

DRAFT TECHNICAL BACKGROUNDER
Northern Ontario Multimodal Transportation Strategy

Highways and Roads

Prepared for the Ontario Ministry of Transportation
and Ministry of Northern Development and Mines



Consulting Team: **IBI Group** | Hemson Consulting Ltd.
November 2016

This technical backgrounder was prepared for the Ontario Ministry of Transportation and Ministry of Northern Development and Mines by the consultant team to assist the ministries in developing the Northern Ontario Multimodal Transportation Strategy. The opinions and ideas in this backgrounder are those of the authors and do not necessarily reflect the positions of the ministries or of the Government of Ontario.

Cette publication hautement spécialisée **Highways and Roads Technical Backgrounder** n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n'est pas obligatoire de la traduire en vertu de la Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le Ministère des Transports au 1-844-505-5006 ou par courriel à **contact@nomts.ca**.

Table of Contents

1	Overview	1
2	Northern Ontario Roadway Jurisdictions, Responsibilities and Programs	5
2.1	Provincial Highways.....	7
	Provincial Highway Classifications.....	8
2.2	International Bridges.....	12
2.3	Winter Roads.....	12
2.4	NORT Roads	12
2.5	Municipal Roads	13
2.6	Local Roads in Unincorporated Areas	13
	Local Road Boards	14
	Statute Labour Commissions.....	14
2.7	Forest Access Roads and Resource Access Roads.....	15
	Forest Access Roads.....	15
	Resource Access Roads.....	17
	Network Extent and Physical Characteristics.....	17
	Public Use Considerations.....	18
2.8	Roads Connecting First Nation Communities	23
3	Physical Characteristics of Highway Infrastructure.....	24
3.1	Existing Network Characteristics	24
	Number of Lanes	24
	Posted Speeds	25
	Bridges	26
3.2	Geometric Highway Design	34
3.3	Planned and Studied Highway Improvements	37
	Northern Ontario Highways Program	37
	Previously-Studied Potential Highway Improvements.....	37
4	Current and Historic Traffic Trends.....	40
4.1	Current Travel and Traffic Trends.....	40

Table of Contents (continued)

4.2	Seasonal Traffic Trends.....	51
4.3	Historic Traffic Trends.....	51
5	Maintenance	55
5.1	Area Maintenance Contracts	55
5.2	Winter Road Maintenance	55
	Provincial Highways.....	55
	Municipal Highways	57
5.3	Other Municipal Road Maintenance Standards	59
6	Roads Connecting First Nations.....	61
6.1	Responsibilities, Programs and Policies	63
	Road Responsibilities	63
	Programs	64
6.2	Overview of Community Concerns	66
7	Trucking.....	67
7.1	Regulations.....	67
	Hours-of-Service Regulations	68
	Vehicle Size and Weight Limitations	68
	Role of MTO Carrier Enforcement	69
7.2	Overview of Trucking Flows.....	70
	Truck Origin-Destination Flows	71
	Truck Flow by Truck Body Style and Loaded vs. Empty Truck Load Status.....	76
7.3	Vehicle Size and Weight Considerations	79
	Vehicle Size and Weight Limitations	79
	Oversize/Overweight Permits	79
	Oversize Vehicle Routing Considerations	83
7.4	Technological Advancements in Trucking	85
8	Highway Network Reliability and Resilience	86
8.1	Reliability	87
	Collisions	87
	Weather-Related Events.....	87
	Infrastructure Failure.....	88
	Climate Change Impacts and Possible Adaptation Strategies	88

Table of Contents (continued)

8.2	Resilience: Network Redundancy	90
8.3	Resilience: Real-Time Highway Information Systems	92
	Changeable Message Signs	92
	Road Weather Information System (RWIS)	93
	Seasonal Load Advisory Monitoring.....	93
	Ontario 511	93
	Other Intelligent Transportation Systems (ITS) Technology.....	98
9	Highway Rest Areas and Amenities	99
9.1	Highway Rest Area Provision	99
	MTO Rest Areas	99
	Fuel Stations.....	101
	Electric Vehicle Charging Stations	107
9.2	Rest Area Needs	107
	Daily Trucking Hours-of-Service Regulations.....	108
	Tourism Considerations	109
	Rest Areas and Network Resiliency Considerations	113
	Driver Fatigue-Related Collision Considerations.....	113
	Summary of Rest Area Needs	113
9.3	Mobile Phone Coverage	115
10	Outlook: Future Traffic Trends	118
10.1	Overview of Traffic Forecasting Process	118
10.2	Overview of Traffic Forecasting Results	120
10.3	Highway Link-Level Traffic Forecasting Results	122
10.4	International Border Crossing Flows.....	123
10.5	Implications on Highway Network Capacity	129
	Summer Network Volumes	131
	Truck Traffic Forecasting Sensitivity Analysis	138
11	Issues and Opportunities	146
11.1	Summary of Issues	146
	Traffic Delays and Accidents	146
	Issues Relating to Road Network Reliability and Resiliency	146
	Climate Change Impacts on Highway Reliability	147
	Rehabilitation Challenges	147
	Overweight/Oversize Cargos	148
	Way-Finding and Real-Time Communications.....	148

Table of Contents (continued)

Cross-Border Travel Infrastructure.....	148
Connections to First Nation Communities and Resource Development Sites.....	149
Rest Areas.....	149
Freight Connectivity between Modes	149
11.2 Opportunities	150
Targeted Highway Safety and Capacity Improvements	150
Increased Network Reliability.....	150
Improved Network Redundancy.....	151
Improvements to Real-Time Communications	151
Design Standards and Rehabilitation.....	152
Roadway Classification and Responsibilities	152
Provincial Cycling Network	152
Improved Transportation Infrastructure at International Border Crossings.....	153
Enhancing the Availability and Quality of Rest Areas.....	153
Improved Connectivity between Freight Modes	154
Advancements in Trucking Technologies and Operations	154
Support for Economic Development in the Far North.....	154
Opportunities to Improve Connections to First Nation Communities ..	155
Improved Collaboration and Partnerships	155
References	157
Alternate Text for Exhibits	158
 Appendix A: Roads Connecting First Nation Communities: Detailed Maps and Tables	
 Appendix B: Advances in Trucking Technologies	
 Appendix C: Highway Demand Forecasting Methodology	

Table of Contents (continued)

List of Exhibits

Exhibit 1.1: Northern Ontario Multimodal Transportation System Infrastructure	3
Exhibit 1.2: Traffic Volumes for Trips Using the Northern Ontario Highway Network, 2011	4
Exhibit 2.1: Map of Northern Ontario: Municipalities and Canada Census Districts	6
Exhibit 2.2: Northern Ontario Highway Classifications	10
Exhibit 2.3: Trans-Canada Highway Signage Example: Highway 69	11
Exhibit 2.4: View of an Example Northern Ontario Forest Access Road ..	16
Exhibit 2.6: Forest Access Roads and Resource Access Roads: Responsibility	19
Exhibit 2.7: Resource Roads: Classifications	20
Exhibit 2.8: Resource Road: Number of Lanes	21
Exhibit 2.9: Resource Road: Surface Type.....	22
 Exhibit 3.1: Northern Ontario Provincial Highways: Number of Lanes.....	 27
Exhibit 3.2: Northern Ontario Provincial Highways: Number of Lanes, Northwest View	28
Exhibit 3.3: Northern Ontario Provincial Highways: Number of Lanes, Central View.....	29
Exhibit 3.4: Northern Ontario Provincial Highways: Number of Lanes, Northeast View.....	30
Exhibit 3.5: Northern Ontario Provincial Highways: Number of Lanes, Southeast View	31
Exhibit 3.6: Northern Ontario Provincial Highways: Posted Speeds.....	32
Exhibit 3.7: Northern Ontario Provincial Highways: Bridges	33
Exhibit 3.8: Examples of Primary Highway Locations in Northern Ontario with Less than Desirable Geometric Design Features	35
Exhibit 3.9: Examples of Primary Highway Locations in Northern Ontario with Less than Desirable Standard Highway Elements (Map)....	36

Table of Contents (continued)

Exhibit 3.10: Northern Ontario 5-Year Highways Program	38
Exhibit 3.11: Previously-Studied Highway Improvements	39
 Exhibit 4.1: Passenger and Commercial Vehicle Volumes for Trips Using the Northern Ontario Highway Network, 2011.....	44
Exhibit 4.2: Passenger Vehicle Travel Flows by Origin-Destination Type, 2011	45
Exhibit 4.3: Commercial Vehicle Travel Flows by Origin-Destination Type, 2011	46
Exhibit 4.4: Proportion of Trucks by Northern Ontario Highway Link, 2011	47
Exhibit 4.5: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2011	48
Exhibit 4.6: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011	49
Exhibit 4.7: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2011	50
Exhibit 4.8: Seasonal Variation of Traffic Volumes in Northern Ontario ..	53
Exhibit 4.9: Historic Provincial Highway Traffic Trends in Northern Ontario, 2001 to 2011	54
 Exhibit 5.1: Northern Ontario Area Maintenance Contract Areas for Highways	56
Exhibit 5.2: Provincial Highway Snow Clearing Standards by Highway Class	57
Exhibit 5.3: Municipal Highway Classes Used for Application of Maintenance Standards	57
Exhibit 5.4: Municipal Highway Snow Clearing Standards	58
Exhibit 5.5: Municipal Highway Ice Formation and Prevention Standards	59
Exhibit 5.6: Pothole Repair Standards: Paved Surface of Highway	59
Exhibit 5.7: Pothole Repair Standards: Non-Paved Surface of Roadway	60
Exhibit 5.8: Pothole Repair Standards: Paved or Non-Paved Surface of Shoulder	60

Table of Contents (continued)

Exhibit 6.1: Overview Map of Roads Connecting First Nation Communities	62
Exhibit 7.1: Example of Signage Directing Commercial Vehicles to Truck Inspection Station	69
Exhibit 7.2: Origin-Destination Flows for Trucks using the Northern Ontario Highway Network, 2012	72
Exhibit 7.3: Origins and Destinations for Truck Trips to/from/within Northern Ontario, 2012 Average Daily Flows	74
Exhibit 7.4: Commercial Vehicle Travel Flows by Trip Origin-Destination Type, 2011	75
Exhibit 7.5: Daily Truck Trips Using the Ontario Highway Network by Body Style and by Loaded vs. Empty Status, 2012.....	76
Exhibit 7.6: Loaded vs. Unloaded Flows of Daily Truck Trips Using the Ontario Highway Network by Truck Body Style.....	78
Exhibit 7.7: Oversize and Overweight Load Escort Vehicle Requirements.....	80
Exhibit 7.8: Additional Vehicle Width Restrictions on Northern Ontario Highways	81
Exhibit 7.9: Oversize and Overweight Permit Fees	83
Exhibit 7.10: Daily Oversize Vehicle Flows Using the Northern Ontario Highway Network	84
Exhibit 7.11: A Potential Barrier to Oversize Loads/Superloads: Dryden Pedestrian Bridge over Highway 17 Connecting Link	85
 Exhibit 8.1: Northern Ontario Trans-Canada Highway Locations with Significant Redundancy Issues	 91
Exhibit 8.2: Changeable Message Sign Locations	94
Exhibit 8.3: Northern Ontario Road Weather Information System (RWIS)	95
Exhibit 8.4: Sample Road Closure Listing on Ontario 511 Website.....	96
Exhibit 8.5: Sample Road Closure Information on Ontario 511 Website, Interactive Map	97
Exhibit 8.6: Sample Road Closure Detail on Ontario 511 Website	97

Table of Contents (continued)

Exhibit 9.1: Examples of MTO-Maintained Roadside Rest Areas in Northern Ontario	100
Exhibit 9.2: Rest Areas, Gas Stations and Charging Stations in Northern Ontario	102
Exhibit 9.3: Rest Areas, Gas Stations and Charging Stations: Northwest View	103
Exhibit 9.4: Rest Areas, Gas Stations and Charging Stations: Central View	104
Exhibit 9.5: Rest Areas, Gas Stations and Charging Stations: Northeast View	105
Exhibit 9.6: Rest Areas, Gas Stations and Charging Stations: Southeast View	106
Exhibit 9.7: Travel Times between Northern Ontario Communities, Including Trucking Daily Hours-of-Service Travel Time Limits (13 hours) for Travel from Major Trucking Centres	110
Exhibit 9.8: Commercial Vehicle Break Locations in Northern Ontario ..	111
Exhibit 9.9: Tourist Travel Flows across Northern Ontario Border Crossings and Selected Provincial Highway Sites, 2011-2012.....	112
Exhibit 9.10: Summary of Priority Highway Rest Area Needs/Considerations in Northern Ontario	114
Exhibit 9.11: Mobile Phone Coverage in Northern Ontario	117
 Exhibit 10.1: Summary of Socio-Economic Factors Used in Traffic Forecasting Process	 119
Exhibit 10.2: Summary of Forecasting Results.....	121
Exhibit 10.3: Summary of Forecasting Results by Origin-Destination Flow Type.....	121
Exhibit 10.4: Flows of Passenger Vehicles using the Northern Ontario Highway Network, 2011 and 2041	124
Exhibit 10.5: Flows of Commercial Vehicles using the Northern Ontario Highway Network, 2011, 2031 and 2041	125
Exhibit 10.6: Flows of Total Vehicles Using the Northern Ontario Highway Network, 2011, 2031 and 2041	126
Exhibit 10.7: Flows of Passenger and Commercial Vehicles Using the Northern Ontario Highway Network, 2041.....	127

Table of Contents (continued)

Exhibit 10.8: Summary of Passenger and Commercial Vehicle Flows Anticipated at International Border Crossings	128
Exhibit 10.9: Summary of Forecasting Results relating to Commercial Vehicle Commodities Flows at International Border Crossings	128
Exhibit 10.10: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041.....	132
Exhibit 10.11: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041	133
Exhibit 10.12: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041.....	134
Exhibit 10.13: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041 Summer	135
Exhibit 10.14: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer.....	136
Exhibit 10.15: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041 Summer	137
Exhibit 10.16: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments to 2041: Sensitivity Analysis of Truck Traffic Growth vs. GDP Growth.....	139
Exhibit 10.17: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041: 80% GDP Sensitivity Analysis ..	140
Exhibit 10.18: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 80% GDP Sensitivity Analysis	141
Exhibit 10.19: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041, 80% GDP Sensitivity Analysis ..	142
Exhibit 10.20: Northern Ontario Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041: 50% GDP Sensitivity Analysis ..	143
Exhibit 10.21: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 50% GDP Sensitivity Analysis	144
Exhibit 10.22: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car- Equivalent Increments, 2041, 50% GDP Sensitivity Analysis ..	145

Table of Contents (continued)

1 Overview

For most residents and industries of Northern Ontario, the road network is the mainstay of daily mobility and travel, outside of bulk freight shipments by rail or marine modes. The provincial highway network has been developed, improved and maintained over many decades. The network provides vital connections between regions and among communities, and connects to a broader network of roads and to other transportation modes.

The focus of this technical backgrounder is on the provincial highway network in Northern Ontario, maintained by the Ontario Ministry of Transportation (MTO). Related road networks managed by other jurisdictions — e.g. winter roads, municipal roads, forest access roads — are also addressed, but in less detail.

The backgrounder is organized as follows:

- Section 2 describes the broader road network in Northern Ontario, including roads for which other ministries or agencies are responsible.
- Section 3 describes the physical characteristics of the Ontario highway network, both current and planned.
- Section 4 describes current traffic levels, including historic trends and anticipated future traffic levels.
- Section 5 briefly describes highway maintenance, including area contracts and maintenance standards.
- Section 6 provides an overview of roads connecting to First Nation communities.
- Section 7 describes commercial trucking in Northern Ontario.
- Section 8 discusses the reliability and resiliency of the Northern Ontario highway network; reliability involves network redundancy (having an alternate route in case of temporary road closures), real-time traveller information systems and rapid recovery of the road segment from issues when they occur.
- Section 9 describes the provision of roadside rest areas and amenities.
- Section 10 discusses the outlook of the Northern Ontario highway system in terms of anticipated future traffic volumes and related implications for highway capacities.

- Section 11 summaries issues and opportunities relating to highways and roads in Northern Ontario.

Other technical backgrounders discuss in additional depth topics that are directly related to the provincial highway network, including *Intercommunity Passenger Transportation* and *International Bridges*.

For reference, a map of the highway network in Northern Ontario together with other transportation infrastructure for the region is shown in Exhibit 1.1. Also for context and to provide an indication of demand on the highway network, Exhibit 1.2 is a map indicating 2012 highway volumes by medium/heavy truck vs. passenger vehicles. On this plot traffic levels outside of Northern Ontario represent the continuation of trips that use the Northern Ontario highway network, not the total volumes on those highway links.

Exhibit 1.1: Northern Ontario Multimodal Transportation System Infrastructure



Exhibit 1.2: Traffic Volumes for Trips Using the Northern Ontario Highway Network, 2011



Note: Outside of Northern Ontario, traffic volumes depicted represent only the portion of traffic that is the continuation of trips using the Ontario highway network, not the total traffic volumes.

Source: IBI Analysis of MTO highway link volumes and origin-destination travel survey data

2 Northern Ontario Roadway Jurisdictions, Responsibilities and Programs

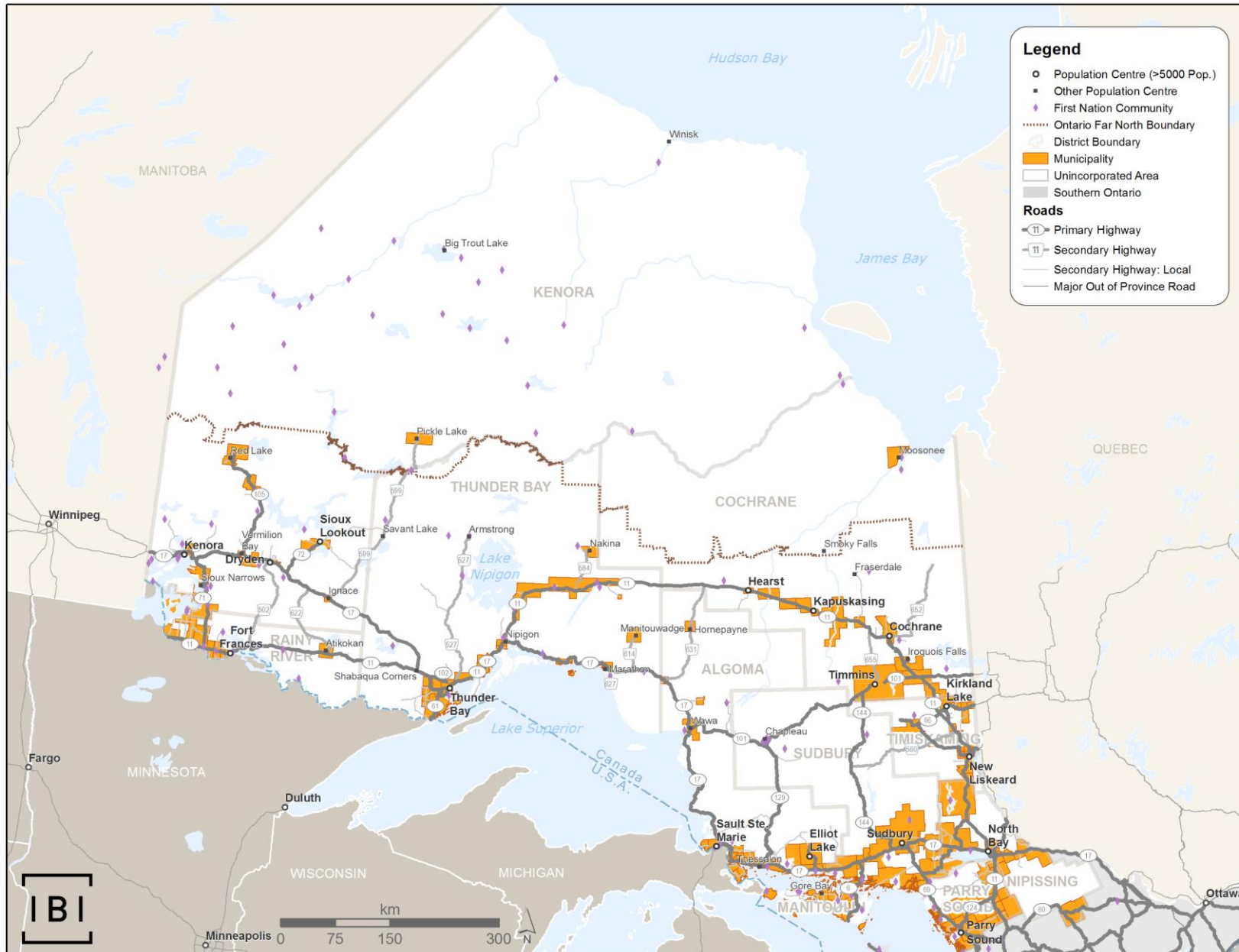
While this technical backgrounder focuses on the provincial highways built and maintained by MTO, these roads are part of a larger network of roads with a variety of stakeholders, and responsibility for parts of the provincial highway network itself is shared with municipalities and others.

This section describes the broader network of roads in Northern Ontario, focusing on the jurisdictions, responsibilities and funding programs. Overviews of each of the following are described in turn:

- Provincial highways (the focus of this document);
- International bridges;
- Winter roads;
- Northern Ontario Resource Trail (NORT) roads;
- Municipal roads;
- Local roads in unincorporated areas; and
- Roads connecting First Nation communities.

There are 144 municipalities in Northern Ontario; the region's districts and municipalities are shown in Exhibit 2.1. Territory outside these municipalities — a majority of the land in Northern Ontario — is unincorporated. The exhibit also shows the eleven territorial Districts (Census Divisions) that are primarily geographic divisions; they do not serve a regional government function.

Exhibit 2.1: Map of Northern Ontario: Municipalities and Canada Census Districts



2.1 Provincial Highways

The Ministry of Transportation (MTO) is responsible for over 11,000 km of provincial highways in Northern Ontario.

The Ministry of Northern Development and Mines (MNDM) invested \$560 million for capital construction and maintenance projects for this vast network in the 2015–16 fiscal year¹, and \$541 million for 2016–17. MNDM works in partnership with MTO to plan and prioritize road improvement projects, which include adding passing lanes, resurfacing roads, bridge repair/improvements, and upgrading sections of Highway 11 & 17 east of Thunder Bay and Highway 69 south of Sudbury to four lanes. The projects are being implemented by MTO.

Highways 11, 17 and 69 are the main highway corridors in Northern Ontario, providing connections within the region to the rest of the province, and to the rest of Canada. As described under “Provincial Highway Classifications” below, Highways 11, 17 and 69 are part of the primary (or King’s) highway system. Other provincial highways in Northern Ontario connect directly or indirectly to these major highways, and numerous Northern communities are located directly on or in close proximity to these routes. These major routes provide connections as follows:

- Highway 17 traverses all of Northern Ontario from west to east, a distance of over 1,900 km. From its western limit (Highway 1 in Manitoba) Highway 17 continues in an easterly direction through Northwestern Ontario before merging with Highway 11 in the vicinity of Thunder Bay – covering a distance of 175 km. Highway 17 then separates from Highway 11 at Nipigon to follow the north shore of Lake Superior as far as Sault Ste. Marie. From there, the route passes the regional centre of Sudbury, merges with Highway 11 again for approximately 4 km through North Bay, and continues toward Ottawa. At the west end of Ottawa, the route becomes Highway 417 and continues easterly toward Montreal, Quebec.
- Highway 11 traverses the majority of Northern Ontario, from the Ontario-Minnesota border crossing at Rainy River, easterly through Thunder Bay and Nipigon (co-signed with Highway 17), then following a long arc spanning Northeastern Ontario through Hearst, Kapuskasing, New Liskeard and numerous other communities before merging again with Highway 17 in North Bay. From North Bay, Highway 11 continues in a southerly direction until its junction with Highway 400 at Barrie. Highway 11 runs almost 1,500 km from Rainy

¹ MNDM: *2016-2017 Estimates Briefing Book*, <http://www.mndm.gov.on.ca/en/about/published-plans-and-annual-reports/estimates-briefing-book-2016-17>.

River to North Bay, and another 240 km from North Bay to Highway 400.

The travel distance of the Highway 11 route from North Bay to Nipigon is only slightly less than that of Highway 17 between the same points — both distances being approximately 1,000 km.

- In addition to Highway 11, Highway 69/400 serves as the second major link connecting Northern and Southern Ontario. Highway 69 spans nearly 160 km between Sudbury and Parry Sound, then continues as Highway 400 for approximately 130 km southerly to its junction with Highway 11 in Barrie, and a further 80 km south to Highway 401 in Toronto.

Provincial Highway Classifications

There is a wide range of provincial roads in Northern Ontario, including roads under the following provincial highway designations:

- **Primary Highways (King's Highways):** In Ontario, primary highways form an interconnected network that spans and connects regions. These are commonly referred to as King's Highways², though the term is not as widely used as in the past and the highway number markers themselves no longer have the words "The King's Highway" on them (the markers are currently crest-shaped with a crown on top). These routes have highway numbers as high as the 400's. Some primary highways have alternate routes designated with A for Alternate (e.g. Highway 17A, the Kenora bypass) or B for Business route (e.g. Highway 17B, an alternate route east of Sault Ste. Marie). All primary highways are paved.

A subset of King's Highways is the 400-series highways, which are designed to be exclusively controlled-access routes for their entire length; the only 400-series highway in Northern Ontario is a portion of Highway 400 in the vicinity of Parry Sound.

- **Secondary Highways:** These routes generally connect communities to primary highways or serve as connections between primary highways. These highways are numbered in the 500's and 600's and have trapezoid-shaped roadside highway markers. Roads that are secondary highways in Northern Ontario are similar in role to the county or regional roads in Southern Ontario, but with no county or

² The *Ontario Highway Traffic Act* refers to all provincial highways as King's highways, e.g. "That part of the King's Highway known as no. 144".

regional government, these roads are the responsibility of MTO³. Secondary highways vary greatly in functional classification: some serve as arterial or collector routes, such as Highways 655, 631 and 614, while others have more of a local function, such as Highways 558 (west of Highway 11 near New Liskeard) and 547 (connecting Hawk Junction to Highway 101)⁴. Most secondary highways are paved, although some remain gravel-surfaced.

