station	\$ 5,950,000	\$ 5,950,000	\$ 5,950,000	\$ -
St. Catharines Station	\$ 5,250,000	\$ -	\$ -	\$ -
Implementing HOV Lanes	\$ -	\$ 71,100	\$ -	\$ -

ROUTE OPTION FINANCIAL ASSESSMENT

ROUTE OPTIONS

Option C: Weekday Express Bus Service

The most cost effective option is the weekday express bus service that will make a total of 4 stops between McMaster University, Hamilton Centre, Brock University, and Niagara Falls.

	A	B	C	D
OPTIONS REVIEW				
Grand Total Expenditures	\$13,769,990	\$7,414,374	\$7,336,164	-
Grand Total Revenue	\$13,369,638	\$7,825,860	\$7,754,760	(\$1,450,000,000)
COST VS. BENEFIT	(\$400,352)	\$411,486	\$418,596	(\$1,450,000,000)

The recommended fare for this option is \$13.50, with two trips in the morning peak time going both east and westbound, and two trips in the evening peak time going both east and westbound.

This option is ideal as it is the most suitable for the commuter profile of the GTHA and Niagara Region. It is an affordable and accessible addition to the existing services, and also promotes 'investment-readiness' in the GTHA and Niagara Region.

YOUR NOTES



LJ Geomatics

c/o Niagara College (Glendale Campus)
135 Taylor Road, Room E308
NOTL, Ontario
LOS 1J0

ALICE LIN - PROJECT MANAGER
PHONE: 647 638 7438
LINA@ALUMNI.UOGUELPH.CA

Jasmine Joy - Principal Data Analyst
PHONE: 289 834 0406
JOYJASMINE.MAIL@GMAIL.COM