- **Tertiary Highways:** A class of Ontario provincial highways that exists only in Northern Ontario is tertiary highways. These provide additional links to communities or to resources. They are numbered in the 800's and have a rectangular roadside highway number marker. Most are gravel surfaced.
- **Other Highways:** MTO is responsible for additional roads beyond the three classes above. These have a 7000-series numbering for inventory purposes, but do not have roadside markings with this designation. An example is Old Cartier Road off Highway 144 north of Onaping.

These highway designations are shown in Exhibit 2.2, which also includes the TransCanada Highway designation, described below.

Trans-Canada Highway

A Trans-Canada highway designation is given to a network of highways that connects all ten Canadian provinces. These are specially signed throughout the network with a distinctive white maple leaf on a green sign, either below the number markers or on its own. The white leaf sometimes includes the highway number or another route designation. An example of a Trans-Canada roadside marker is shown as Exhibit 2.3 for Highway 69.

Except for segments located in national parks, there is no federal program for the Trans-Canada highway. A Trans-Canada highway designation does not imply different guidelines or standards compared to other provincial highways.

³ The City of Greater Sudbury is the one exception in Northern Ontario of a municipality maintaining a system of numbered roads that are not provincial highways.

⁴ With the exception of Exhibit 2.2, the maps in this and other backgrounders distinguish between secondary highways that have an arterial or collector function as “secondary highways” and those with a local function as “secondary highways: local”. Tertiary highways and other highways are also included with the “secondary highways: local” designation in these maps.

Exhibit 2.2: Northern Ontario Highway Classifications



Exhibit 2.3: Trans-Canada Highway Signage Example: Highway 69



Note: Sign at junction with Shebeshekong Road. Photo Source: A. Mori

Connecting Links

Where a provincial highway passes through a municipality, all or part of the highway may become the responsibility of the municipality for construction, maintenance and repairs. The Connecting Links program is a provincial subsidy provided to municipalities to assist with these tasks. Highway segments under this program keep highway numbering through the municipality, and may be signed underneath roadside highway number markers with a black “CL” designation on an amber diamond underneath the highway number.

Connecting links in Northern Ontario include portions of the following routes:

- Highway 6 in Little Current (Manitoulin) and Espanola (Sudbury);
- Highway 11 in Kapuskasing, Hearst, Fort Frances and Rainy River; and
- Highway 17 in Dryden, Sault Ste. Marie, Blind River and Sturgeon Falls.

2.2 International Bridges

There are four road-based international border crossings in Northern Ontario: Rainy River, Fort Frances, Pigeon River and Sault Ste. Marie. Ownership of the bridges is by the private sector, the public sector or by joint state-province ownership depending on the bridge. The international bridges are discussed in detail in the *Draft International Borders Technical Backgrounder*.

2.3 Winter Roads

Most communities in the Far North and some in the Near North do not have direct all-season road or rail connections to the larger provincial highway network. During deep-freeze conditions, approximately January to March, the communities rely on winter roads to connect them to the all-season road or rail network for the critical and cost-effective re-supply of essential supplies such as fuel, housing materials, food, potable water, and other goods.

The Ontario Ministry of Northern Development and Mines (MNDM) administers the Northern Ontario Winter Roads Program, with funding support from the federal department of Indigenous and Northern Affairs Canada (INAC). Winter roads are described in depth in a separate technical backgrounder.

2.4 NORT Roads

Two all-season roads extend north from the provincial highway network into the Far North and provide connections to the winter road network; both are called the Northern Ontario Resources Trail (NORT) or NORT road⁵:

- Pickle Lake Road: The only provincial highway that crosses into the Far North is Highway 599, a paved secondary highway that connects Pickle Lake to Highway 17 at Ignace. North of Pickle Lake, the NORT Road, is a gravel road extending another 200 km northward to Windigo Lake.
- Nungesser Road: Nungesser Road is another NORT gravel road, extending north from Red Lake about 100 km.

These roads can be seen in the multimodal transportation system map, Exhibit 1.1. They are the responsibility of MNDM, which fully funds all work on these roads, including both winter and summer maintenance. Neither MTO nor MNRF provide any funding toward maintenance of these roads, and the roads are not part of the inventory of provincial (MTO) highway assets. However, the NORT roads are largely under the jurisdiction and control of MTO through Crown Land

⁵ The all-season road portion of the route to Marten Falls includes both provincial roads and forest access roads (described in Section 2.7).

Plans (CLPs), the exception being the most northerly portion (approximately 40 km) of the Pickle Lake NORT road, which has no CLP, and therefore is under the jurisdiction of MNRF.

2.5 Municipal Roads

There are 144 municipalities of wide range of sizes in Northern Ontario; the area covered by these municipalities was shown earlier in Exhibit 2.1. Municipalities in Ontario are directly responsible for the land use, infrastructure and municipal services within their boundaries, including transportation. They plan, deliver and regulate municipal roads and municipal transit systems. Municipalities create Official Plans, by-laws, and approve new developments.

Roads within municipal boundaries are built and maintained by municipal governments with assistance from the Province.

2.6 Local Roads in Unincorporated Areas

Some roads outside of municipal boundaries can serve to connect First Nations and other unincorporated communities in Northern Ontario to the provincial road network. Funding assistance for maintaining these roads is available through the Unincorporated Roads Access Program, which is funded by MDNM, and administered by the Provincial Highways Management (PHM) branch of MTO, for Northeast and Northwest Region separately. The program has an annual budget of \$25 million, \$3 million of which is available for the maintenance arrangements described below. Because there is an annual budget limit, road maintenance projects under the program need to be prioritized. This program is primarily used by Local Roads Boards (LRBs, described below), who form a large proportion of applicants for the program; a small amount is accessed by First Nations for roads connecting their communities. (Other programs specifically to support First Nation connecting roads are described more fully in Section 6.)

There is an open application process for roads in unincorporated areas for this funding program. Funding is generally provided in the form of a one-year agreement with the possibility of renewal. Funding criteria for the program include the following:

- A minimum of six residents use the road.
- There must be an economic need or provincial interest in funding the maintenance of the road.
- The road must already exist and meet minimum standards. (The funding program is not intended for building new roads but for maintaining existing ones that do not require extensive upgrading.)

- Applicants must demonstrate the capacity to maintain the road (i.e. they have equipment and trained staff).

The program cannot be used to buy road maintenance equipment, only to conduct the maintenance.

As part of the Unincorporated Roads Program, MTO staff can provide technical assistance to the Boards and to the First Nations and can arrange contractors to perform the work if needed. This can result in efficiencies where the contractor can cover a number of roads in a given area.

There are some road associations in Ontario that are not LRBs that opt to fund access roads without public money.

Local Road Boards

A total of 197 Local Roads Boards (LRBs) are responsible for building and maintaining 3,636 km of local roads in unincorporated areas in Northern Ontario. LRBs operate under the provincial *Local Roads Boards Act, 1990*. LRBs raise money through property taxes to fund their operations. LRB funds are matched at up to a 2:1 ratio by MNDM through the Unincorporated Areas Roads Program. MTO is responsible for delivering this program

Funding for LRB road maintenance is also available through the Federal Gas Tax Fund. This program was renewed in 2014, and commits the Federal Government to pay approximately \$2 million annually over the next ten years to assist in funding the maintenance of the local road network in unincorporated areas of the province. (This funding is not used toward the maintenance of roads connecting First Nations.)

Statute Labour Commissions

Similar to LRBs but much less common in Ontario, Statute Labour Commissions (SLCs)⁶ also coordinate road maintenance in unincorporated areas. SLCs also have the power to raise funds through taxation on property within their jurisdiction, but the funds are matched at up to a 1:1 ratio by MNDM. The level of technical assistance provided by the province is also far less than with LRBs. There are five SLCs in Ontario, all of which are in the New Liskeard area.

⁶ The original intent of the *Statute Labour Act* (and as still written in the Act) was to pay the tax with a stipulated number of days of labour on local roads depending on the assessed value of one's property. However, the Act also contains a provision to provide payment in money instead of labour with the payment funding maintenance contractors. The latter option prevails today.

2.7 Forest Access Roads and Resource Access Roads

Forest access roads and resource access roads are a very significant component of Northern Ontario's transportation system. These roads not only support not only the forestry industry, but also the mining and mineral exploration industry, the tourism industry, anglers, hunters, First Nations and Métis; or Indigenous communities, utilities, railways and for emergency management. Forest and resource access roads are also sometimes used instead of the highway system by the general public to reduce travel times and distances between communities. For example, using forest access roads for travel from the community of Geraldton to Marathon can save drivers over an hour of travel time. Travel times from Fort Frances to Ignace are also considerably reduced by using forest access roads.

Forest Access Roads

The most extensive type of road in Northern Ontario is Forest Access Roads: there are over 46,000 km of primary and branch forest access roads usable by the public, as well as additional operational roads – the latter are used to access active forestry operations only and are not safe for public use. On average approximately 20,000 km of these roads are maintained and almost 900 km of new roads are constructed and maintained as per approved Forest Management Plans each year, while annually hundreds of kilometres of existing forest access roads are also decommissioned each year to protect other types of values in the forest, including natural resources and remote tourism. Forest access roads are built and maintained by the forestry industry. The Ministry of Natural Resources and Forestry (MNRF) oversees the forest management planning process. For the most part, the forest industry is responsible for building and maintaining the roads as per their licence conditions, but the roads remain Crown Land and active roads can be used by the public. A view of a typical gravel-topped Northern Ontario forest access road is shown in Exhibit 2.4.

Exhibit 2.4: View of an Example Northern Ontario Forest Access Road



Source: Government of Ontario (2015)

There are three main types of Forest Access Roads identified in Forest Management Plans. As identified in *The Forest Management Planning Manual for Ontario's Crown Forests* (2009), Glossary of Terms-18, these are as follows:

Primary: A road that provides principal access for the management unit, and is constructed, maintained, and used as part of the main road system on the management unit. Primary roads are normally permanent roads.

Branch: A road, other than a primary road, that branches off an existing or new primary or branch road, providing access to, through or between areas of operations on a management unit.

Operational: A road within an operational road boundary, other than a primary or branch road, that provides short-term access for harvest, renewal and tending operations. Operational roads are normally not maintained after they are no longer required for forest management purposes, and are often site prepared and regenerated.

Forest access road infrastructure is identified during the Forest Management Planning process. The Road Use Management Strategy describes the construction and maintenance regimes required for the next 20 years and are identified on maps contained in the Plan.

Funding

Since 2005, the Province has operated a Forest Access Roads Funding Program to support multi-use public forest access road infrastructure. The program provides funding for the construction and maintenance of roads that are:

- identified in an approved *Forest Management Plan and Annual Work Schedule*, which must be in place for all Management Units;
- classified as primary or branch;
- on Crown Land; and
- must not be exclusive to forest industry use.

Through MNRF, the Province covers up to 100% of construction and maintenance costs for primary roads and up to 50% of construction and maintenance costs for branch roads up to the annual funding available. Eligible costs include the construction of new “greenfield” roads and the year-round general maintenance activities associated with existing roads.

- Aggregates used in the construction process are obtained within the Forest Management Unit royalty-free, as allowable under the Ontario Aggregates Act.

Resource Access Roads

In addition to Forest Access Roads administered and funded by MNRF are Resource Access Roads. These are also administered by MNRF, but are funded by MNDM. Resource Access Roads differ from Forest Access Roads in that there is no Sustainable Forest License (SFL) holder using the road, but the road is deemed provincially significant, and a low level of maintenance is continued. There are over 30,000 km of Resource Access Roads in Northern Ontario.

Network Extent and Physical Characteristics

The extent of the forest and resource access road network by responsibility is shown in Exhibit 2.5. Forest access roads under SFLs are indicated in orange, and most of the remaining non-provincial roads indicated are resource access roads under an industry Memorandum of Understanding (MOU) or other form of administration under MNRF.

Exhibit 2.6 shows the forest access road network by Forest Management Plan class, with resource roads not under this classification.

The roads are built to the needs of the industry. The roads could have either one or two lanes (Exhibit 2.7), and tend to be gravelled or unsurfaced, with very few paved (Exhibit 2.8).

Some larger areas that can be seen not to have forest access roads or resource access roads in these maps are national or provincial parks or protected spaces.

Public Use Considerations

Forest access roads are built to serve industry needs and are rarely built to provincial highway standards, with the exception of water crossings, which are inspected and must be built to public highway standards. MNDM has entered into partnerships in the past to increase the standard of maintenance for certain forest access roads, e.g. MNDM funds Marten Falls First Nation for winter maintenance of the road connecting the community to the provincial road network.

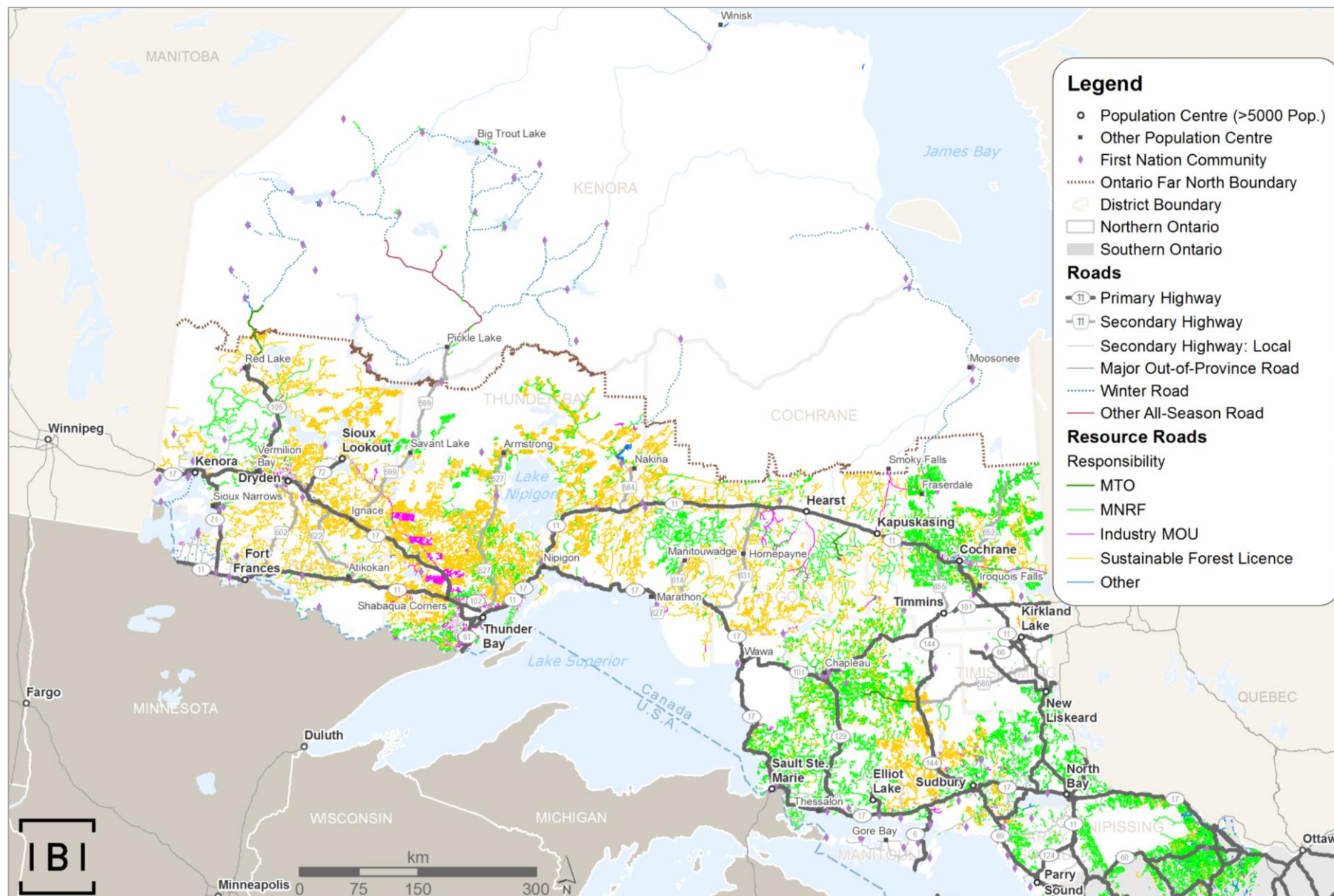
Roads are named in the Forest Management Plan; however, most do not have name signs located at entrances.

A small number of forestry vehicles use coloured fuel (indicating they are vehicles used for industry and not intended for or insured for driving on public roads). (Many forest industry vehicles are plated, and insured for driving on public roads.) In the case of collisions due to mixed industry/public traffic, liability is determined on a case-by-case basis.

The roads are not posted to show allowable weights for public vehicles, but bridges must be signed for this information.

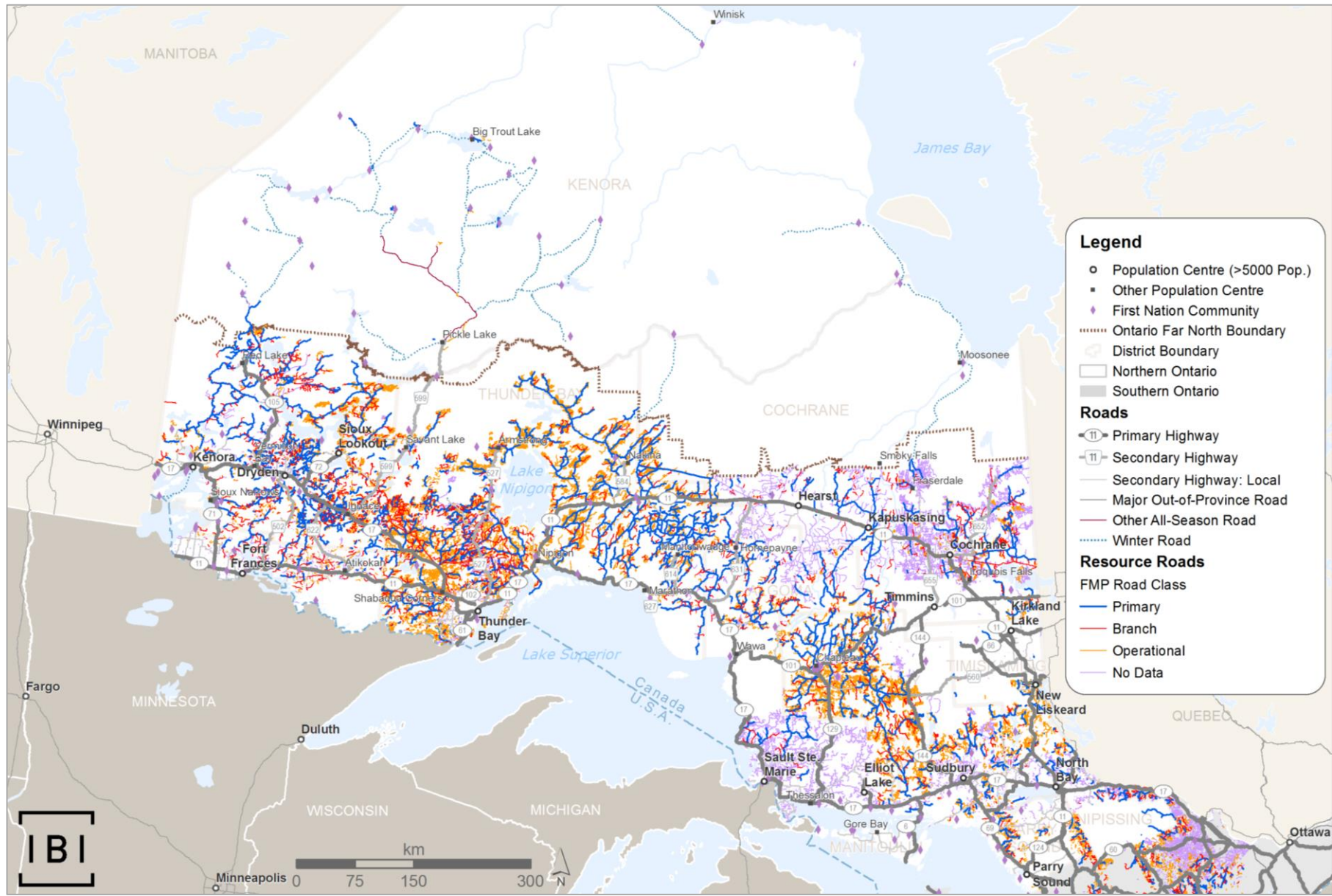
Many kilometres of forest access roads are closed annually to public vehicular access to protect resources and allow for remote tourism. At times roads that are closed had come to be relied upon by the public and there is generally no public warning to users when the forestry industry decides it is no longer interested in maintaining a forest access road. An example of this is when Resolute Forest Products closed the bridge north of Iroquois Falls that had for years served as a convenient connection between Highway 11/Iroquois Falls and Highway 652.

Exhibit 2.5: Forest Access Roads and Resource Access Roads: Responsibility



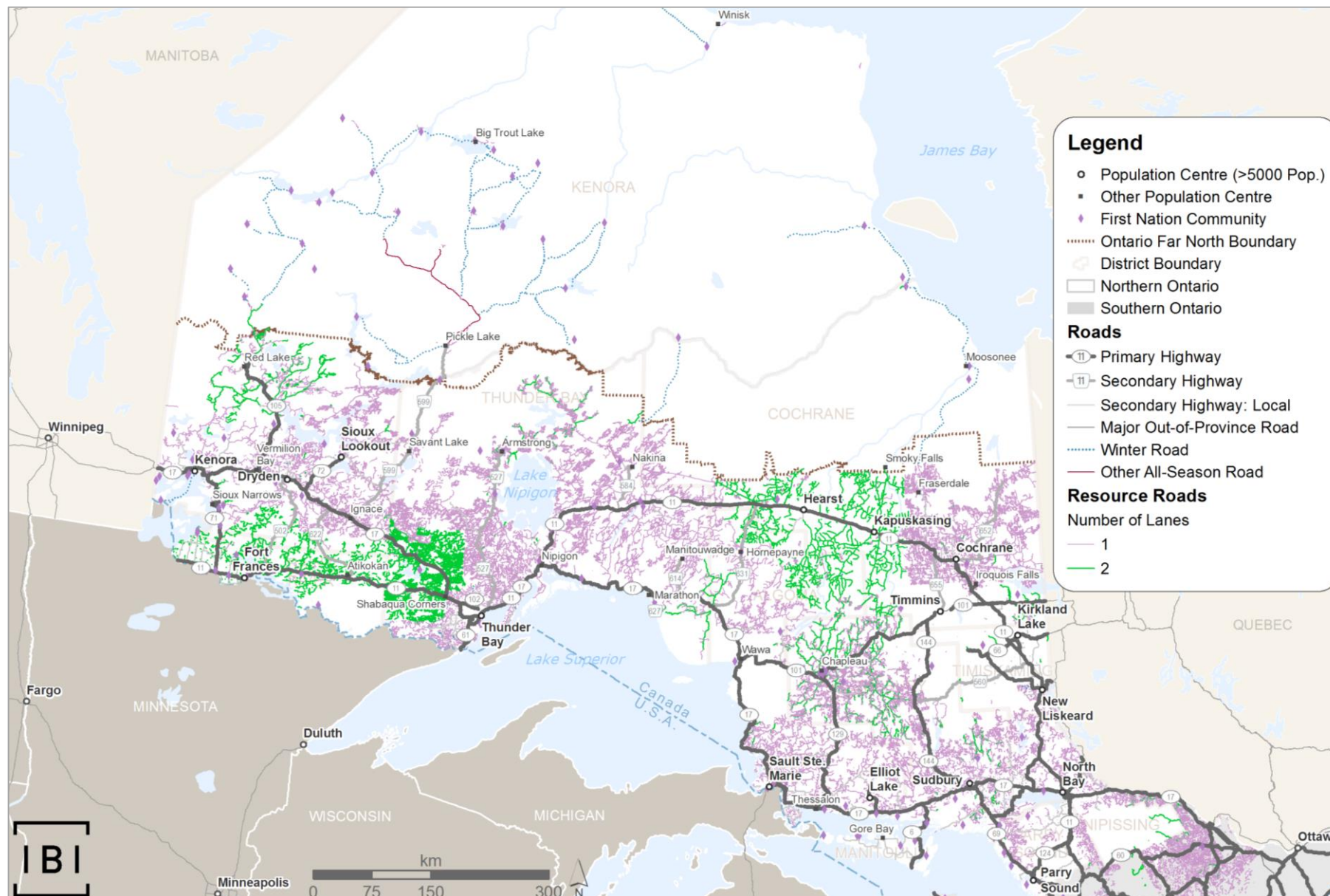
Forest and resource access road data source: Ontario Ministry of Natural Resources and Forestry through Land Information Ontario

Exhibit 2.6: Resource Roads: Classifications



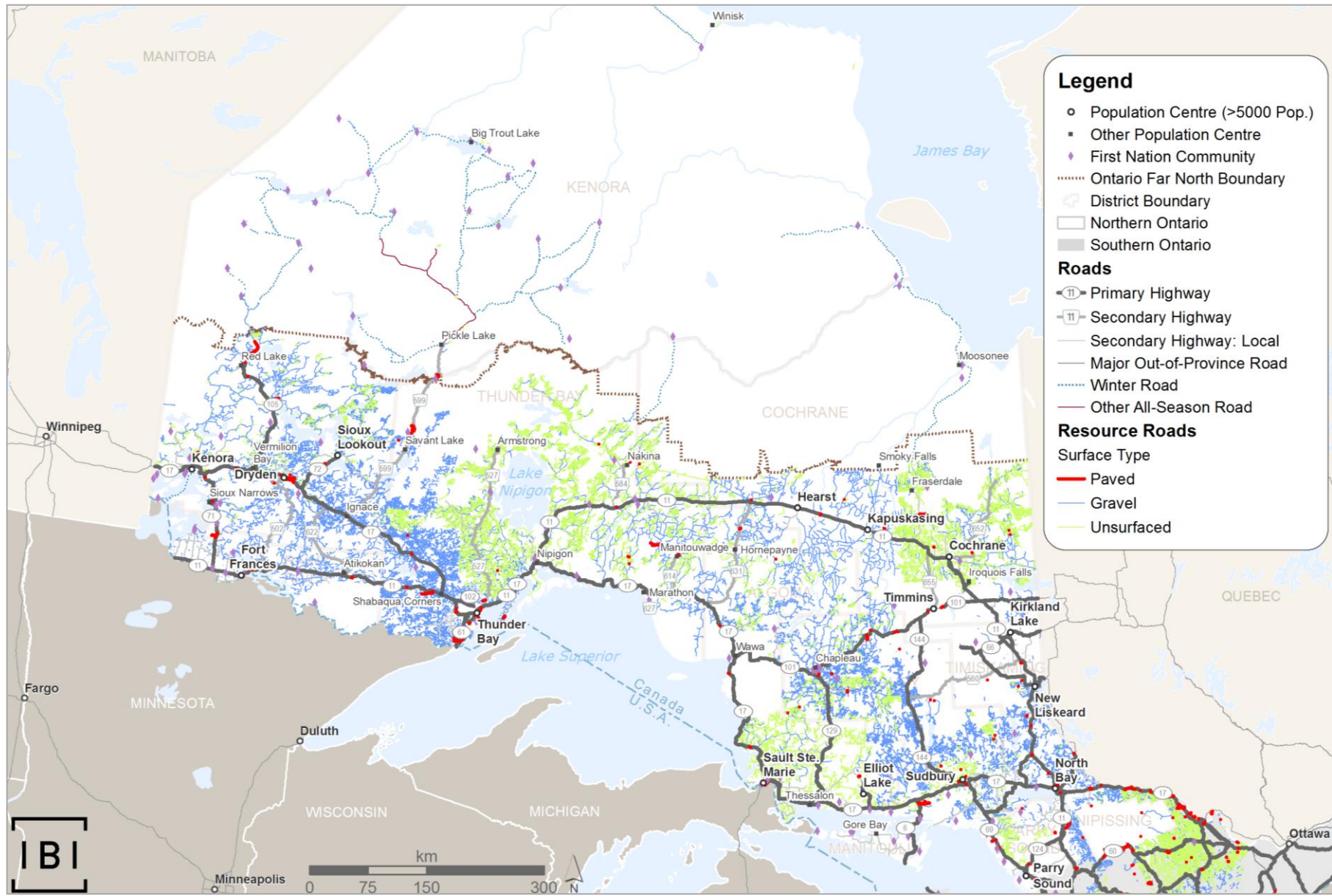
Forest and resource access road data source: Ontario Ministry of Natural Resources and Forestry through Land Information Ontario

Exhibit 2.7: Resource Road: Number of Lanes



Forest and resource access road data source: Ontario Ministry of Natural Resources and Forestry through Land Information Ontario

Exhibit 2.8: Resource Road: Surface Type



Forest and resource access road data source: Ontario Ministry of Natural Resources and Forestry through Land Information Ontario

2.8 Roads Connecting First Nation Communities

Roads that connect First Nation communities to the all-season road network include any combination of the roads described above: provincial highways, NORT roads, forest access roads, or roads maintained by municipalities or local road boards. Where the road is not one of the above, MTO provides funding support for road maintenance, provided the road remains a public road. These roads are discussed further in Chapter 6; Appendix A includes maps showing the locations of these roads as well as tables summarizing the characteristics of these roads.

3 Physical Characteristics of Highway Infrastructure

3.1 Existing Network Characteristics

Number of Lanes

Exhibit 3.1 is a map showing the provincial highway network in Northern Ontario indicating the number of lanes on each segment, including the provision of climbing and passing lanes by direction on two-lane roads. Exhibits 3.2 through 3.5 show the same information at a larger scale for four sub-regions of Northern Ontario⁷.

Most provincial highways in Northern Ontario are two lanes wide, with wider sections of Highways 11 and 17, and Highway 69 near urban centres and at Northern-Southern Ontario connections. In most cases, four-lane provincial highway sections in Northern Ontario are constructed as controlled access, divided highways, rather than simply adding lanes to current 2-lane roadways, with some exceptions within urban areas.

Provincial highways passing through the urban centres of Thunder Bay, Sudbury and North Bay have the highest volumes on the network (see Exhibit 1.2), and are 4-lane routes. The four-laning of Highway 11 south of North Bay, connecting Northern and Southern Ontario, has been completed within the last few years, and there are plans to complete the four-laning of Highway 69, the other Northern-Southern Ontario link, within the next 5 years or so. These Northern-Southern Ontario links are among the highest-volume highway sections in the region outside of urban centres, in the order of 8,000 to 10,000 average daily traffic annually and increasing to approximately 10,000 to 12,000 average daily traffic in summer.

Highway 17 connecting North Bay, Sudbury and Highway 6 have volumes that are generally higher than those along the Northern-Southern Ontario links. There have been some preliminary studies to four-lane portions of this corridor as well, though there is no commitment to constructing these improvements as yet.

⁷ The size of the lines at the map scale of this series of exhibits may make the spacing between passing lanes or climbing lanes appear closer than they are in reality.

Along its length through Northern Ontario, Highway 17 is generally two lanes wide, with provision of climbing and passing lanes throughout, with the exception of sections between Shabaqua Corners and Ignace in Northwestern Ontario — one of the lowest-volume sections of Highway 17 (approximately 2,400 vehicles daily), but with a very high proportion of trucks (approximately 50%).

North of North Bay, daily traffic volumes along Highway 11 generally vary from 4,000 to 7,000 to Kirkland Lake (and are as high as 14,000 through New Liskeard), and are approximately 2,500 to 4,000 vehicles daily from there through to Hearst, after which passenger vehicles are noticeably lower, but truck traffic remains steady through the highway's length in the province.

West of Thunder Bay, Highway 11 has traffic levels in the order of 1,000 vehicles daily, outside of the Fort Frances/Rainy River area. Passing/climbing lane provision is to a degree proportional to traffic levels: along Highway 11, there is more provision of climbing and passing lanes between North Bay and New Liskeard, a less dense provision of climbing/passing lanes from there to the Cochrane area, and only a very few sections with climbing or passing lanes from there for a distance of about 500 km to Nipigon, which is mitigated in part by this part of the route being relatively straight and on flat terrain. There are no climbing or passing lanes on Highway 11 west of Thunder Bay.

Posted Speeds

Exhibit 3.6 is a map showing posted speeds along the Northern Ontario provincial highway network. For most of their distance in Northern Ontario, Highway 11, 17 and 69 are posted at 90 km/h, with speed limits of 100 km/h along 4-lane controlled-access sections. Highway 655 north of Timmins and portions of Highway 66 between Highway 11 and Quebec also have posted speeds of 90 km/h. The remaining provincial highways have posted speeds of 80 km/h, with lower speed limits when passing through communities and urban centres.

Bridges

With numerous lakes, rivers and waterways throughout Northern Ontario, bridges are a common and important part of roadway infrastructure. Exhibit 3.7 shows the locations of bridges in Northern Ontario by length of span, with the bridges shown in red having the longest lengths. There are ten bridges spanning more than 200 m in the region; these listed by highway corridor from west to east below:

- Highway 11 and 17 spanning the Nipigon River in Nipigon;
- Highway 11 from west to east:
 - spanning Rainy Lake east of Fort Frances;
 - spanning the Missinaibi River in Mattice, between Hearst and Kapuskasing;
 - spanning the Mattagami River in Smooth Rock Falls, between Kapuskasing and Cochrane;
 - spanning the Englehart River, between New Liskeard and Kirkland Lake;
 - spanning Trout Creek, approximately 40 km south of North Bay;
 - spanning both the Magnetawan River and Highway 520/Ryerson Centre Road at Burk's Falls, Parry Sound District
- Highway 17 spanning Little Pic River, approximately 30 km northwest of Marathon;
- Highway 64 spanning the French River, approximately 7 km east of Highway 69 in Parry Sound District;
- Highway 652 spanning the Abitibi River east of Cochrane; and
- Highway 548 spanning the St. Joseph Channel to connect Thessalon, on Highway 17, east of Sault Ste. Marie to St. Joseph Island.

As discussed in Section 6, bridges are among the most vulnerable locations on the highway network — not just the longest ones listed above but bridges of all lengths — and are of concern from a highway network reliability and resiliency perspective.

Exhibit 3.1: Northern Ontario Provincial Highways: Number of Lanes

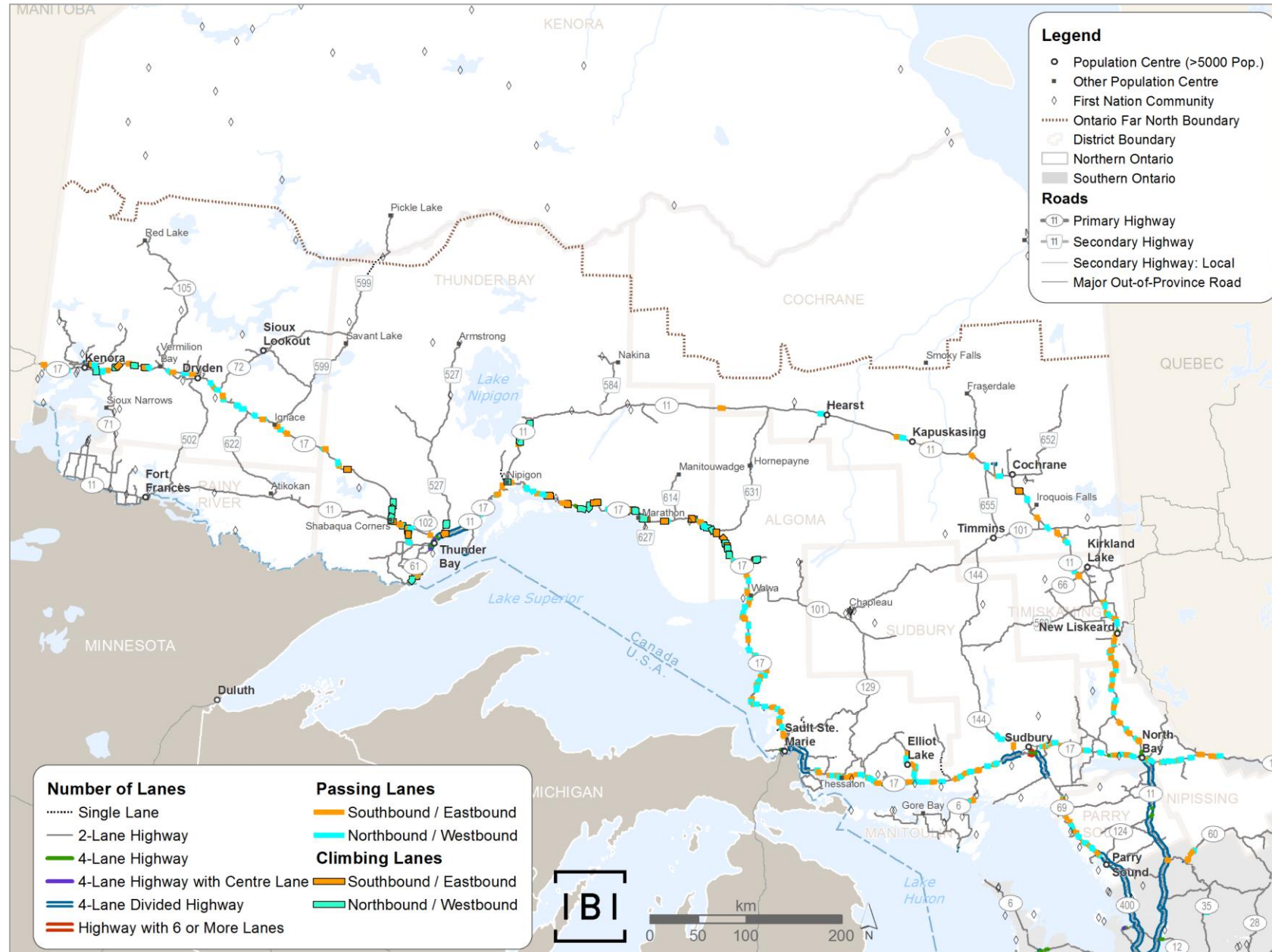


Exhibit 3.2: Northern Ontario Provincial Highways: Number of Lanes, Northwest View

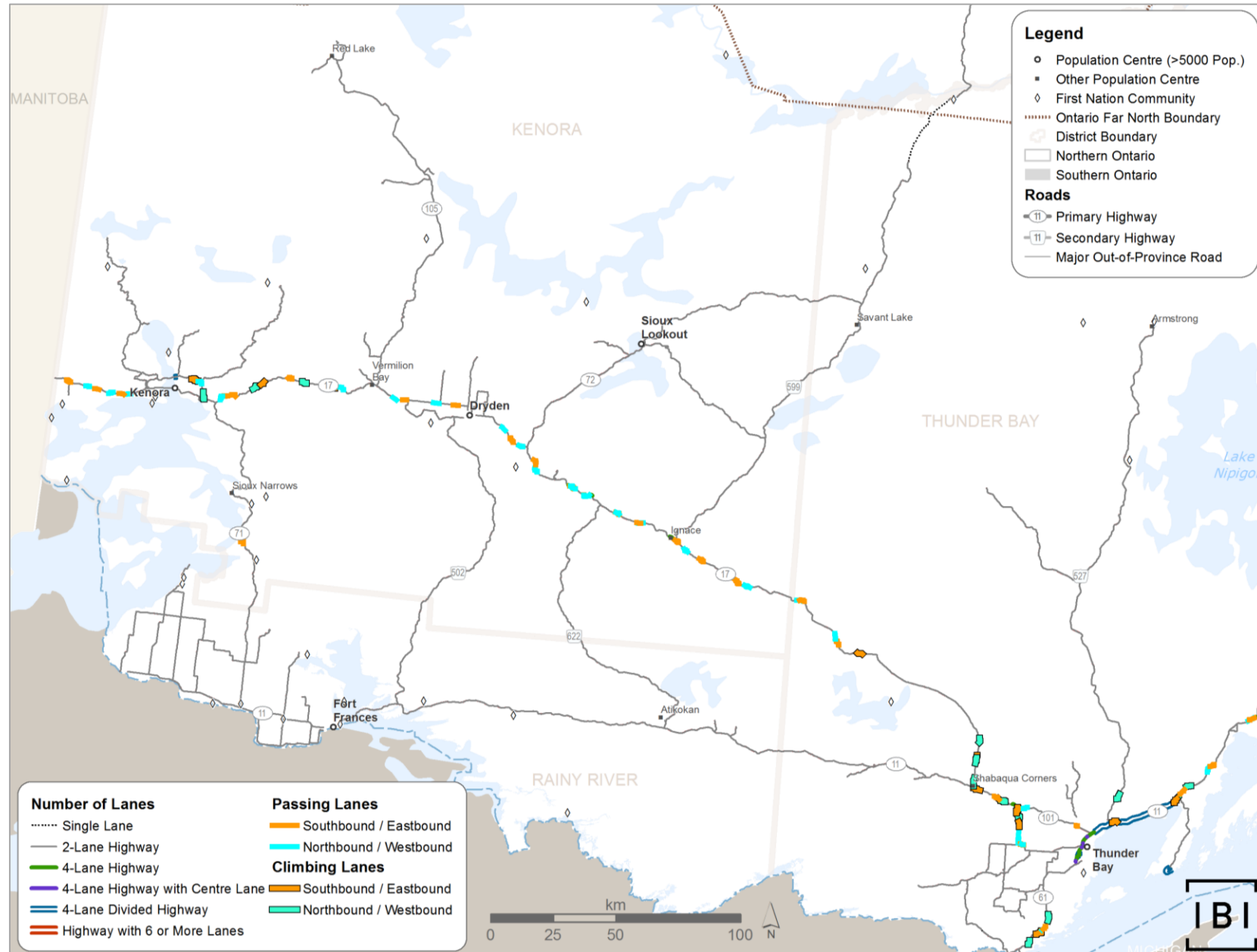


Exhibit 3.3: Northern Ontario Provincial Highways: Number of Lanes, Central View

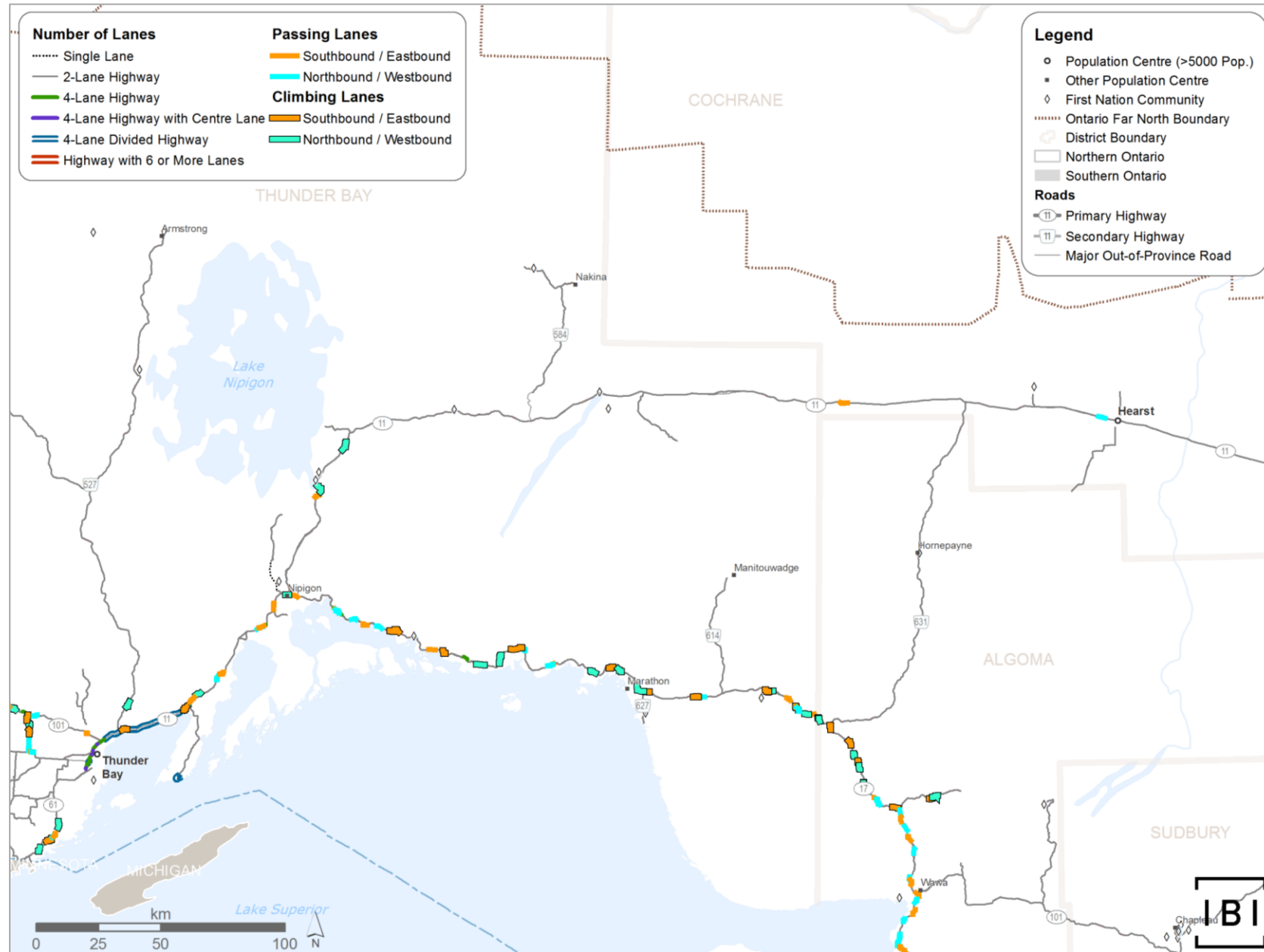


Exhibit 3.4: Northern Ontario Provincial Highways: Number of Lanes, Northeast View

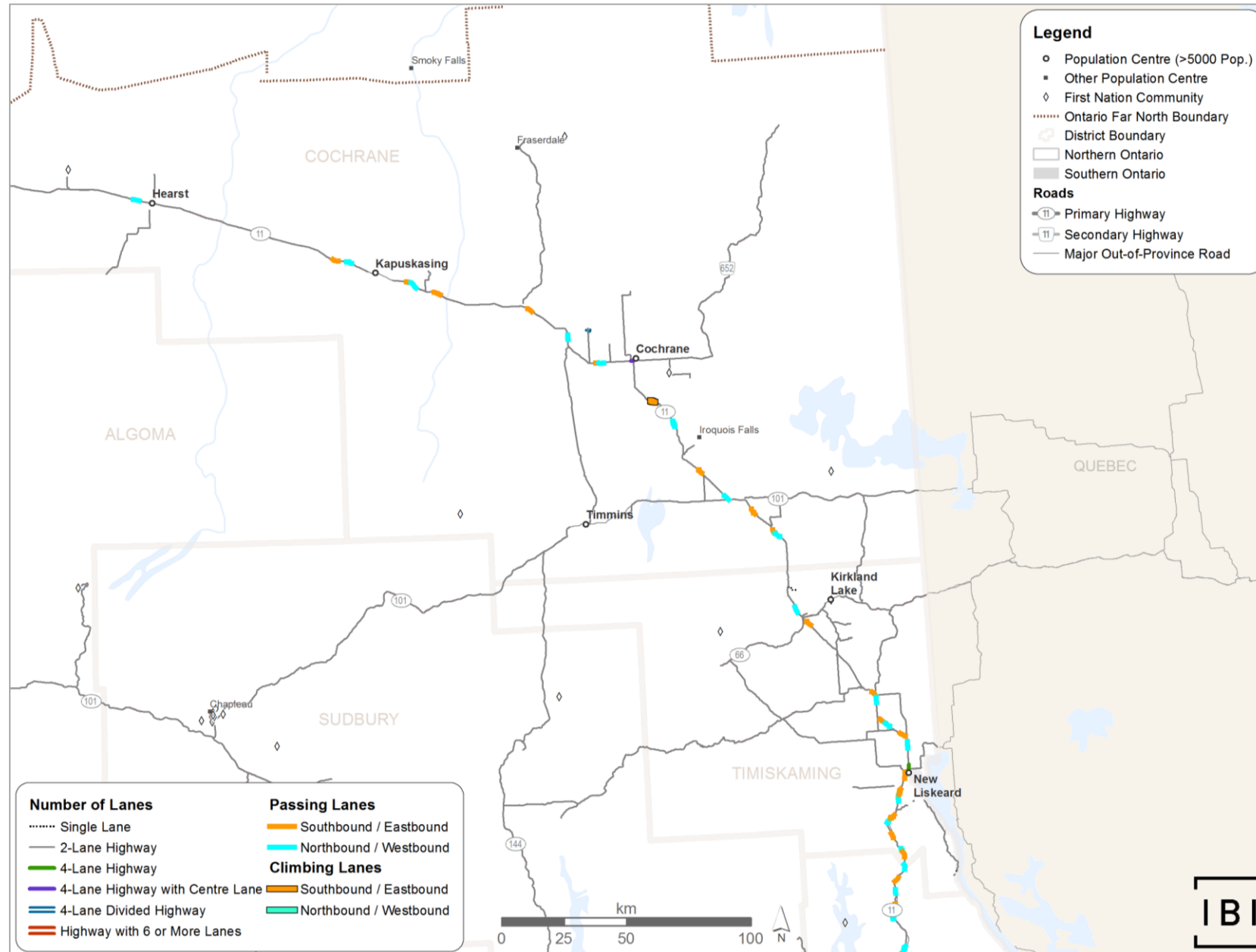


Exhibit 3.5: Northern Ontario Provincial Highways: Number of Lanes, Southeast View

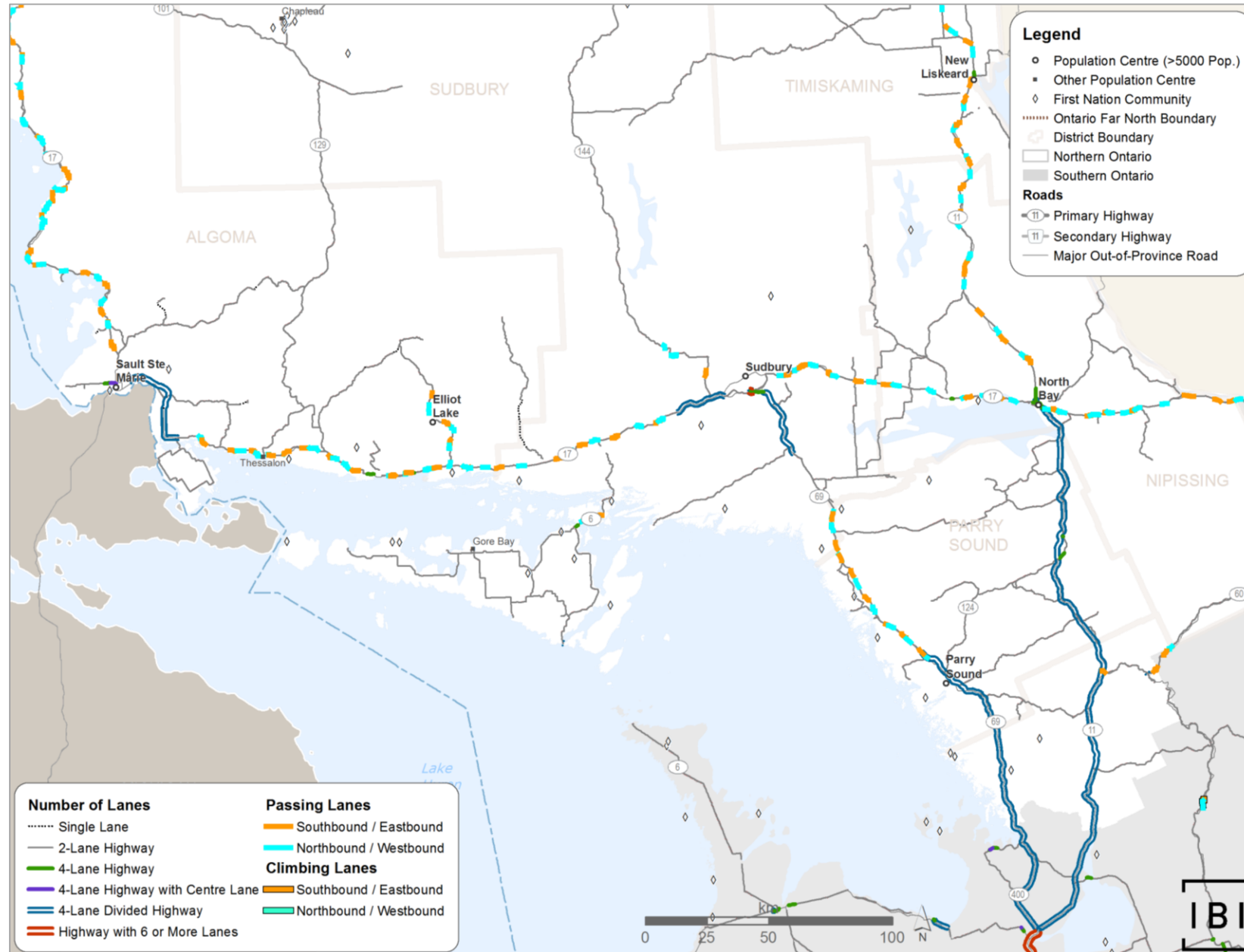


Exhibit 3.6: Northern Ontario Provincial Highways: Posted Speeds

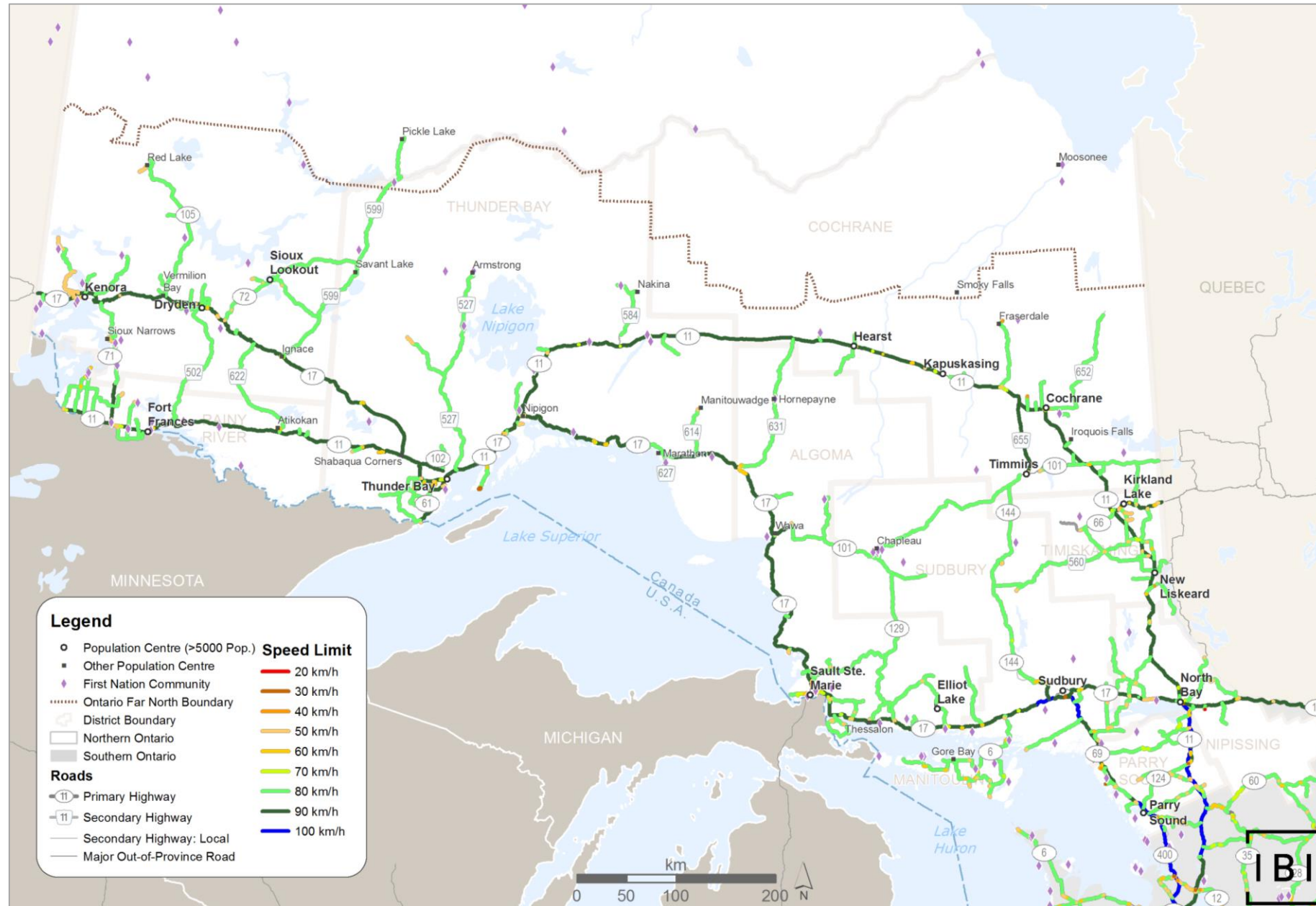
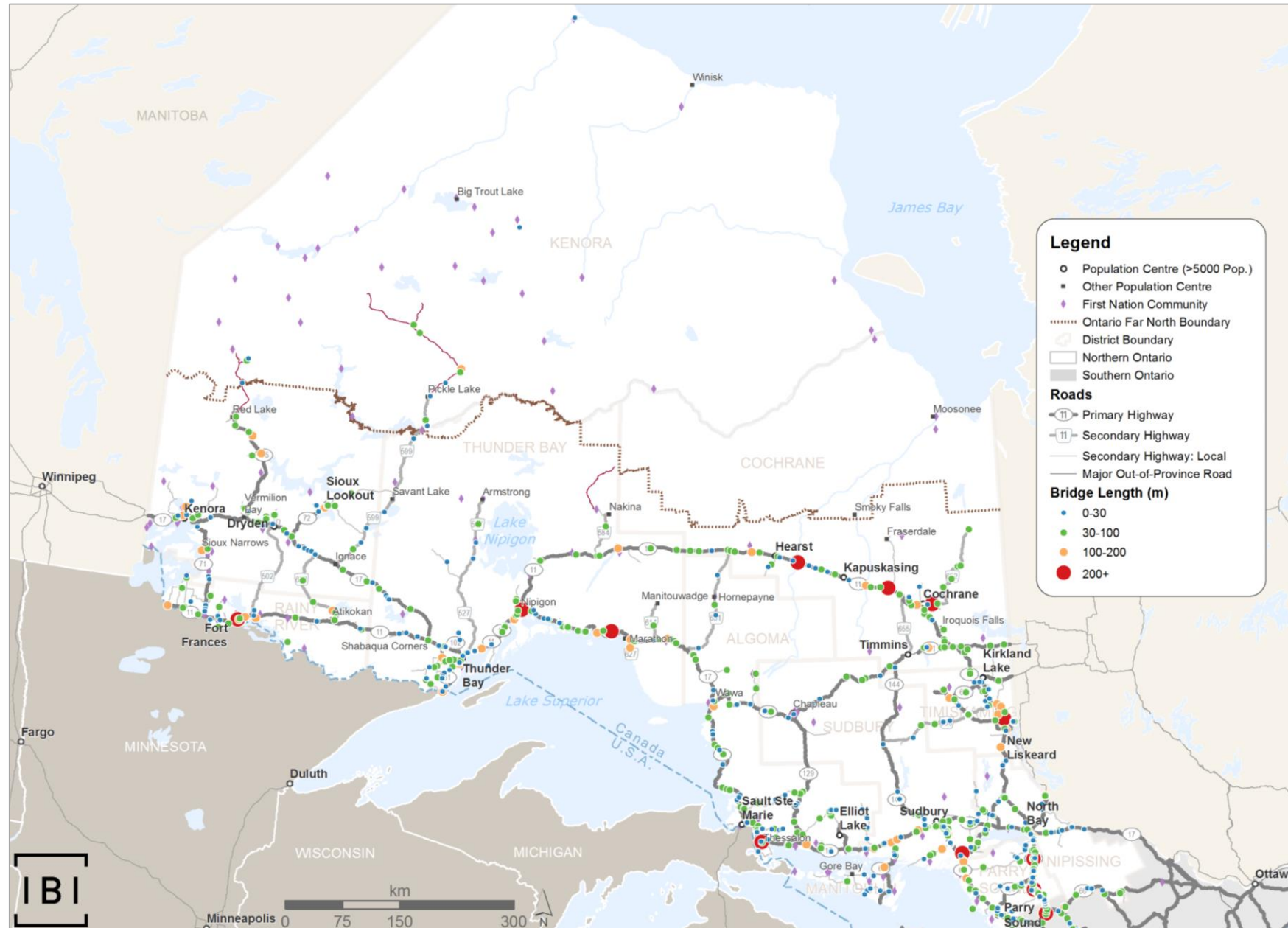


Exhibit 3.7: Northern Ontario Provincial Highways: Bridges



3.2 Geometric Highway Design

MTO has geometric design standards in place for Ontario's highways, though meeting these standards in Northern Ontario can be challenging due to the uneven and rocky terrain of the Canadian Shield, which necessitates cutting, blasting and filling throughout the highway corridor to construct manageable slopes/grades, sufficient right-of-way widths, and horizontal and vertical curves that provide good sight lines, increasing the cost of highway construction substantially compared to the flatter terrain in other parts of the province. The highest elevations in Ontario can be found in the area between Highways 11 and 17 in Northeastern Ontario. (More detail and a topographic map of the region can be found in *NOMTS Working Paper 1: Geographic and Policy Context*, May 2016). There are also numerous lakes, rivers and waterways throughout to consider in designing highway alignments.

Highway traffic volumes are also a significant factor in determining how to allocate available resources to highway improvements: improvements for many highway segments in the North tend to be considered of lower priority than those for higher-volume segments.

Less than desirable geometric design features such as narrow shoulders, close rock outcrop, and tight and sudden vertical and horizontal curves can lead to decreased visibility and an increased risk of collisions, though speed limits and advance warning signs are posted accordingly. Exhibit 3.8 shows some of the more significant examples of less than desirable highway design on primary Northern Ontario provincial highways, and Exhibit 3.9 shows where these are located on the highway network.

Exhibit 3.8: Examples of Primary Highway Locations in Northern Ontario with Less than Desirable Geometric Design Features

HIGHWAY 144: NARROW SHOULDERS, ALTERNATING ROAD SIDE ROCK FACE/ROADSIDE DROP-OFFS



@46.849398, -81.62243

HIGHWAY 129: SIGNIFICANT GRADES, LESS THAN DESIRABLE STANDARD HORIZONTAL AND VERTICAL CURVES



@46.4776039, -83.388475

HIGHWAY 17 AT MONTREAL RIVER: NARROW SHOULDERS, SIGNIFICANT GRADES, LESS THAN DESIRABLE STANDARD CURVES



@47.242542, -84.6343683

HIGHWAY 17 BETWEEN DRYDEN AND HIGHWAY 622: LESS THAN DESIRABLE STANDARD HORIZONTAL CURVES*

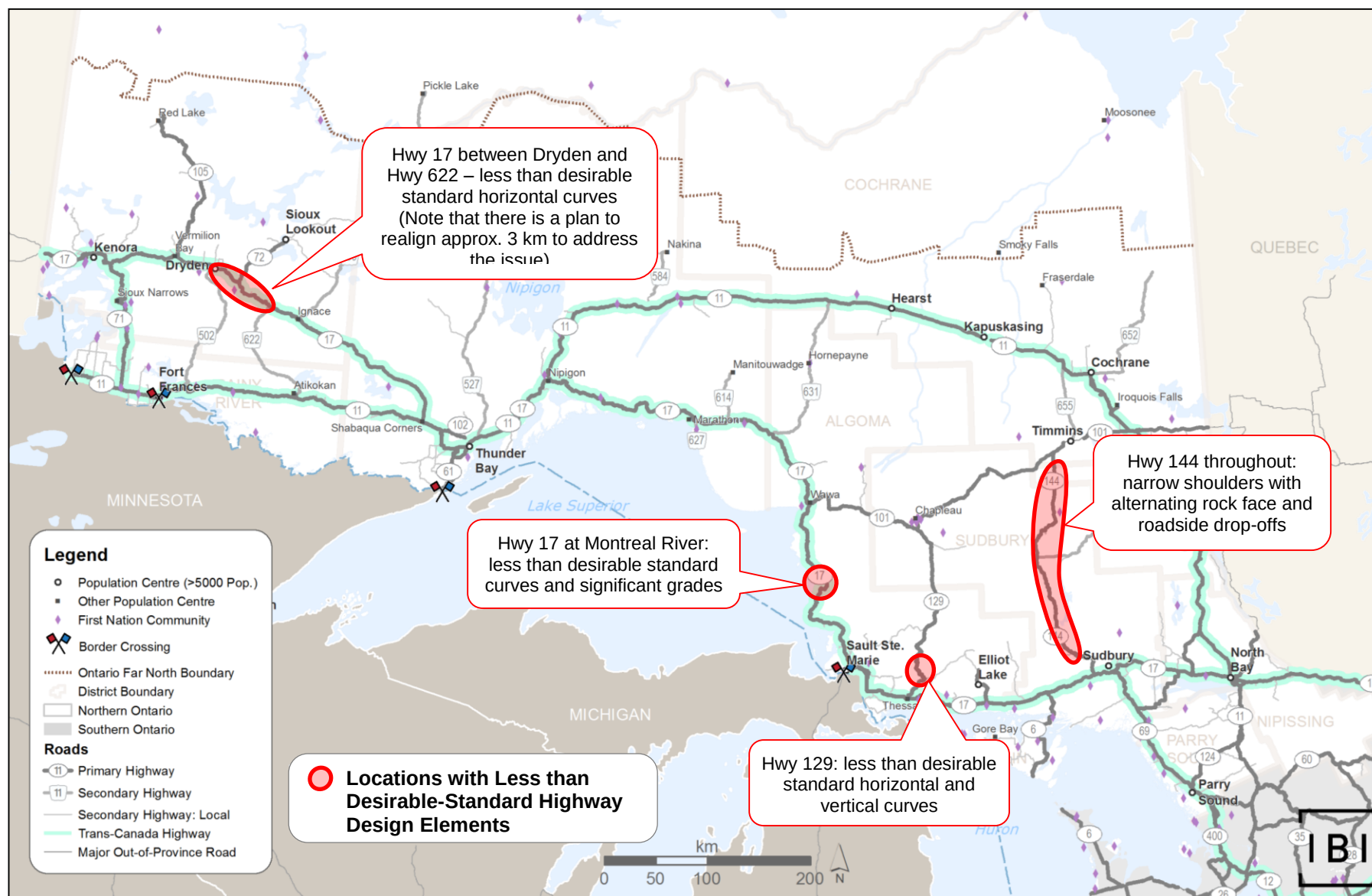


@ 49.627512, -92.440805

Note: * A plan is in place to realign approximately 3 km to address the issue

Source: Google Maps Streetview for images

Exhibit 3.9: Examples of Primary Highway Locations in Northern Ontario with Less than Desirable Standard Highway Elements (Map)



Note: The examples illustrated still meet provincial highway design requirements.

3.3 Planned and Studied Highway Improvements

Northern Ontario Highways Program

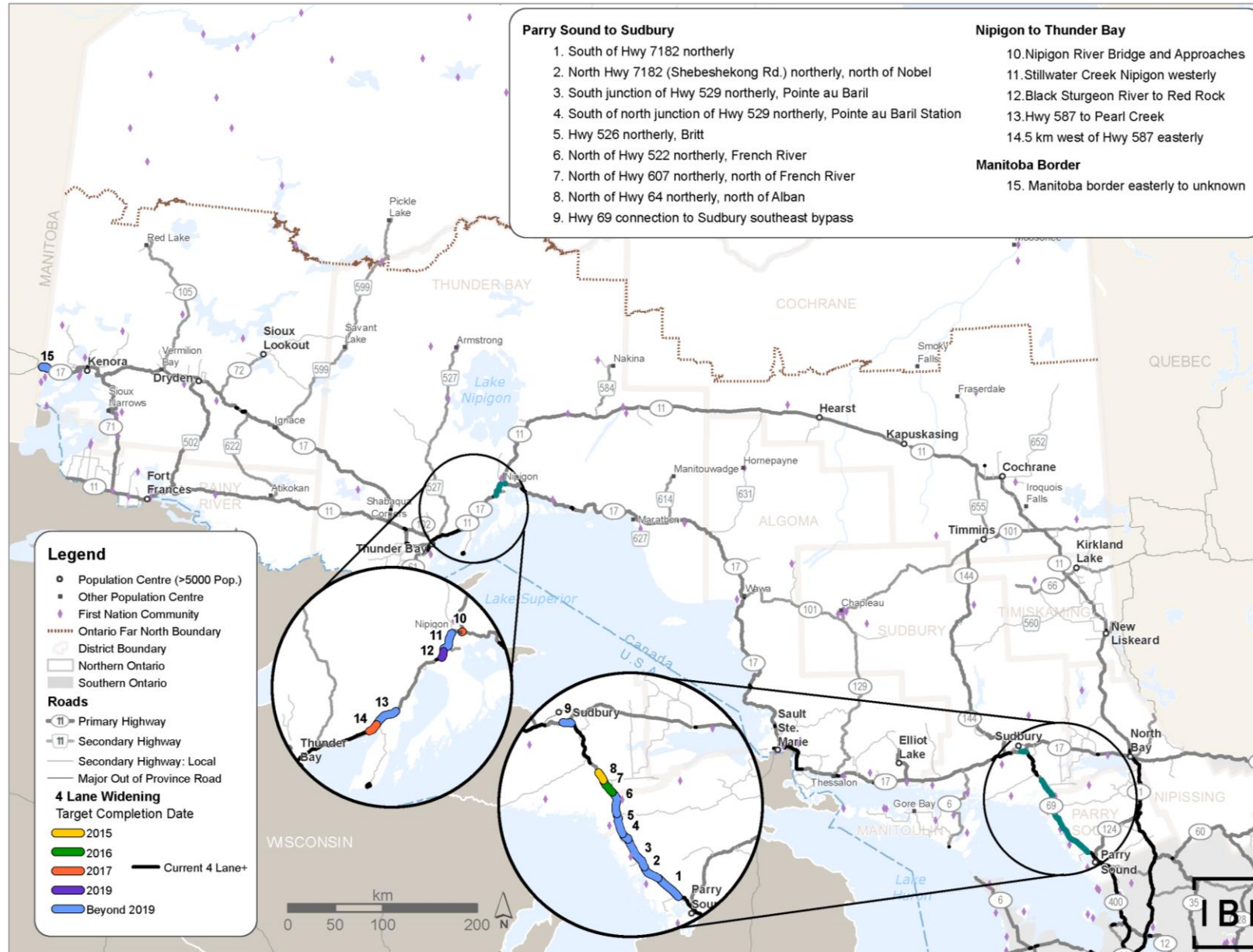
Exhibit 3.10 shows the locations of Northern Ontario highway improvements planned over the next five years according to the 2015–2019 Northern Highways Program. These include the following:

- continuing the four-laning of Highway 69/400 between Sudbury and Parry Sound by extending the four-lane portion from north to south;
- four-laning portions of Highway 11&17 between Thunder Bay and Nipigon, portions that essentially follow the current road alignment; remaining sections will require a degree of re-alignment and will be more costly to implement; and
- four-laning Highway 17 from the Ontario-Manitoba border easterly, for a currently unspecified distance (pending local community agreement).

Previously-Studied Potential Highway Improvements

A number of studies toward highway improvements have been conducted over the past decades, from initial feasibility studies to preliminary designs. These have been initiated to outline options and costs and in some cases to secure future highway alignments. Detail design for identified improvements have not been started. These studies are summarized in Exhibit 3.11, and include improving two of the sections noted in Section 3.2 as having less than desirable standard design features, as well as bypasses of urban areas, four-laning, controlled-access interchanges, and a potential new road.

Exhibit 3.10: Northern Ontario 5-Year Highways Program



Note: Road improvements indicated are based on the 5-Year Roads Program for 2015, and some improvements indicated have already been completed.

Exhibit 3.11: Previously-Studied Highway Improvements



Note: No current degree of commitment to completing the studied improvement is implied with the inclusion of any of the studies listed.

4 Current and Historic Traffic Trends

This section provides an overview of current and historic traffic patterns and trends on the Northern Ontario highway network. Anticipated traffic trends through to 2041 are discussed in Section 11.

Tourism traffic is discussed in more detail in a separate technical backgrounder, and commercial vehicle travel is also discussed further in Chapter 7.

More information is also provided about current passenger vehicle and commercial vehicle travel patterns in the two NOMTS Part 1 survey summary reports (IBI Group 2013a, 2013b) based on findings at individual survey locations, and in MTO's *2012 Ontario Commercial Vehicle Profile* report.

4.1 Current Travel and Traffic Trends

Exhibit 4.1 shows annual average daily passenger and commercial vehicle volumes for trips using the Northern Ontario provincial highway network in 2011. (This map was also shown earlier as the Exhibit 1.2). This plot is based on assigning trips from passenger and commercial travel origin-destination survey data to all road links in a computer model road network, and comparing these link by link with observed traffic volumes on each link, as measured by the Northern Ontario provincial highway traffic measurement program, and substituting the measured volume for the former for locations where the survey data do not fully represent local traffic. (This process is described more fully in Appendix A.) On this plot and on other assignment plots in this document, traffic levels on routes outside of Northern Ontario represent the continuation of trips that use the Northern Ontario highway network, not the total volumes on those routes.

As was noted in Section 3.1, the highest-volume highway segments include those in the urban areas of Thunder Bay, Sudbury, and North Bay, followed by the Northern-Southern Ontario connections of Highways 11 and 69/400. Typical volumes on Highway 17 from Highway 6 through North Bay are higher than those of the Northern-Southern Ontario links.

Exhibit 4.2 and Exhibit 4.3 show 2011 travel flows on the highway network by trip origin-destination type for passenger vehicles and for commercial vehicles, respectively..

Among passenger vehicle trips, most of the highway network primarily serves trips within Northern Ontario. There is only a very small volume of through trips; many travellers prefer to cover long travel distances by air travel rather than by very long road trips. Some highway segments have significant interregional passenger traffic flows, as follows:

- Highway 69/400 serves significant volumes of passenger vehicles travelling to/from the Greater Toronto Area and other parts of Southern Ontario (approximately 4,200 daily). More than half of these interregional trips are to/from the Sudbury area, while much of the remainder continues along Highway 17 west of Sudbury.
- Highway 11 south of North Bay has total passenger vehicle volumes that are comparable to but a bit higher than Highway 69 south of Sudbury (7,500 vs. 6,500 passenger vehicles daily, respectively). It also serves significant volumes of passenger vehicles traveling to/from Southern Ontario (approximately 2,500 vehicles daily), but approximately one-third of the total passenger vehicle volumes are comprised of local travel between communities along Highway 11 such as North Bay, Sundridge, Huntsville, etc.
- Highway 17 east of North Bay serves interregional traffic to/from Northern Ontario — approximately 2,000 passenger vehicle trips daily; these tend to be to/from the Ottawa area.
- Much of the traffic to/from Northern Ontario travelling as far as the North Bay area continues through North Bay and northerly along Highway 11, with these interregional volumes tapering off steadily with increased distance north along Highway 11.
- Highway 61 south of Thunder Bay and Highway 17 west of Kenora also primarily serve interregional travel (approximately 4,000 and 3,200 passenger vehicles, respectively — this is underrepresented in the map plot for Highway 17 west of Kenora, as the travel survey dataset for this location is limited to Ontario-plated vehicles).

Among commercial vehicle travel, travel patterns as shown in Exhibit 4.3 (which has a larger traffic volume scale than Exhibit 4.2), can be seen to be quite different from that of passenger vehicle traffic:

- There is a considerable focus on travel through the region, especially on the routes connecting the major trucking centres of Peel Region (Mississauga, Brampton and Caledon), Montreal and Winnipeg, namely Highway 69/400, Highway 11 east of Thunder Bay, and Highway 17 along its entire length.
- In addition to this commercial vehicle through traffic, commercial vehicle flows between Northern Ontario and Southern Ontario (especially Peel Region) are very prominent, representing approximately two-thirds of the commercial vehicle flows on Highways 69/400 south of Sudbury and Highway 11 south of North Bay (totalling approximately 900 and 700 commercial vehicles daily, respectively, traveling between Northern Ontario and Southern Ontario) ; these Northern-Southern Ontario flows are significant through the Highway

11 corridor continuing northerly from North Bay. In the Northwest, flows to and from Northern Ontario are primarily between Winnipeg and the Kenora or Dryden areas.

- Internal Northern Ontario commercial vehicle flows are also significant on the Trans-Canada network, as well as Highway 6 to/from Manitoulin and Highways 144, 560 and 101 in the Northeast, and on north-south links such as Highways 72, 105, 502 and others in the Northwest.

Exhibit 4.4 shows the proportion of trucks throughout the network. A high proportion of trucks can be frustrating to passenger vehicle drivers when there are limited passing opportunities, due to increased acceleration and deceleration times needed for trucks and increased difficulties trucks have on highway grades; Truck proportions are very significant throughout Northern Ontario: trucks represent over 30% of vehicles on much of Highway 17 from the Manitoba border as far east as Sault Ste. Marie, and on Highway 11 through Northeastern Ontario north of North Bay. Highway 652, which runs from Cochrane to Detour Mine, has the highest proportion of trucks, as it is predominantly used by trucks serving the mining industry.

Northern Ontario also has a much higher proportion of recreational vehicles on many routes than tends to be seen in other parts of Ontario. Anecdotally it has been noted by Northerners that these can cause more frustration than trucks at times: truck drivers tend to be familiar with travelling in Northern Ontario and slow-moving trucks are not as much of an issue as slow-moving recreational vehicles, whose drivers tend to be tourists who are less familiar with driving in the area. Recreational vehicles are part of passenger vehicle travel flows, but are not shown separately from other passenger vehicles in the exhibits in this report due to limited data.

In some 2-lane sections of the highway network, passing lanes have generally not been warranted based on a traffic volume basis, but truck proportions remain high, most notably along Highway 11 from Highway 631 (west of Hearst) to Nipigon, although this is mitigated to a degree by relatively flat terrain and longer sight distances, allowing for more passing opportunities. Similarly, passing lanes on Highway 17 from Shabaqua Corners to Ignace are very limited. Other sections of Highways 11 and 17 with very high truck proportions have a higher level of passing lane and/or climbing lane provision. Highway 144, as well as Highway 560 east of Highway 144 are both routes without passing lanes but have over 30% trucks.

Exhibit 4.5 shows traffic volumes on the Northern Ontario highway network in 5,000-vehicle increments. Volumes are shown in passenger car equivalents (PCEs), where each truck is counted as 2.5 PCEs, due to their longer lengths, increased time needed to accelerate and decelerate, etc. Exhibit 4.6 and Exhibit 4.7 show the same information focused on the Sudbury-North Bay area and Thunder Bay Area, respectively.

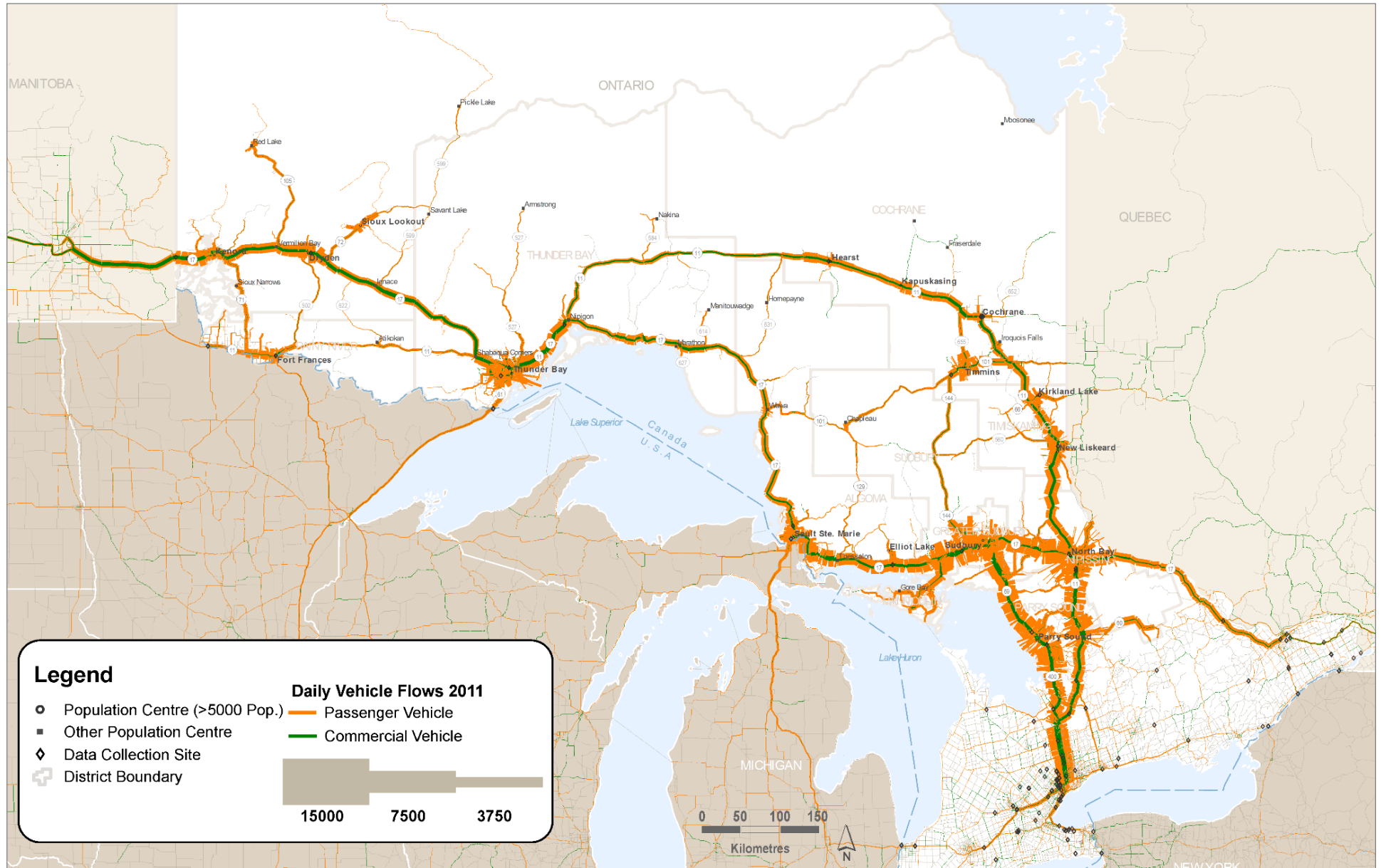
At approximately 10,000 average daily vehicles, increasing the roadway's capacity from 2 lanes to 4 lanes may begin to be considered from a highway capacity perspective. Many factors are considered in the decision to 4-lane a roadway, including the daily distribution and directionality of traffic at peak times, design-hour volume, grade, sight lines, topography, and mix of trucks and cars. On Exhibit 4.5 through Exhibit 4.7, this daily traffic volume level is indicated by the yellow 10,000 to 15,000 PCE links, and on higher-volume magenta links.

Segments of the highway network that are 2-lane links and currently already have PCE values over 10,000 are all in the Sudbury and North Bay areas and include the following:

- Highway 17 west of Sudbury as far as Highway 6;
- Highway 17 immediately east of Sudbury;
- Highway 144 through Chelmsford, west of Sudbury; and
- Highway 17 immediately east and west of North Bay.

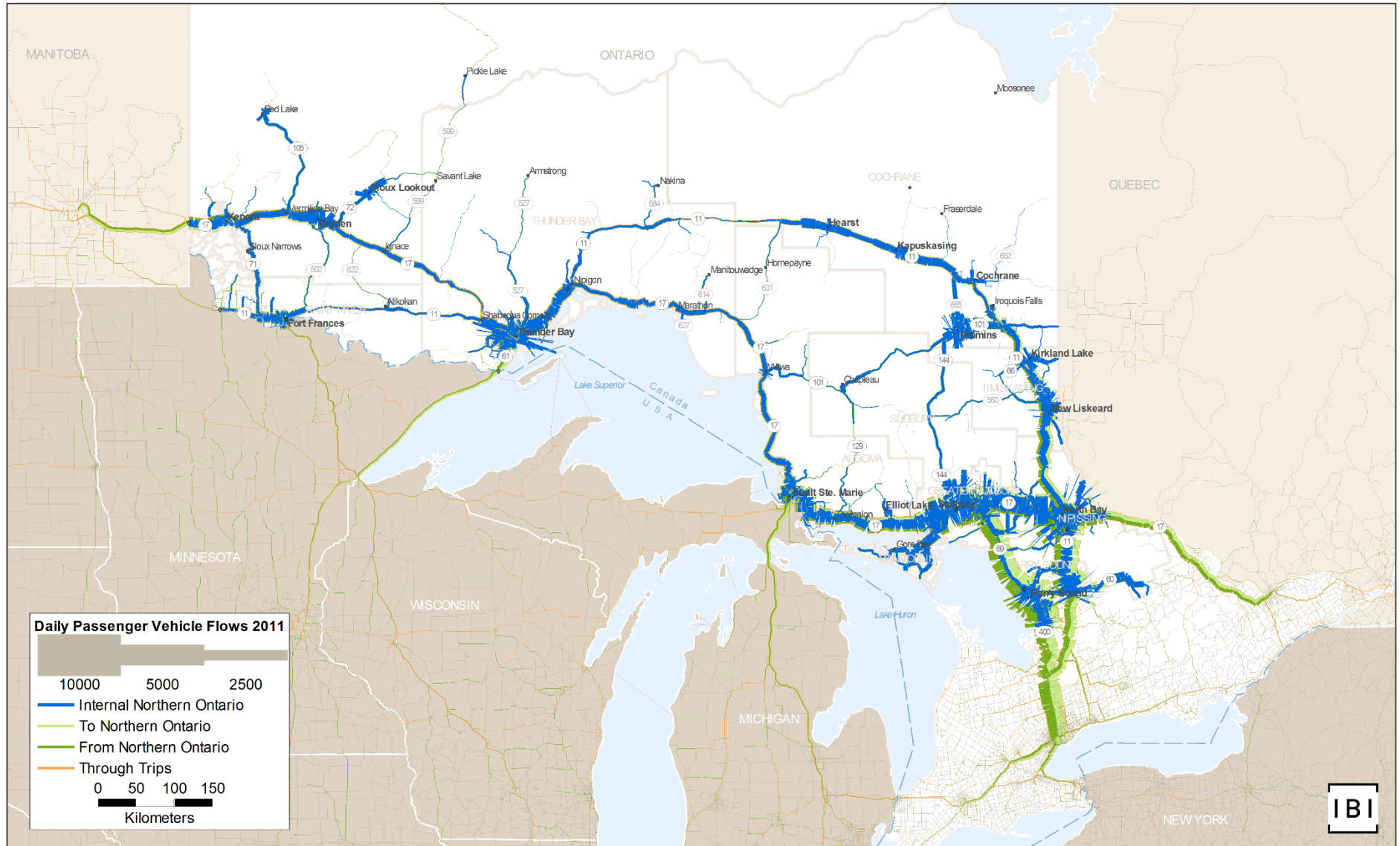
Four-laning these sections could be given consideration in development of the Strategy.

Exhibit 4.1: Passenger and Commercial Vehicle Volumes for Trips Using the Northern Ontario Highway Network, 2011



Source: IBI Group analysis of MTO origin-destination survey data and provincial highway traffic count program data

Exhibit 4.2: Passenger Vehicle Travel Flows by Origin-Destination Type, 2011



Source: IBI Group analysis of MTO origin-destination survey data and highway link traffic count data

Note: there is under-representation of trips to/from Northern Ontario by non-Ontario-plated passenger vehicles at Manitoba and Quebec provincial borders.

Exhibit 4.3: Commercial Vehicle Travel Flows by Origin-Destination Type, 2011



Source: IBI Group analysis of MTO origin-destination survey data and provincial highway traffic count program data

Exhibit 4.4: Proportion of Trucks by Northern Ontario Highway Link, 2011

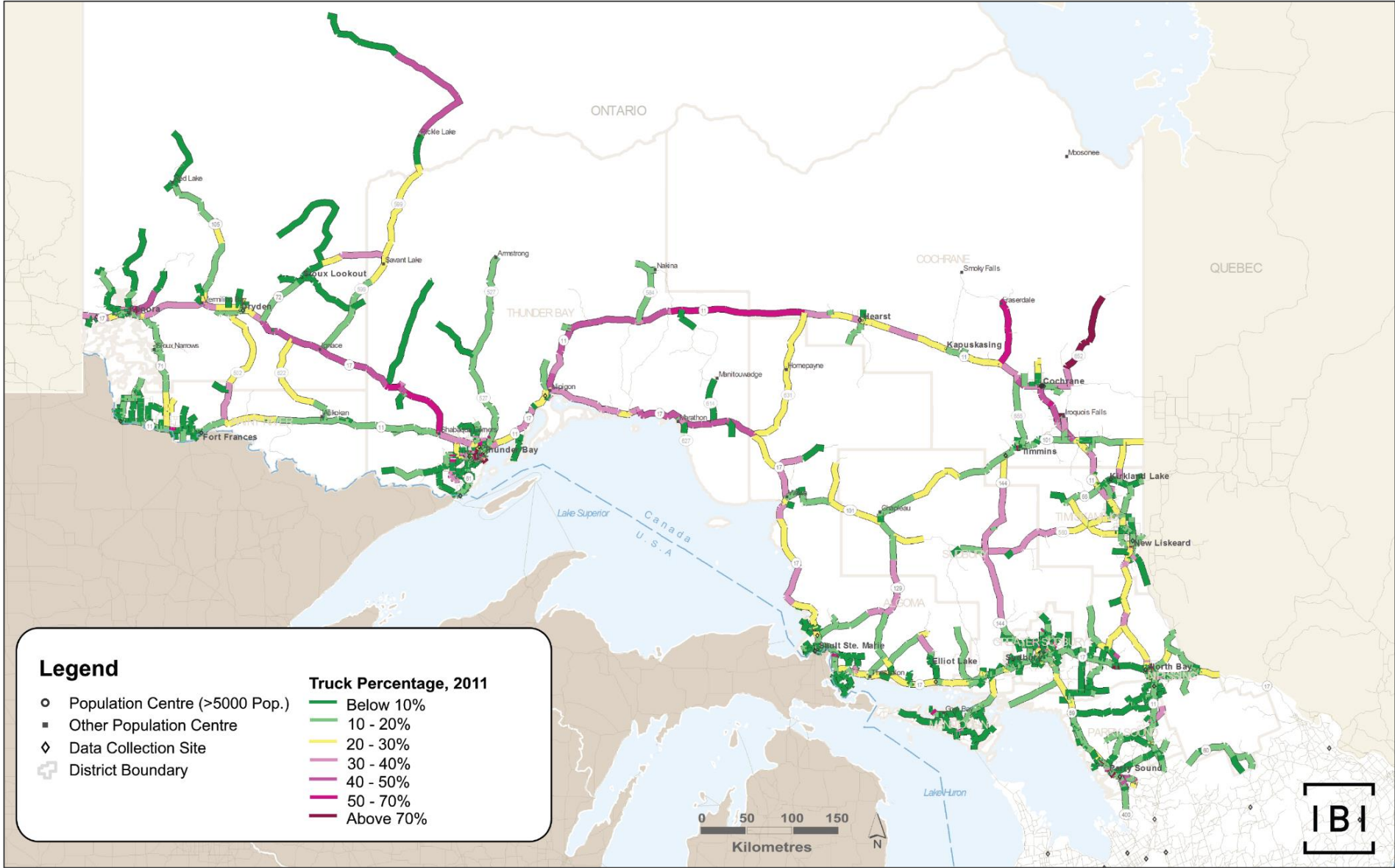


Exhibit 4.5: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011

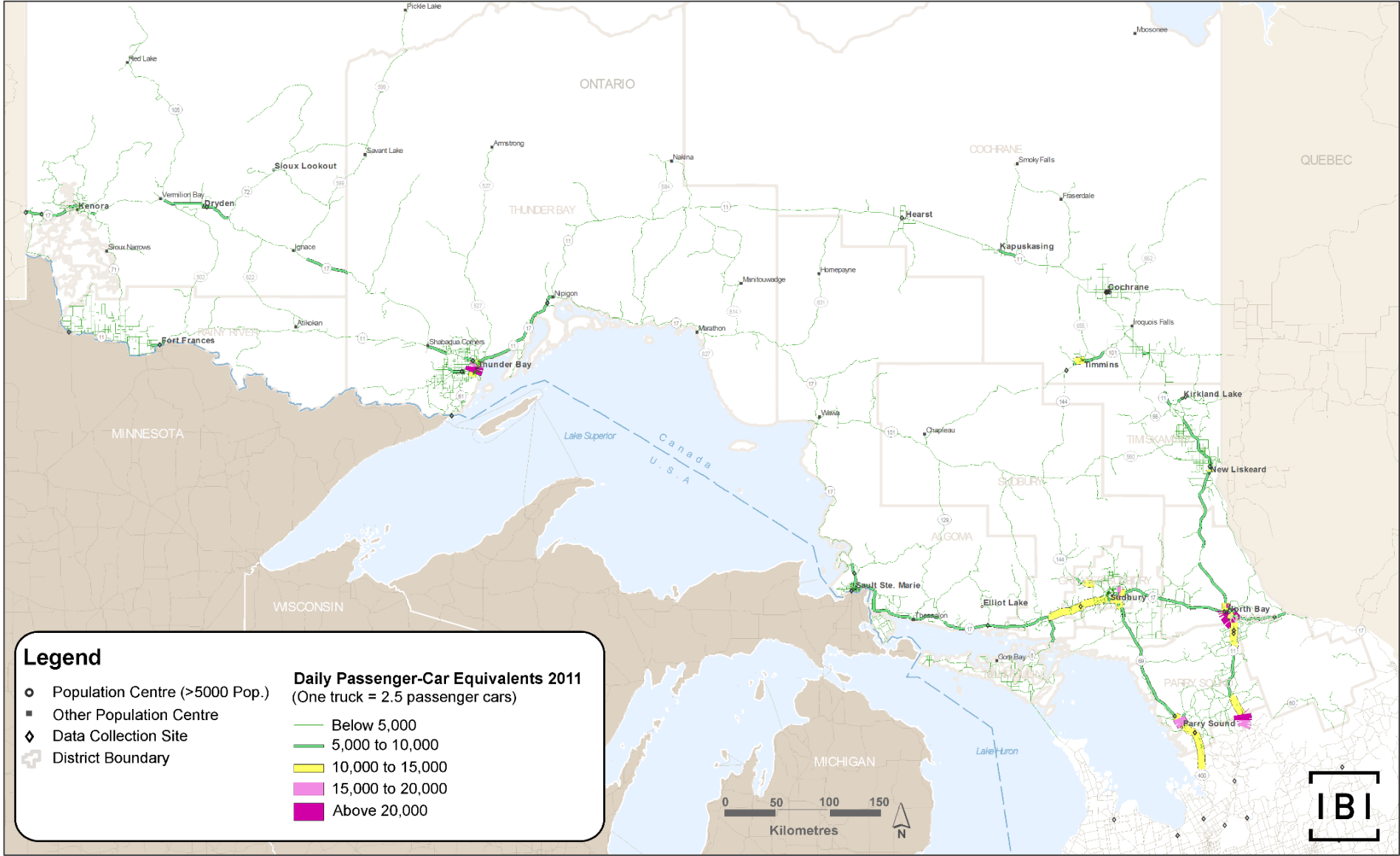


Exhibit 4.6: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011

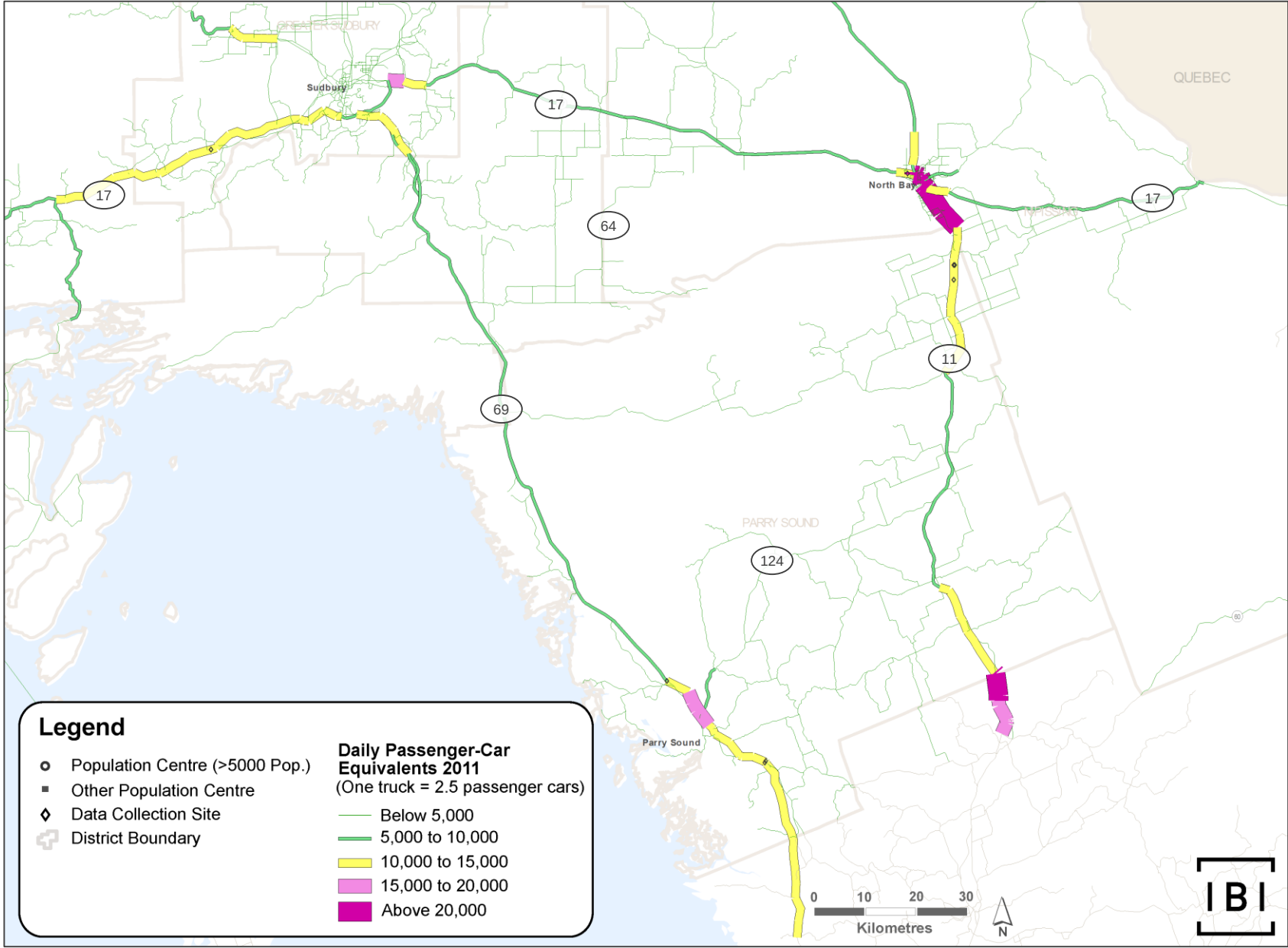
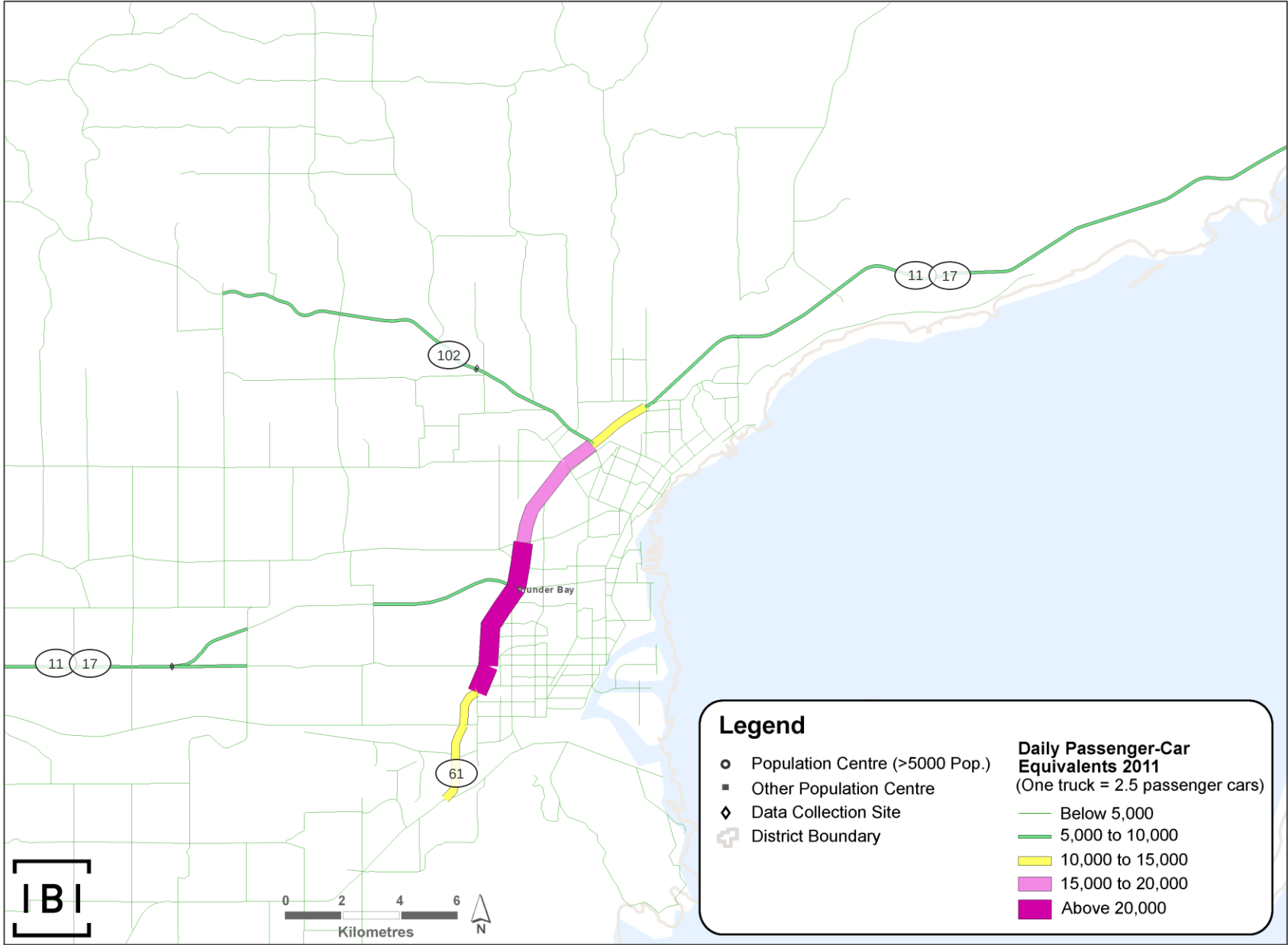


Exhibit 4.7: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011



4.2 Seasonal Traffic Trends

Northern Ontario highways see considerable variation in traffic levels by season, due largely to the attractiveness of Northern Ontario for tourism and recreation, especially in the summer months, as well as to reduced travel in winter when road conditions are not ideal for driving, such as snow squalls or snowy or icy road surfaces.

Exhibit 4.8 shows the seasonal variation of traffic levels on the Northern Ontario highway network. Commercial vehicle volumes are assumed to be relatively consistent through the year, while most of the variation is due to passenger vehicle variation. Passenger vehicle volumes increase on average 65% overall over the network between winter and summer months, and summer average daily passenger vehicle traffic is 30% higher than average daily traffic overall. The amount of increase varies by area, and much of this additional traffic is seen on summer weekends. Including commercial vehicle traffic, summer traffic volumes are 24% higher than average annual volumes overall.

The largest seasonal variability can be seen in two “gateway” locations reflecting routes to popular tourism/recreation locations in Northern Ontario: Highway 400 south of Parry Sound, as well as Highway 17 from the Manitoba border to Kenora (and Lake of the Woods recreation areas). Passenger vehicle volumes more than double between winter and summer months along these routes.

4.3 Historic Traffic Trends

Exhibit 4.9 is a map plot showing historic changes along the Northern Ontario highway network over the 10-year period 2001 to 2011. Overall, growth has been generally stable, with some slight declines and increases in traffic throughout the network. Many of the changes in highway link traffic volumes are quite small, and may be attributed to random variation in traffic at the time of the counts program from year to year.

Two corridors in Northeastern Ontario with a slight but consistent increase in traffic include the following:

- the Highway 69/400 corridor; and
- Highway 17 from Highway 108 (toward Elliot Lake) easterly through Northeastern Ontario, particularly between Highway 6 (toward Manitoulin) and Sudbury.

Over this time period, there were the following concurrent population changes in the area (from the NOMTS *Socio-Economic Context Working Paper*, February 2016):

- a slight net increase in population in the Sudbury area (an increase in population in the city of Greater Sudbury from 161,000 to 165,000, but a decrease in Sudbury District from 24,000 to 22,000), and increased population in Parry Sound District (from 41,000 to 43,000 population);
- fairly stable population in North Bay and in Manitoulin, and
- a slight decline in population within Algoma District (from 124,000 to 119,000).

Highway 17 has also seen a slight increase in traffic for much of the corridor from the Manitoba border through Thunder Bay, continuing as far as Wawa. Some of this increase in volumes may be attributed to a slight increase in truck traffic volumes along the TransCanada highways in Ontario, particularly in the westbound direction over this period. Over this period, Kenora District has also had an increase in population (from 67,000 to 70,000), with most growth taking place outside of the city of Kenora. Meanwhile, the Thunder Bay District population has decreased (from 157,000 to 150,000)

Exhibit 4.8: Seasonal Variation of Traffic Volumes in Northern Ontario

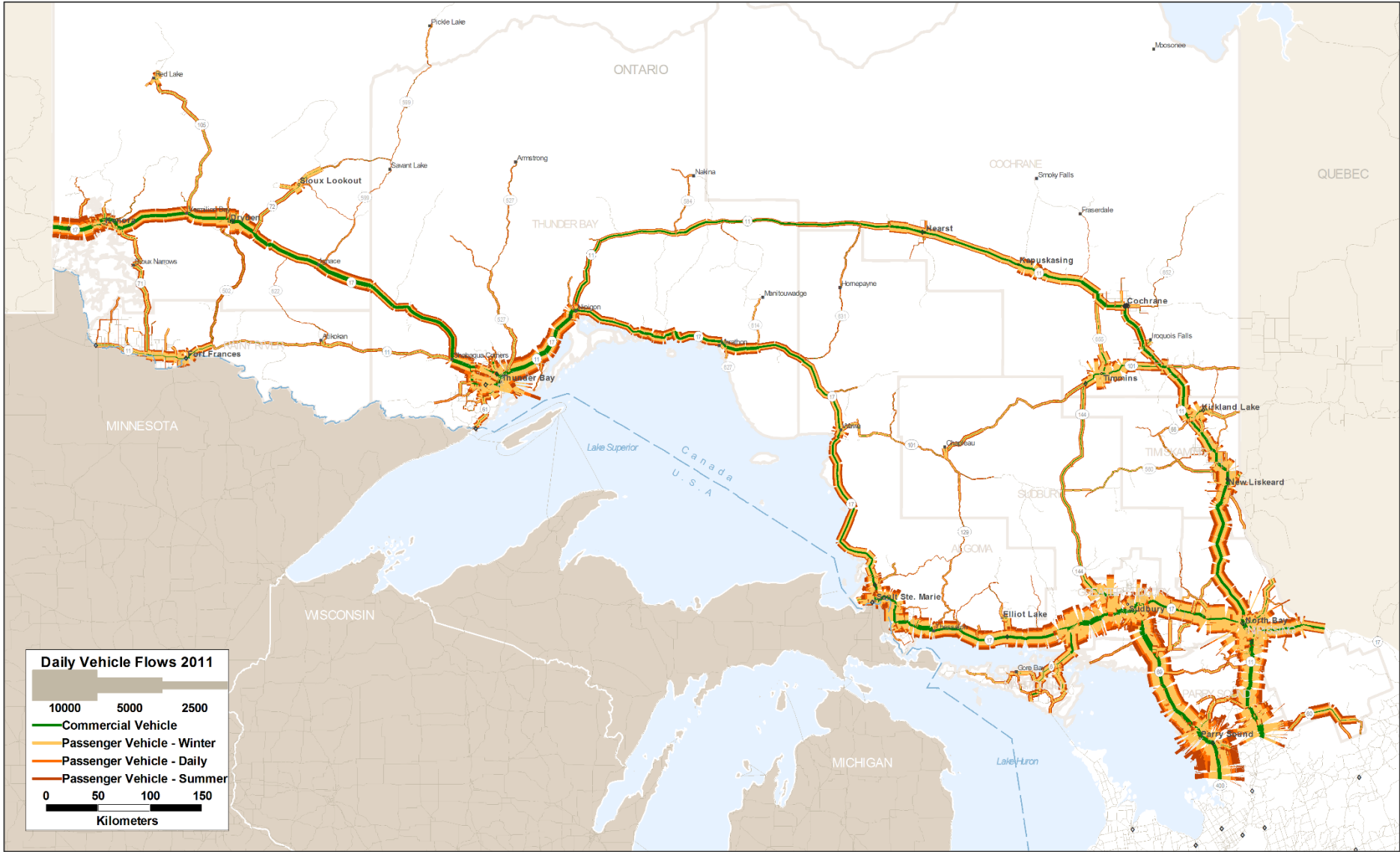
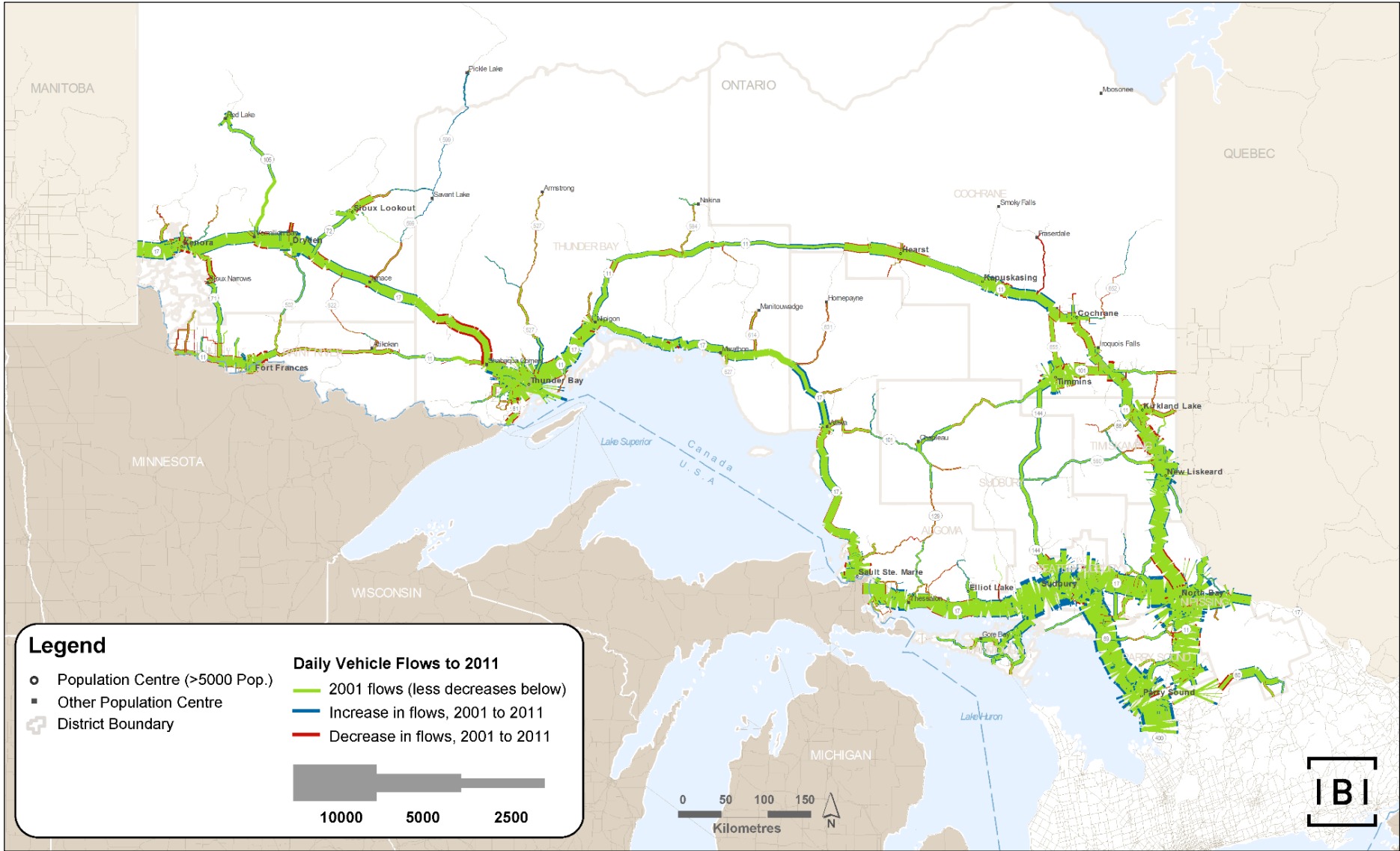


Exhibit 4.9: Historic Provincial Highway Traffic Trends in Northern Ontario, 2001 to 2011



5 Maintenance

This section provides an overview of some of the maintenance processes and standards relating to provincial and municipal roads in Northern Ontario.

5.1 Area Maintenance Contracts

Summer and winter maintenance of provincial highways under MTO responsibility is contracted to private service providers under Area Maintenance Contracts (AMCs). The eight AMC areas covering Northern Ontario highways are shown in Exhibit 5.1. Contract compliance is evaluated based on results, and contractors may use a variety of methods to achieve Ministry-specified requirements. (Previously, the contractor's performance was based on compliance with ministry-specified methods.)

5.2 Winter Road Maintenance

With cold temperatures and frequent snow falls, maintaining Northern Ontario's roadways is a constant challenge, with frequent snow plowing and de-icing required.

For de-icing, salt can be used, but it becomes less effective for melting snow and ice at temperatures below minus 12°C, and is not effective below minus 18°C. At colder temperatures, sand may be used to improve friction.

Provincial Highways

All winter highway maintenance work in Ontario is delivered by contractors, as noted in Section 5.1 above.

Performance standards for winter road maintenance are based on the time frame for restoring bare pavement (i.e. clearing the road completely of snow) after a snowfall. The standard time frame varies based on highway type. Exhibit 5.2 summarizes the winter snow clearing performance targets by highway type. The Province holds the contractor accountable by ensuring the standards are met 90% of the time.

Exhibit 5.1: Northern Ontario Area Maintenance Contract Areas for Highways

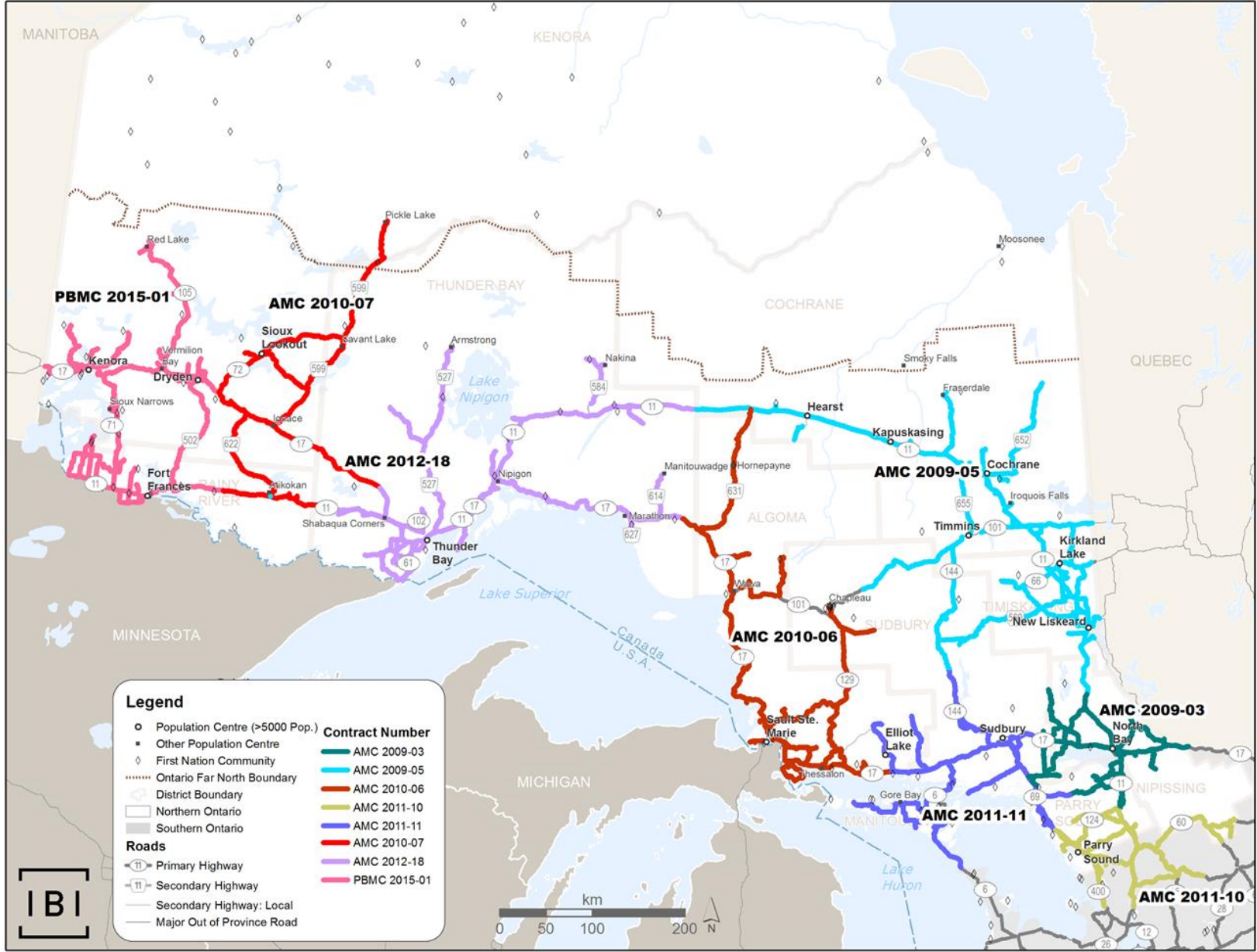


Exhibit 5.2: Provincial Highway Snow Clearing Standards by Highway Class

Highway Class	Winter Volumes (Average Vehicles per Day)	Northern Ontario Example	Bare Pavement Standard
1	>10,000	4-lane sections of Hwy 11	Bare pavement within 8 hours of the end of a winter storm
2	1,500 – 10,000	Hwy 17	Bare pavement within 16 hours of the end of a winter storm
3	800 – 1,500	Hwy 144	Bare pavement within 24 hours of the end of a winter storm
4	400 – 500	Hwy 516	Centre bare pavement (2.5m in the centre strip) within 24 hours of the end of a winter storm – full clearing when conditions permit
5	<400	Hwy 622	Snow packed surface within 24 hours of the end of a winter storm – sand is applied where friction is required

Municipal Highways

The Province also sets maintenance standards for municipal highways through regulations under the *Municipal Act*. The maintenance standards vary by highway class, defined as a function of traffic volumes and posted speeds, as shown in Exhibit 5.3.

Exhibit 5.3: Municipal Highway Classes Used for Application of Maintenance Standards

Average Annual Daily Traffic (number of motor vehicles)	Posted or Statutory Speed Limit (km/h)						
	91 - 100	81 - 90	71 - 80	61 - 70	51 - 60	41 - 50	1-40
15,000 or more	1	1	1	2	2	2	2
12,000 - 14,999	1	1	1	2	2	3	3
10,000 - 11,999	1	1	2	2	3	3	3
8,000 - 9,999	1	1	2	3	3	3	3
6,000 - 7,999	1	2	2	3	3	3	3
5,000 - 5,999	1	2	2	3	3	3	3
4,000 - 4,999	1	2	3	3	3	3	4
3,000 - 3,999	1	2	3	3	3	4	4
2,000 - 2,999	1	2	3	3	4	4	4
1,000 - 1,999	1	3	3	3	4	4	5
500 - 999	1	3	4	4	4	4	5
200 - 499	1	3	4	4	5	5	5
50 - 199	1	3	4	5	5	5	5
0 - 49	1	3	6	6	6	6	6

Source: Municipal Act, 2001, Ontario Regulation 239/02, s. 1

Because winter presents more weather-related maintenance challenges, the regulations provide detailed standards for snow and ice clearing. The regulations specify that between October 1 and April 30, current and forecasted weather must be checked at least three times per calendar day to maintain an awareness of when there may be a potential need for clearing snow and ice. Snow clearing standards for municipal highways are as follows:

- Municipalities must begin snow clearing once snow has accumulated to a depth greater than those set out in Exhibit 5.4.
- When the snowfall has ended, municipalities must reduce the snow depth to less than or equal to the guideline depth and within the time frame set out in Exhibit 5.4.
- Lanes must be cleared to a minimum width of three metres or the actual lane width, and Class 4 and 5 highways with two lanes must be cleared to a minimum total width of five metres.

Exhibit 5.4: Municipal Highway Snow Clearing Standards

Highway Class*	Snow Depth (cm)	Clearing Time Maximum (Hours)
1	2.5	4
2	5	6
3	8	12
4	8	16
5	10	24

Note: * Refer to Exhibit 5.3 for an explanation of highway classes for municipal road maintenance.

Source: *Municipal Act, 2001*: Ontario Regulation 239/02, s.3

Municipalities must also monitor their highways for ice formation. If there is a significant probability of ice formation the roadway must be treated to prevent ice formation within the time frame identified by highway class in Exhibit 5.5. When a municipality becomes aware that a highway is icy, the same timeframes apply for taking corrective action.

Exhibit 5.5: Municipal Highway Ice Formation and Prevention Standards

Highway Class*	Ice-Clearing Time (Hours)
1	3
2	4
3	8
4	12
5	16

Note: * Refer to Exhibit 5.3 for an explanation of highway classes for municipal road maintenance.

Source: Municipal Act, 2001, Ontario Regulation 239/02 (O. Reg. 47/13, s. 5)

5.3 Other Municipal Road Maintenance Standards

The *Municipal Act* sets other standards for road patrolling frequencies and road maintenance relating to potholes, debris, pavement cracks, luminaires, shoulder drop offs, bridges, traffic control systems, signage, roadway and sidewalk surface discontinuities. The example of pothole repair is described in further detail below.

The act provides standards on pothole repair on municipal highways. If a pothole exceeds a certain surface area and depth, the Act sets a maximum timeframe for repairing the damage. The standards by highway class are summarized in Exhibit 5.6 through Exhibit 5.8.

Exhibit 5.6: Pothole Repair Standards: Paved Surface of Highway

Highway Class*	Surface Area	Depth	Maximum Time
1	600 cm ²	8 cm	4 days
2	800 cm ²	8 cm	4 days
3	1,000 cm ²	8 cm	7 days
4	1,000 cm ²	8 cm	14 days
5	1,000 cm ²	8 cm	30 days

Note: * Refer to Exhibit 5.3 for an explanation of highway classes for municipal road maintenance.

Source: Municipal Act, 2001, Ontario Regulation 239/02, s. 6, Table 1

Exhibit 5.7: Pothole Repair Standards: Non-Paved Surface of Roadway

Highway Class*	Surface Area	Depth	Maximum Time
3	1,500 cm ²	8 cm	7 days
4	1,500 cm ²	10 cm	14 days
5	1,500 cm ²	12 cm	30 days

Note: * Refer to Exhibit 5.3 for an explanation of highway classes for municipal road maintenance.

Source: Municipal Act, 2001, Ontario Regulation 239/02, s. 6, Table 2

Exhibit 5.8: Pothole Repair Standards: Paved or Non-Paved Surface of Shoulder

Highway Class*	Surface Area	Depth	Maximum Time
1	1,500 cm ²	8 cm	7 days
2	1,500 cm ²	8 cm	7 days
3	1,500 cm ²	8 cm	14 days
4	1,500 cm ²	10 cm	30 days
5	1,500 cm ²	12 cm	60 days

Note: * Refer to Exhibit 5.3 for an explanation of highway classes for municipal road maintenance.

Source: Municipal Act, 2001, Ontario Regulation 239/02, s. 6, Table 3

6 Roads Connecting First Nations

First Nations reserves and communities are located throughout Northern Ontario, and connect in various ways to the region's multimodal transportation system.

An extensive winter roads program is put in place each winter to provide seasonal access to some 30 remote First Nations, primarily in the Far North of Ontario, from approximately mid-January to late March. Winter roads that provide access to remote First Nations are described in a separate technical backgrounder.

Where First Nations are connected by all-season roads to the provincial highway network, a variety of agencies may be involved in the maintenance of the connecting road, and there can be confusion as to how to ensure that necessary improvements or maintenance are carried out.

An overview map showing the locations of the roads connecting First Nations to the provincial highway network is provided in Exhibit 6.1. Four detailed regional maps showing the locations of each connecting road are provided in Appendix A, along with tables describing the characteristics of each connecting road.

This section summarizes these connecting roads, including a description of the various agencies, programs and policies that may be involved, and provides a brief overview of community concerns heard as part of NOMTS information-sharing sessions.

Exhibit 6.1: Overview Map of Roads Connecting First Nation Communities



6.1 Responsibilities, Programs and Policies

The Province's main interest in road maintenance is to ensure that all public roads meet certain quality standards. In some cases it may take more funding than is available from community sources to maintain these standards on roads that are not provincial highways. Funding assistance can be available from the Province under various programs to maintain public roads, though a requirement of any provincial funding for road construction or maintenance is that the road must remain open to public use.

For provincial road funding programs, a distinction is made between roads within First Nation reserve boundaries and those outside of reserve boundaries. Funding assistance for maintaining roads within First Nation reserve boundaries is available from the Province's First Nations Roads Program, described further below.

Road Responsibilities

Outside of First Nation reserve boundaries, roads that connect First Nation communities to the provincial highway network are typically located in unincorporated territory and may be the responsibility of a provincial agency. For roads that fall within unincorporated land and are not the responsibility of Local Roads Boards, the community can apply for road maintenance assistance with MNDM under the Unincorporated Roads program (described in Section 2.6). Less frequently, portions of the connecting roads fall under the responsibility of municipalities or of Local Roads Boards. Various Northern Ontario roadway responsibilities and funding are described in more detail in Section 2 of this technical backgrounder. These are summarized below as they relate to roads connecting First Nations in Northern Ontario.

Provincial Highways

The Province through MTO is responsible for the maintenance of the provincial highways regardless of what jurisdictions they pass through, including municipalities or reserves. A Connecting Links Agreement or other funding agreement may be in place for provincial roads within municipal boundaries. Where a provincial highway passes through reserve territory, any corridor management issues need to be collaboratively resolved between MTO and the community, including for example, agreement on the placement of signs or the construction of structures along highway easements.

Forest Access Roads and Resource Access Roads.

Forest access roads and resource access roads are the jurisdiction of the Ministry of Natural Resources and Forestry (MNRF), with the latter funded by MNDM. Slate Falls is one example of a First Nation on reserve that can make

use of a forest access road for all-season access to the community (a winter road provides seasonal access for resupply of goods). In some cases, forest access roads also provide access for First Nations residents to traditional lands. Where a forest access road is no longer needed for industry purposes, the road can be decommissioned; the First Nation would need to apply to MNDM on a case-by-case basis for assistance in maintaining the road.

Municipalities

Where roads connecting First Nations pass through municipal territory, the roads are built and maintained by municipal governments with assistance from the Province. Due to budget limits, the municipality may not always prioritize the maintenance of the road connecting the First Nation, and the maintenance of the road may not meet the needs of the First Nation community relying on the road.

Local Roads Boards (LRBs)

Similar to connecting roads that pass through municipal territory, a local road board⁸ may not always prioritize the maintenance of a connecting road that serves the First Nation.

Programs

Consideration of provincial funding to upgrade roads connecting First Nations in Northern Ontario is subject to the availability of funding and to a commitment to build public roads to a minimum standard.

Unincorporated Roads Access Program

Funding for roads in Northern Ontario's unorganized territory — which include roads maintained by Local Roads Boards as well as roads connecting First Nations — is available through the Unincorporated Roads Program, as described earlier in Section 2.6. The program is funded by MNDM and administered by MTO. Given the large number of LRBS (197), much of the funding under this program goes to the LRB roads⁹.

⁸ Similar to LRBs but much less common in Ontario, Statute Labour Commissions (SLCs) also coordinate road maintenance in unincorporated areas, but no SLC roads pertain to roads connecting First Nations in Northern Ontario.

⁹ Funding for LRB road maintenance is also available through the Federal Gas Tax Fund. This program was renewed in 2014, which commits the Federal Government to pay approximately \$2 million annually over the next ten years to assist in funding the maintenance of the local road network in unincorporated areas of the province. This funding is not used toward the maintenance of roads connecting First Nation communities.

First Nations Roads Program

While First Nation reserves are the responsibility of the Federal government, the Province takes an interest in public roads within reserve boundaries toward ensuring that public roads are consistent with provincial standards. The First Nations Road Program is funded through grants from MTO, without federal assistance, and administered by the Provincial Highways Management (PHM) Branch of MTO. The program provides approximately \$3 million annually for road maintenance and infrastructure projects relating to roads within First Nation reserve boundaries, and involves up to a 50/50 cost-sharing between the Province and the community to cover the cost of maintenance and minor capital improvements. In Northern Ontario, 28 First Nations are part of the First Nations Roads Program, including 7 in Northwest Region and 21 in Northeast Region.

After a First Nation applies for funding under the program, the road is assessed by the Province in terms of current standards, grading and right-of-way to ensure that the road has only maintenance and minor capital improvement needs, rather than more substantial construction needs, which the program is not intended to assist with.

Aboriginal Procurement Program

The Aboriginal procurement program is a Government of Ontario initiative designed to promote Indigenous economic development by increasing opportunities to access contracts for businesses owned by First Nation, Métis, and Inuit people. The program is used to increase Indigenous involvement in constructing and maintaining community access roads.

Government ministries are encouraged to purchase from Indigenous-owned businesses when goods and services meet one or more the following criteria:

- Benefit the Indigenous people or community;
- Serve the needs of Indigenous people; and
- Are culturally specific to Indigenous people.

Government ministries may also reserve procurements for goods and services for competition among eligible Indigenous businesses. Ministries may also issue Indigenous requirements when tendering contracts that encourage suppliers to partner or sub-contract with an Indigenous business to complete the contract.

The program is open to businesses that are either:

- An indigenous business (51% or more controlled by Indigenous people); or
- A joint venture or consortium, controlled and owned by an Indigenous business or businesses.

In the case of a joint venture at least one third of the value of the work must be done by an Indigenous business as a contractor or as a sub-contractor. In the case of an indigenous business all of the work must be completed by an Indigenous business and sub-contracting must only be done with other Indigenous businesses.

6.2 Overview of Community Concerns

Information-sharing sessions conducted with Indigenous communities as part of the NOMTS development process revealed that communities overwhelmingly want more involvement in construction and maintenance contracts for roads that lead to their communities and/or pass through their traditional lands.

Community representatives also expressed concerns over safety. It was reported that winter maintenance response time is often slow, leading to snow and ice build-up on the roads. It was also reported that many pedestrians use the roads and that shoulders should be wide enough to accommodate pedestrians. Lighting for pedestrians would also be appreciated. The roads themselves were also said to be in poor condition with dust and potholes that permanently remain unrepaired.

Finally, there was concern expressed over the amount of funding provided through the First Nations Road Program. Community representatives feel that the program is underfunded, especially considering there are large private industrial trucks that use the roads without contributing to their maintenance.

7 Trucking

Trucking is a very versatile mode of freight transportation: a variety of truck styles and sizes are available to move a wide range of commodities anywhere there is a suitable highway network to accommodate the trucking movements. Trucking is especially suited to the movement of perishable goods and to just-in-time delivery for supply chain logistics. Unlike rail and marine modes, numerous operators are available to transport goods by truck. Movement of freight by rail and marine modes is well-suited to large bulk loads, with economies of scale that can bring energy savings per freight-kilometre transported over long-distances.

The efficient movement of freight by truck in Northern Ontario is important not only to the regional economy, but also to interregional trade partners. The only Canadian highway routes that connect Southern Ontario and Eastern Canada with Western Canada are located within Northern Ontario.

This section describes the regulatory environment for trucking in Northern Ontario and also provides an overview of trucking flows in Northern Ontario, vehicle weights and dimension considerations, and the potential impact of technological advancements in trucking.

7.1 Regulations

Commercial vehicle operators in Ontario are governed by the following legislation:

- The Ontario **Highway Traffic Act, 1990** regulates driver licences, vehicles and equipment, and vehicle/load dimensions and weight, and the hours of service of commercial vehicle drivers.
- The federal **Transportation of Dangerous Goods Act** regulates the transportation of any cargo defined in the Act as 'dangerous.'
- The federal **Motor Vehicle Transport Act** also provides hours-of-service regulations for commercial vehicles engaging in interprovincial transportation. The regulations are similar to Ontario's regulations.

Hours-of-service regulations and enforcement are described further below, while vehicle weights and dimensions considerations are discussed in Section 7.4.

Hours-of-Service Regulations

To help guard against fatigue-related safety issues, the time that a driver may operate a vehicle and be on-duty is limited and must be logged. The daily hours-of-service requirements have the most direct impact on transportation planning, and are as follows¹⁰:

- Drivers must have 10 hours off-duty in a day.
- Drivers cannot drive more than 13 hours in a day.
- Drivers cannot drive the same day after 14 hours on-duty in a day.

Log Requirements

Drivers must make daily log entries of their driving and rest time; these entries may be handwritten, computer generated, or generated with a recording device. Examples of the information required in the log include the vehicle odometer reading at the start and end of the day, start and end times of each duty status during the day, and locations where the driver's duty status changed.

Implications

With long distances between population centres and rest areas in Northern Ontario, hours-of-service regulations can be particularly challenging for truck operators wanting to make the most of their driving days. Drivers may be faced with the decision of stopping early and not maximizing their allowable driving hours to make use of suitable rest areas while they are available, continuing on to the next appropriate rest area while exceeding their permitted daily service hours, or stopping at an unsuitable location. With pending legislation requiring electronic monitoring of driver hours, the need to provide properly-spaced rest areas will be a critical component of enabling drivers to drive a full day without exceeding their maximum service hours.

Vehicle Size and Weight Limitations

Commercial vehicle loads come in many different shapes and sizes. To maintain road safety and highway infrastructure Ontario's *Highway Traffic Act* places limits on the size and weight of loads that may travel on Ontario's highway network. The size and configuration of commercial vehicles are currently governed by Ontario Regulation 413/05, Vehicle Weights and Dimensions – For Safe, Productive, and Infrastructure-Friendly (SPIF) Vehicles. This regulation provides weight and size limits, including any aerodynamic devices. This regulation has been updated on a regular basis, with the most recent modifications coming into

¹⁰ On-duty time includes time driving as well as performing other activities such as loading and unloading, inspecting the vehicle, and waiting on route due to a collision or other unforeseen event, among others.

force on February 5, 2016. The most recent changes included an increased allowance for aerodynamic devices at the rear of commercial vehicles and a length increase for B-train double-trailer configurations to 27.5 m.

Beyond these limits an oversize/overweight permit is needed, which is discussed further in Section 7.4.

MTO is currently undertaking a pilot program allowing long combination vehicles (LCVs), which are double-trailer vehicles outside of the configurations and sizes allowed under O. Reg. 413/05, on certain routes under the LCV pilot program.

Role of MTO Carrier Enforcement

MTO Motor Carrier Enforcement Officers from the Ministry's Road User Safety branch enforce provincial legislation related to commercial vehicles, including vehicle maintenance and road worthiness, vehicle weights and dimensions, and driver hours of service. Random commercial vehicle inspections by the officers at Truck Inspection Stations (TISSs) (see Exhibit 7.1) located at strategic locations along the provincial highway network. MTO Enforcement Officers may also go offsite to conduct inspections.

Exhibit 7.1: Example of Signage Directing Commercial Vehicles to Truck Inspection Station



Note: 3rd Avenue approaching Highway 11, Cochrane
Source: Google Maps @49.060253, -81.030176,

7.2 Overview of Trucking Flows

Each day, almost 8,400 trucks trips are made using the Northern Ontario provincial highway network. These trips move over 87,000 total tonnes of cargo valued at over \$200 million in total daily, and with each truck travelling on average approximately 350 km on the Northern Ontario provincial highway network, according to the 2012 Ontario Commercial Vehicle Survey (CVS)¹¹.

The Ontario CVS is an exceptionally rich source of data on trucking movements throughout the province. The survey is conducted by MTO and involves roadside interviews of trucking operators; it includes questions about the current trip including the travel origin, destination, and cargo pick-up/drop-off and break points, travel routing, commodity carried, vehicle weights and dimensions, vehicle technologies, and company information. The 2012 CVS is a consolidation of data collected at over 200 directional survey locations province-wide between 2010 and 2014, and includes over 45,000 trip records.

The 2011 Northern Ontario CVS was one of the earliest phases of data collection, and survey results were documented in detail as part of Part 1 of the NOMTS Study (IBI Group, 2013). The Northern Ontario CVS dataset was incorporated into the 2012 province-wide dataset, and underwent further data processing and refinement relating to vehicle weights and dimensions, and to commodities carried. As a result, the Northern Ontario trucking patterns described in this document, while generally in agreement, may differ slightly from the documented 2011 Northern Ontario CVS results¹².

¹¹ There are also an estimated additional 6,300 relatively local, shorter-distance truck trips daily on the Northern Ontario highway network not represented in the commercial vehicle survey; these trips would not have passed any of the survey sites.

¹² Other reasons for these differences include the following:

- The dataset reflects additional survey records at the east end of Highway 17 at Haley Station, and at the south end of Highways 11 and 69/400 in Simcoe County, and other survey locations, where reported trips continue to/from Northern Ontario.
- Additional CVS survey sample was also obtained in Timmins in 2013 and in the Cochrane area in 2013 and 2014.

Traffic counts at borders were refined to reflect annual averages for each crossing rather than for an average based on two-week counts

Truck Origin-Destination Flows

Daily truck flows in Northern Ontario by origin and destination are summarized three different ways in the following exhibits:

- Exhibit 7.2 includes origin-destination matrices indicating (A) truck trips and (B) commodity value by origin-destination pair.
- Exhibit 7.3 summarizes trips to/from/within (A) Northwestern Ontario and (B) Northeastern Ontario in bar chart form.
- Exhibit 7.4 shows truck flows by origin-destination type assigned to a computer model of a road network. This exhibit was shown earlier in this document as Exhibit 4.3.

Of the almost 8,400 daily trips in Northern Ontario, approximately 1,100 or 13% are through trips, i.e. having neither origin nor destination in Northern Ontario. Because each through trip covers a very long distance on the Northern Ontario highway network, through trips, shown in orange in Exhibit 7.4, are very prominent on the Northern Ontario highway network, especially on the Trans-Canada highway. These trucks tend to carry relatively high value goods and use much of the truck's capacity to ensure efficiencies. Through trips, therefore, tend to represent a higher-value commodity load per vehicle on average, representing approximately \$85 million or 40% of the daily value of goods trucked on the Northern Ontario highway network.

According to the Ontario CVS, there are almost 4,200 daily truck trips within Northern Ontario, representing 50% of truck trips on the Northern Ontario highway network. These carry approximately \$45 million in goods, or 21% of the Northern Ontario total commodity value moved by truck.

Trips to Northern Ontario total 1,600 trips each way, as to trips from Northern Ontario (each representing approximately 19% of total Northern Ontario truck trips). These represent \$54 million in goods trucked to Northern Ontario (25%) and \$28 million in goods trucked from Northern Ontario (13%) daily.

The Greater Toronto and Hamilton Area (GTHA) and the Greater Golden Horseshoe (GGH) generate much trucking activity, in part because they are the home of numerous trucking and warehousing companies. Northwestern Ontario, being relatively distant from the GTHA and GGH, is unique in the province in that it is more reliant on Manitoba and on the US — given their relatively close proximity to Northwestern Ontario — for goods being trucked into the region. One commodity that is virtually exclusively trucked in from Manitoba to the region is petroleum (whereas other parts of the province have petroleum shipped in from the GTHA or Western Ontario distribution centres). Meanwhile, approximately \$38 million in goods are trucked between Northeastern Ontario and the GGH daily. Approximately \$9 million in goods are also trucked between Northeastern Ontario and Quebec daily.

Exhibit 7.2: Origin-Destination Flows for Trucks using the Northern Ontario Highway Network, 2012

A. Daily Truck Trips

Origin Region	Destination Region											
	North-west Region	North-east Region	GTHA	Other GGH	Other East Region	Other West Region	Manitoba	Other Western Canada	Quebec	Atlantic Canada	USA	Total
Truck Trips												
ON: Northwest Region	1,153	114	24	8	1	11	229	35	10	0	156	1,740
ON: Northeast Region	119	2,774	483	270	43	40	11	8	125		123	3,995
ON: GTHA	43	454	3	5	1		97	201	25		3	831
ON: Other GGH	6	200		2			12	36	12		1	269
ON: Other East Region	5	50	2	14			7	15	17		5	115
ON: Other West Region	1	56		0			7	11	10		0	85
Manitoba	274	18	77	13	7	7			31	5	7	440
Other Western Canada	14	14	82	18	12	11			44	9	2	206
Quebec	10	165	42	9	4	5	31	56	18		26	367
Atlantic Canada		3					6	9			1	19
USA	143	120	6	4	5	1	8	7	31	1	1	326
Total	1,768	3,968	719	342	72	75	408	378	324	15	325	8,394
Percentage of Total Trips												
ON: Northwest Region	13.74%	1.36%	0.29%	0.09%	0.01%	0.13%	2.73%	0.42%	0.12%	0.00%	1.86%	20.73%
ON: Northeast Region	1.42%	33.05%	5.75%	3.22%	0.51%	0.48%	0.13%	0.09%	1.49%	-	1.46%	47.60%
ON: GTHA	0.51%	5.40%	0.03%	0.06%	0.01%	-	1.16%	2.39%	0.30%	-	0.03%	9.90%
ON: Other GGH	0.08%	2.39%	-	0.02%	-	-	0.14%	0.43%	0.14%	-	0.01%	3.21%
ON: Other East Region	0.06%	0.59%	0.02%	0.17%	-	-	0.09%	0.18%	0.21%	-	0.06%	1.37%
ON: Other West Region	0.01%	0.66%	-	0.01%	-	-	0.09%	0.13%	0.12%	-	0.00%	1.02%
Manitoba	3.26%	0.21%	0.92%	0.15%	0.09%	0.09%	-	-	0.37%	0.06%	0.08%	5.24%
Other Western Canada	0.17%	0.17%	0.97%	0.21%	0.14%	0.13%	-	-	0.52%	0.11%	0.02%	2.46%
Quebec	0.12%	1.96%	0.50%	0.10%	0.04%	0.06%	0.37%	0.67%	0.22%	-	0.32%	4.37%
Atlantic Canada	-	0.04%	-	-	-	-	0.07%	0.10%	-	-	0.01%	0.22%
USA	1.70%	1.43%	0.07%	0.05%	0.06%	0.01%	0.09%	0.08%	0.37%	0.01%	0.01%	3.88%
Total	21.07%	47.27%	8.56%	4.08%	0.86%	0.89%	4.87%	4.50%	3.85%	0.18%	3.87%	100%

Source: IBI Group analysis of 2012 Ontario CVS data; dataset includes truck trips passing survey data collection sites only

Exhibit 7.2: Origin-Destination Flows for Trucks using the Northern Ontario Highway Network, 2012

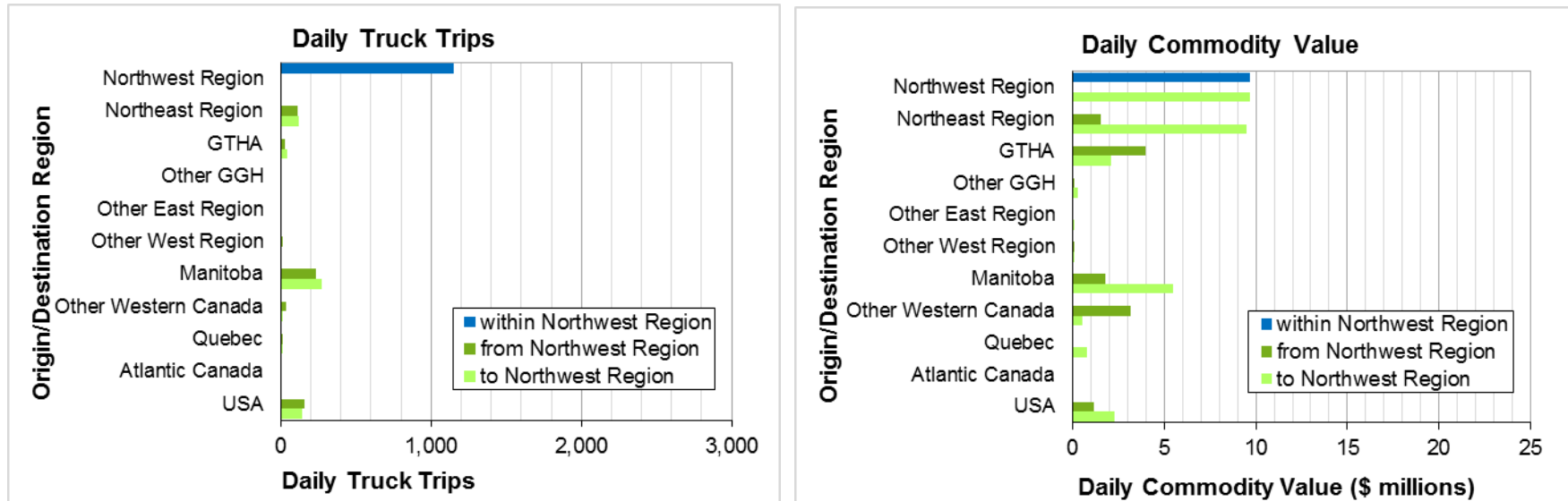
B. Daily Commodity Value Transported by Truck

Origin Region	Destination Region											
	North-west Region	North-east Region	GTHA	Other GGH	Other East Region	Other West Region	Manitoba	Other Western Canada	Quebec	Atlantic Canada	USA	Total
Commodity Value (\$ millions)												
ON: Northwest Region	9.67	1.56	3.97	0.11	0.01	0.08	1.80	3.17	0.06	0.01	1.16	21.60
ON: Northeast Region	9.50	23.93	8.62	2.16	1.07	0.33	0.51	0.44	1.84		2.71	51.10
ON: GTHA	2.08	23.58	0.01	0.03			7.80	22.12	0.73		0.22	56.57
ON: Other GGH	0.30	3.75		0.01			0.58	2.19	0.31		0.01	7.15
ON: Other East Region	0.08	0.95	0.02	0.07			0.44	1.85	0.38		0.18	3.97
ON: Other West Region	0.08	1.61		0.01			0.36	0.50	0.15		0.01	2.73
Manitoba	5.48	0.93	7.00	0.79	1.91	0.34			5.75	0.31	0.26	22.78
Other Western Canada	0.55	1.17	8.30	1.17	0.65	0.44			3.31	0.53	0.21	16.32
Quebec	0.80	7.22	1.41	0.18	0.10	0.02	2.93	7.19	0.55		0.83	21.23
Atlantic Canada		0.32					0.19	0.78			0.01	1.31
USA	2.26	2.98	0.21	0.39	0.13	0.00	0.45	0.50	1.56	0.01	0.03	8.54
Total	30.81	67.99	29.55	4.91	3.89	1.21	15.07	38.74	14.64	0.86	5.65	213.3
Percentage of Total Commodity Value												
Northwest Region	4.53%	0.73%	1.86%	0.05%	0.01%	0.04%	0.84%	1.49%	0.03%	0.00%	0.54%	10.1%
Northeast Region	4.45%	11.22%	4.04%	1.01%	0.50%	0.15%	0.24%	0.21%	0.86%	-	1.27%	24.0%
GTHA	0.98%	11.05%	0.01%	0.01%	-	-	3.66%	10.37%	0.34%	-	0.10%	26.5%
Other GGH	0.14%	1.76%	-	0.00%	-	-	0.27%	1.02%	0.15%	-	0.00%	3.4%
Other East Region	0.04%	0.44%	0.01%	0.03%	-	-	0.21%	0.87%	0.18%	-	0.08%	1.9%
Other West Region	0.04%	0.75%	-	0.01%	-	-	0.17%	0.24%	0.07%	-	0.01%	1.3%
Manitoba	2.57%	0.44%	3.28%	0.37%	0.90%	0.16%	-	-	2.70%	0.14%	0.12%	10.7%
Other Western Canada	0.26%	0.55%	3.89%	0.55%	0.31%	0.20%	-	-	1.55%	0.25%	0.10%	7.7%
Quebec	0.38%	3.38%	0.66%	0.08%	0.05%	0.01%	1.38%	3.37%	0.26%	-	0.39%	10.0%
Atlantic Canada	-	0.15%	-	-	-	-	0.09%	0.37%	-	-	0.01%	0.6%
USA	1.06%	1.40%	0.10%	0.18%	0.06%	0.00%	0.21%	0.24%	0.73%	0.01%	0.02%	4.0%
Total	14.4%	31.9%	13.9%	2.3%	1.8%	0.6%	7.1%	18.2%	6.9%	0.4%	2.6%	100%

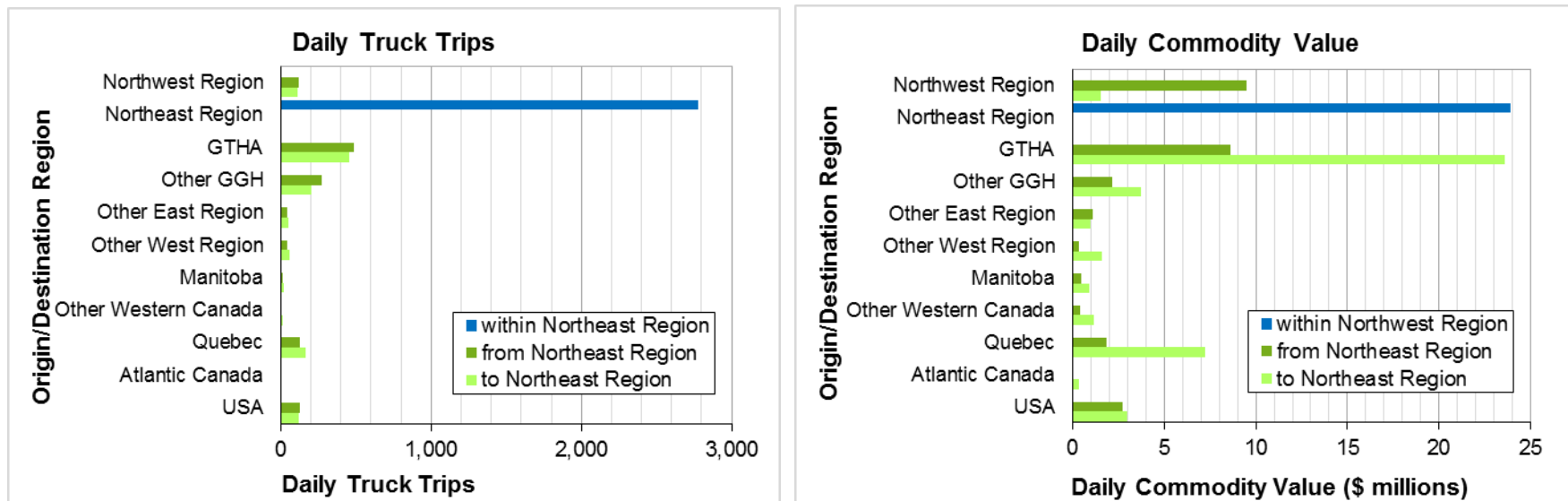
Source: IBI Group analysis of 2012 Ontario CVS data; dataset includes truck trips passing survey data collection sites only

Exhibit 7.3: Origins and Destinations for Truck Trips to/from/within Northern Ontario, 2012 Average Daily Flows

A. To/from/within Northwestern Ontario



A. To/from/within Northeastern Ontario



Source: IBI Group analysis of 2012 Ontario CVS data; dataset includes truck trips passing survey data collection sites only

Exhibit 7.4: Commercial Vehicle Travel Flows by Trip Origin-Destination Type, 2011



Source: IBI Group analysis of MTO origin-destination survey data and provincial highway traffic count program data

Truck Flow by Truck Body Style and Loaded vs. Empty Truck Load Status

Exhibit 7.5 summarizes truck flows on the Northern Ontario provincial highway network in terms of average daily truck trips, commodity value, tonnes of cargo carried, vehicle-kilometres travelled in Northern Ontario, and average trip lengths. The exhibit summarizes van-style trucks, which are common truck body styles used in the trucking industry to carry a wide variety of goods, separately from other more-specialized trucks body styles that tend to be designed to carry particular goods, such as tankers, cement mixers, logging trucks, dump trucks, animal carriers, etc. The exhibit also shows summary statistics for loaded vs. empty vehicles for each category of body styles separately.

Exhibit 7.5: Daily Truck Trips Using the Ontario Highway Network by Body Style and by Loaded vs. Empty Status, 2012

Truck Body Style and Load Status	Total Truck Trips		Commodity Value (\$2012 millions)		Tonnes of Cargo Carried (thousands)		Northern Ontario Vehicle-km Travelled (thousands)		Average Northern Ontario km/Trip	Average Total km/Trip
	Trucks	%	Value	%	Tonnes	%	Veh-km	%		
Commercial Vehicle Survey (CVS) Trips										
Van Style										
Loaded	2,396	29%	130	61%	25	29%	1,600	54%	668	1,207
Empty	700	8%	-	-	-	-	151	5%	216	362
Specialized										
Loaded	2,620	31%	83	39%	61	71%	782	26%	299	557
Empty	2,096	25%	-	-	-	-	359	12%	171	257
Non-Cargo-Carrying	581	7%	-	-	-	-	97	3%	167	270
Total CVS Trips	8,394	100%	213	100%	87	100%	2,989	100%	356	631
Local Trips on Provincial Highways, not represented by CVS										
Local Trips	6,326*						949		150*	150*
Total Northern Ontario Flows										
Total	14,720						3,938		268	

Note: *Average local trip length is an estimate only; total local trips is based on total local-trip vehicle-km divided by trip length estimate

Source: IBI Group analysis of Ontario 2012 Commercial Vehicle Survey

With van-style trucks, the industry has in general been able to achieve excellent efficiencies to remain competitive, as once a van-style truck delivers its load, it can be loaded with a different load for its next journey. For specialized trucks, it is much more difficult to achieve such efficiencies, and specialized trucks often have to return to their origin empty after dropping off their load. The

exhibit also includes “non-cargo-carrying” trucks, which includes vehicles such as service trucks and mobile machines that are not intended to carry cargo and cannot be considered “empty” even though they are not carrying a load.

The flows of the above truck types are also shown in Exhibit 7.6, where the orange flows represent van-style trucks, and blue flows represent specialized truck body styles. Lighter orange and lighter blue flows represent flows of empty trucks for these body styles, respectively. Flows shown in green represent trucking flows that are not represented by the 2012 Ontario CVS, as determined by comparing 2012 highway link truck volume counts to the assigned flows. (These are called “local” flows in Exhibit 7.5, and tend to be located on segments of highway where there were no CVS data collection sites; there is therefore no information such as trip lengths, commodities, etc. available for these trips from survey data.) Flows shown in magenta represent non-cargo-carrying trucks, and are a relatively small portion of volumes on the highway network.

These flows can be compared to those in Exhibit 4.3, which shows commercial vehicle flows to, from within and through Northern Ontario separately. Most of the through trips are by van-style vehicles between the major trucking centres of Peel Region, Montreal and Winnipeg.

Empty trucks represent one third of truck trips, and non-cargo-carrying trips represent another 7% of trips. In terms of truck trips, empty vehicles seems like a large proportion of flows, but when considered in terms of vehicle-kilometres travelled, it can be seen that the trucking industry has been able to introduce significant efficiencies by reducing the distance travelled by empty vehicles compared to loaded vehicles. In terms of vehicle-kilometres travelled, empty trucks represent 17% of the flows on the Northern Ontario highway network. Van-style trucks represent 59% of flows in total in terms of vehicle-kilometres in Northern Ontario, but empty van-style trucks only represent 9% of van-style truck flows. Specialized trucks represent 38% of truck vehicle flows in Northern Ontario.

In Exhibit 7.6, the highest flows of both van-style and specialized truck flows can be seen on both Highway 11 and the Highway 400/69/17 routes from the Greater Toronto Area (specifically Peel Region: Brampton, Mississauga and Caledon) through Nipigon can be seen, with both routes merging and continuing westward along Highway 17 toward Winnipeg westerly. Significant flows can also be seen on Highway 17 between Montreal and Sudbury. Standardized van-style transport trucks are the mainstay of trucking logistics companies and distributors such as those concentrated in Montreal, Peel Region and Winnipeg.

Empty truck flows are generally a very small portion of flows shown on the map. Some of the more significant empty truck flows can be seen among both van-style and specialized truck trips returning southbound from both Sudbury and North Bay areas toward Peel Region.

Exhibit 7.6: Loaded vs. Unloaded Flows of Daily Truck Trips Using the Ontario Highway Network by Truck Body Style



Source: IBI Group analysis of MTO Ontario CVS dataset

7.3 Vehicle Size and Weight Considerations

Vehicle Size and Weight Limitations

The *Highway Traffic Act* sets the following dimension limitations that, if exceeded require and oversize and/or overweight permit:

- **Maximum width (vehicle including load):** 2.6 m¹³
- **Maximum length:**
 - Single vehicle including load: 12.5 m
 - Semi-trailer including load: 14.65 m
 - Combination vehicle including load: 23 m
- **Maximum height (vehicle and load):** 4.15 m
- **Maximum weight:** Maximum vehicle weight is determined by axle configurations and spacing set out in the *Highway Traffic Act* Regulation 413/05. There are 33 weight categories based on axle number and spacing combinations, and based on the allowable weight per axle. Determining the allowable gross vehicle weight is a multi-step calculation. On a typical 5-axle semi-trailer truck, allowable gross weights range from 30,200 kg to 41,700 kg, depending on allowable front axle weight and axel spacing.

These truck size and weight limits are in place due to maintain truck and highway safety, to keep trucks from unduly impeding traffic, and to maintain the integrity of Ontario provincial highway infrastructure, as an overweight truck can have as much impact on the deterioration of the roadway as hundreds or thousands of cars.

Oversize/Overweight Permits

When a vehicle exceeds vehicle size and weight limits listed in Section 7.1, MTO can issue a permit for indivisible vehicles/loads that, if separated into smaller loads or vehicle would:

- compromise the intended use of the vehicle or load (i.e. make it unable to perform the function for which it was intended);
- destroy the value of the load or vehicle (i.e. make it unusable for its intended purposes); and/or

¹³ Trucks carrying raw forest products may be 2.8 m wide.

- require more than eight hours work to dismantle using appropriate resources and equipment.

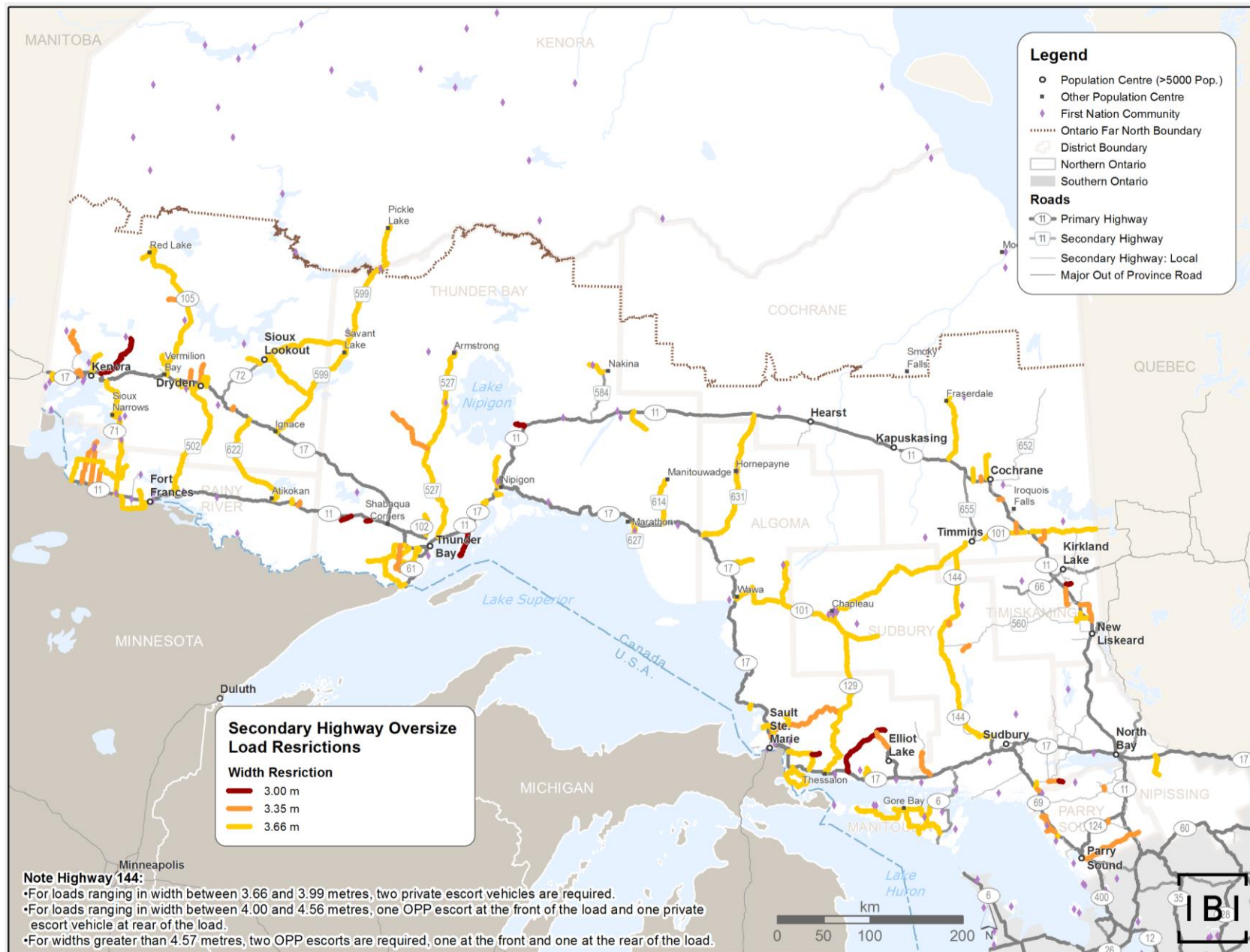
Informally, MTO encourages carriers to explore transporting oversize/overweight loads by rail and marine modes where feasible.

In addition to obtaining the necessary permits, oversize/overweight loads require escort vehicles when the loads exceed certain parameters. Escorts are either private or police depending on the size and weight of the load. Carriers are responsible for arranging the appropriate escort in addition to obtaining the permit. A police escort usually takes 14 days to arrange and must be complete prior to a permit being issued. Escort requirements are summarized in Exhibit 7.7. There are also specific width restrictions and related escort requirements by roadway and by vehicle width for Northern Ontario highways; these are shown in Exhibit 7.8.

Exhibit 7.7: Oversize and Overweight Load Escort Vehicle Requirements

Truck Dimension	Escort Size
Private Escort Required	
Width	
4 m to 4.99 m	1 escort vehicle required on multi-lane highways
4 m to 4.59 m	1 escort vehicle required on 2- lane highways
4.6 m to 4.99 m	2 escort vehicles required on 2-lane highways
Length	
36.76 m to 45.74 m	1 escort vehicle required
Rear overhang greater than 4.65 m	1 escort vehicle required at the rear of load
Police Escort Required	
Width	
5 m and greater	Minimum 2 police vehicles
Length	
45.75 m and greater	Minimum 2 police vehicles
Weight	
Upon weight and Load Engineer's request	Minimum 2 police vehicles

Exhibit 7.8: Additional Vehicle Width Restrictions on Northern Ontario Highways



Superloads

Superloads are loads that exceed typical oversize and overweight loads and are therefore subject to additional review.

They are loads that exceed any of the following limits:

- 120,000 kg gross vehicle weight;
- 5 m in width; and
- 45.75 m long.

MTO advises that permits for loads wider than 6 m must include additional justification for why the load needs to be transported on a provincial highway. Loads that exceed 120,000 kg must have an engineer evaluate all of the bridges on the proposed route. Complex transportation operations may take up to six months to fulfill all of the pre-trip requirements.

Types of Permits

There are three types of oversize/overweight permits available:

- **Annual Permits:** permits are valid for 12 months for travel on all King's highways subject to permit specific height and weight limits;
- **Project Permits:** permits are designed to allow contractors to move similar loads over the same route for a period of up to six months subject to permit specific height and weight limits; and
- **Single Trip Permit:** permits are issued to move a single oversize/overweight load on a single one way trip along a specific route. The permit is valid for one trip within a designated five-day window.

Permitting Process

Carriers must submit forms to the MTO permitting office in St. Catharines by fax, e-mail, mail, or in person. Applications are usually processed in 72 hours. Route checks are done manually by MTO staff.

Permit Costs

The following permit fees by permit type listed in Exhibit 7.9 have been in effect since January 1, 2016. The costs do not include police escorts when required.

Exhibit 7.9: Oversize and Overweight Permit Fees

Permit Type	Fee (\$ CAN)
Multi-Trip	
Annual	\$440
Project	\$286
Single Trip	
Oversize	\$65
Overweight up to 120,000 kg	
Up to 100 km	\$125
From 101 to 500 km	\$200
Over 500 km	\$260
Overweight over 120,000 kg, regardless of travel distance	\$700
Oversize and overweight	Sum of applicable oversize and overweight fees

Oversize Vehicle Routing Considerations

Current Routing

Exhibit 7.10 shows the current flows of oversize/overweight vehicles using the Northern Ontario highway network. The vehicles tend to use Highway 11 through Northeastern Ontario as opposed to Highway 17, given the less challenging terrain on Highway 11. Oversize/overweight vehicles can also be seen on Highways 69/400, 11 and 17 between Northern Ontario and Southern Ontario, as well as on Highway 144.

Routing Considerations

Power lines over routes used by oversize trucks can be temporarily relocated, albeit at a high cost. Other obstacles cannot be relocated, such as the pedestrian bridge over Highway 17 and the CN rail line in Dryden (see Exhibit 7.11); this would require alternative routing for taller oversized trucks (which are only a portion of all oversized vehicles).

There are many sections of highway in Northern Ontario with only two lanes. This is a concern with slow-moving long-distance oversize traffic, especially with loads that exceed 6 m in width and/or weigh more than 120,000 kg. Loads of this type require incremental highway closures to ensure the safety of all road users.

Construction also creates issues for moving oversize loads through Northern Ontario. Construction often narrows lane widths to less than 3.7 m. If there are lane width reductions on Highways 11 and 17 at the same time, oversize loads may not be able to move through Northern Ontario.

Exhibit 7.10: Daily Oversize Vehicle Flows Using the Northern Ontario Highway Network



Source: IBI analysis of MTO 2012 CVS dataset

Exhibit 7.11: A Potential Barrier to Oversize Loads/Superloads: Dryden Pedestrian Bridge over Highway 17 Connecting Link



Source: Google Maps

The efficient movement of oversize loads is a concern not only for commercial truck operators:

- Ports are also stakeholders: if oversize loads cannot reach or leave the Port of Thunder Bay, the port may lose business to other ports such as Duluth, Minnesota.
- Carriers from other provinces and the United States are also important stakeholders. The permitting process in Ontario can be far more cumbersome compared with jurisdictions where carriers may apply online and be granted a permit quickly because route checks are automated.
- Manufacturers are also important stakeholders in the oversize/overweight permitting process. Anecdotal evidence suggests that some manufacturers will not take on contracts to produce products that are too big to ship in Northern Ontario. More research is needed to determine specifically what types of products are not built by Northern Ontario manufacturers due to size restrictions and perhaps also because of the permitting process itself.

7.4 Technological Advancements in Trucking

Anticipated technological advances in trucking in Ontario generally focus on improving efficiency and reducing fuel consumption, thereby reducing greenhouse gas (GHG) emissions and fuel costs.

Advances are being made to reduce idling, decrease vehicle weight, increase capacity, reduce rolling and aerodynamic resistance, improve propulsion systems, and operate more efficiently.

These advances, including specific technologies and their planning implications, are discussed in Appendix B.

8 Highway Network Reliability and Resilience

Highway network reliability and resilience refers to the ability of a highway network to provide an acceptable level of service in the face of operational challenges.

More specifically, **reliability** refers to how prone a section of roadway is to service disruptions and road closures. Increasing a roadway's reliability involves identifying the probable risks and reducing the roadway's vulnerabilities to those risks. For example, a section of road may be prone to closures due to flooding and therefore has low reliability, and decreasing the likelihood that the road will be flooded makes the road more reliable.

Resilience is the ability of a road system or network to reduce the level of disruption to users when service disruptions do occur. Elements of resilience include the following:

- **Redundancy:** This involves having a feasible alternate route to use when a roadway link is temporarily closed.
- **Real-Time Information:** Getting roadway service disruption information to drivers quickly allows them to minimize their own delay and disruptions, e.g. if they know about a downstream road closure in advance, they can take appropriate alternate routes and minimize backtracking.
- **Recovery:** The ability to restore service on the closed roadway quickly.

Sometimes the term resilience is also used to encompass both the highway's reliability and its resilience as described above.

Reliability and resilience go hand-in-hand in strategic transportation planning. Where a network's resilience is low, e.g. where there is a lack of redundancy, there needs to be more of a focus on reliability. Likewise, a network should have strong resilience, especially in regard to sections that have low reliability.

The remainder of this section discusses roadway reliability, network redundancy as a key element of resilience as well as real-time Northern Ontario highway information systems currently in use.

8.1 Reliability

Roadway service disruptions happen due to a variety of operational challenges:

- Collisions: a major traffic accident could require a roadway to be blocked during investigation and clean-up;
- Weather-related events: intense rainfall events can cause flooding and washouts, snow storms can compromise visibility and create icy conditions, high winds can blow over vehicles, trees or other objects onto the roadway, etc.;
- Infrastructure failure: infrastructure such as bridges or pavements can fail due to age, lack of maintenance, or the effects of extreme heat or weather events.

Considerations related to different types of challenges are described further below.

Collisions

As highway collisions often result in closure of one or more traffic lanes, collisions are a major source of highway travel delays. MTO is continually making targeted highway improvements to reduce collision rates. For Northern Ontario, improvements that have a significant impact on overall collision rates include those that address wildlife collision risks, continued strategic provision of passing lanes and 4-laning to address capacity concerns and improper passing/overtaking, and provision of sufficient rest areas to address risks due to driver fatigue, among others.

Where roads are only two lanes wide, it is generally less likely that traffic will be able to move around the collision site, especially where the road also has narrow shoulders. Widening shoulders and/or 4-laning critical routes (especially those with low resilience, e.g. no redundant route) would help to reduce the risk of full road closure in case of traffic incidents.

Weather-Related Events

In addition to highway collisions, other major causes of traffic disruptions and road closures are weather events and their impacts on highway infrastructure and operability. While road closure records were not available in a format that could be analysed for this technical backgrounder, it is known anecdotally that highways in the lee of major water bodies are especially vulnerable to closure in the winter, specifically:

- Highway 17 from Sault Ste. Marie to Wawa, along the east shore of Lake Superior; and
- Highway 400/69 from Waubesa to Sudbury, along the east shore of Georgian Bay.

Weather-related reliability issues can be difficult to mitigate. Realigning routes so that they are less exposed to the lake effects is costly, but could be considered for particularly vulnerable sections. Ensuring that there are periodic rest areas along the highway where drivers can pull off safely to rest from driving in difficult weather conditions can also reduce the risk of traffic incidents.

Where a roadway is prone to weather risks that cannot be easily mitigated to improve reliability, more focus on resiliency will be needed, including ensuring that a well-defined alternate route exists, ensuring that effective real-time information is in place to warn motorists, and allowing the highway to re-open as quickly as possible once the weather issue is cleared.

Infrastructure Failure

Bridges and culverts are particularly vulnerable parts of the road network; they can sustain damage or be flooded or washed out due to extreme precipitation events or rapid melting of snow pack in the spring. Exhibit 3.7, in Section 3 of this technical backgrounder, depicts the locations of the large number of bridges that are part of Northern Ontario's provincial highway system. These are vulnerable to rapid cooling and ice formation when temperatures drop suddenly, and also to structural impacts from heating/cooling cycles and foundation damage due to scouring from flooding events.

Highway pavements are also vulnerable to damage, though they tend to deteriorate over time and generally do not fail quickly in a way that causes road closure. As trucks contribute much more to pavement deterioration than cars, continuing to ensure that trucks maintain axle loading appropriate for the roadway they travel on is essential to the integrity of pavements along the Northern Ontario road network.

Climate Change Impacts and Possible Adaptation Strategies

As noted in the *Draft Climate Change Context Working Paper* of NOMTS Phase 1 (January 2016), the severity and frequency of extreme weather events appear to be increasing, reflecting ongoing warming and changing precipitation levels associated with climate change. The impacts of these on the transportation system include structural damage to infrastructure and loss of function from flooding, washouts, ice build-up, high winds, freeze-thaw cycles, extreme heat, permafrost degradation (for Far North transportation infrastructure), etc. Similarly, such weather events can cause disruption of operations and emergency response

capability from mechanical failure, power outages and failure of control and communications systems.

As flooding events become more severe, culverts designed for precipitation intensities and durations experienced 50 years ago may not be large enough to prevent floods from overtopping the highway and, in some cases, causing a washout and forcing closure of the road. As noted in the *Climate Change Context* paper, an MTO study in 2015 found that most of its culverts in Northern Ontario are large enough to carry precipitation events that drop up to 30% more water into the relevant catchment area than currently experienced, although a small number would require replacement before the end of their design life to handle such events.

As also noted in the *Climate Change Context* working paper, typical adaptation strategies to address the increasing vulnerability of the provincial highway network to climate change impacts such as those outlined above include the following:

- **transportation systems:** enhanced monitoring, operations, management, coordination, communications, maintenance and rehabilitation standards/actions targeted to maintain — and, where possible, improve — the reliability and resilience of Northern Ontario's road system;
- **flooding:** larger storm sewers and culverts, stronger/higher bridges, raising or relocating flood-prone roads and rail lines;
- **wind damage:** stronger sign supports, wind shelters;
- **ice:** stronger overhead supports, automated monitoring and de-icing, tree canopy pruning, exploration of future use of more subterranean infrastructure;
- **heat:** wider road/rail/runway expansion gaps, more use of concrete instead of asphalt, heat-tolerant asphalt, reduced truck axle load limits in very hot weather when pavement is most vulnerable to deterioration; and
- **road subsidence due to permafrost melting (Far North roads):** ongoing corrective maintenance, reconstruction, relocation.

The goal of maintaining/improving reliable and resilient transportation and other essential services in the face of ongoing climate change impacts signals a need for enhanced coordination among transportation and related organizations, sectors, First Nations and levels of government.

8.2 Resilience: Network Redundancy

The ability of a highway section to reduce the level of disruption to users when in roadway closures occur is its resilience, as noted above.

In dense road networks such as in urban settings, there are a variety of redundant routes, so the closure of a key roadway segment can usually be accommodated by re-directing traffic to alternate roads, or using specific detour routes. However, the long distances between highways in Northern Ontario reduce the effectiveness of this measure, as the alternate route may involve hundreds of kilometres of additional travel. With respect to goods movement, finding a suitable detour route capable of truck traffic (e.g. semitrailers, oversize/overweight loads, etc.) can be especially challenging.

Exhibit 8.1 highlights locations along the TransCanada Highway portion of the provincial highway network with significant redundancy issues. Of note are four potential bottlenecks in the network, circled in red: two points are at locations where Highways 11 and 17 are merged (i.e. east and west of Thunder Bay) and two are locations on Highway 17 east and west of Kenora. In these cases, these routes are the only highway links in Canada joining the eastern and western parts of the country. There are no alternative highway routes in Canada in the event that any of these sections are closed.

The closure of the new Nipigon River Bridge on Highway 11 & 17 east of Thunder Bay in January 2016 is an example of the disruption that can be caused to the flow of passengers and goods moving within Northern Ontario, and across Canada. . During the brief time that the bridge was closed, the only viable detour for heavy traffic was via the United States.

The orange arrows along Highway 11 and Highway 17 in the exhibit indicate segments where a provincial highway detour is available, but would require very significant additional travel. As illustrated in blue arrows, while detours are available for lighter vehicles if Highway 17 is closed north of Sault Ste. Marie or east of Sault Ste. Marie, the roads involved may not be suitable for heavy trucks (i.e. due to sections with less than desirable standard geometric design on Highway 129).

Secondary Highways north of Highway 11 (e.g. Highway 599 to Pickle Lake) have limited resilience due to not having a redundant route. Focus in the near-term therefore needs to be on increasing the reliability for these road segments. In some cases, geometric design elements are less than desirable; measures could include, as appropriate, modifying curves to increase sight lines, widening shoulder widths, road surface improvements to allow heavier loads, increasing culvert sizes, and related actions to reduce accidents and road blockages. In the longer term, additional all-season road links could improve redundancy in the Far North.

Exhibit 8.1: Northern Ontario Trans-Canada Highway Locations with Significant Redundancy Issues



8.3 Resilience: Real-Time Highway Information Systems

MTO employs various methods of providing drivers with real-time information in the event of road closures and other problems, including roadside Changeable Message Signs (CMSs), traveller information systems. As outlined below, these are used to inform travellers of road/traffic conditions ahead and possible alternative routes where applicable, thereby improving travel safety and reducing delays associated with road closures/restrictions and adverse weather conditions.

The Ministry also employs other types of Intelligent Transportation Systems (ITS) technology to provide automatic monitoring of traffic volumes and road conditions, and in some cases automatic operational response, so that system operators have real-time information for quicker response and so that CMSs can provide such information to drivers, warning them of hazardous conditions ahead.

Changeable Message Signs

Exhibit 8.2 shows the locations of the thirty CMSs currently installed in Northern Ontario. As shown in this exhibit, these are located along Highways 11 and 17 only. There are several gaps of hundreds of kilometres throughout the Northern Ontario highway network that currently do not have CMSs, and no CMSs on roads other than Highways 11 and 17. CMSs are typically located upstream and/or downstream of population centres and other junction points in the highway network to afford access to alternative routes as applicable. CMSs are placed near opportunities for turnaround and near hotels and restaurants, where possible, to allow long-distance travellers to stop and wait for the road to reopen.

CMSs provide motorists with advisory information particularly relevant to long-distance travellers, including winter closures due to unsafe driving conditions; traffic congestion/delays; highway or lane closures due to collisions and related incidents; amber alerts; and construction activities or scheduled road maintenance.

In addition to the permanent CMSs, portable CMSs are available that can be set up at any location. The drawback to using portable signs is that there is a delay to getting information to drivers while the sign is moved into position, but they provide flexibility to fill gaps in the CMS coverage in response to particular events.

Road Weather Information System (RWIS)

Much of the information on road conditions provided by CMSs is drawn from MTO's Road Weather Information System (RWIS) established to provide weather and highway condition information as experienced on Northern Ontario highways, in particular Highways 11 and 17. As shown in Exhibit 8.3, the system includes 58 stations and additional stations being installed (e.g. in Fort Frances), at which temperature and precipitation data are collected along with wind velocity and road surface conditions.

Seasonal Load Advisory Monitoring

Additional information is also collected at the eight Seasonal Load Advisory (SLA) locations shown in red/magenta in Exhibit 8.3, including depth of snow and depth of ground frost, using special instruments. The latter information enables spring road-load restrictions on secondary roads to be removed as soon as possible.

Ontario 511

Traveller Information Services

One of the more comprehensive sources of real-time information on the operation of Ontario's highways is Ontario 511, which is both a telephone and online service provided by MTO to provide information on Ontario's provincial highways, including road closures, construction projects, weather conditions, and nearby places of interest.

The telephone service uses voice recognition and text-to-speech technologies to allow hands-free communication. Information provided includes a description of the incident or construction project, an approximate delay time, speed limit reductions if applicable, and alternate routes if available. The calling service also provides the option to reach 511 information services from New York, Vermont, Minnesota, and Quebec. In the event that the voice recognition technology is unable to assist a user, agents are available Monday to Friday between 8:30am and 5:00pm.

The website provides accessible information in both English and French through the use of interactive maps, plain text notices, and a feed from the 511 Ontario Twitter page. Exhibit 8.4 shows the road closures view. The interactive maps option allows the user to quickly hone in on the area of interest on the highway network. By clicking on incident icons along the highway on the map, the user is able to bring up information about a particular highway event (see Exhibit 8.5). The Plain Text menu allows the user to see a listing of road closures, winter road (i.e. conditions for highways, construction reports, etc. Sample road closure detail is shown in Exhibit 8.6. The user can also view current traffic camera footage for select locations, though there are no traffic cameras in the system for Northern Ontario highways.

Exhibit 8.2: Changeable Message Sign Locations

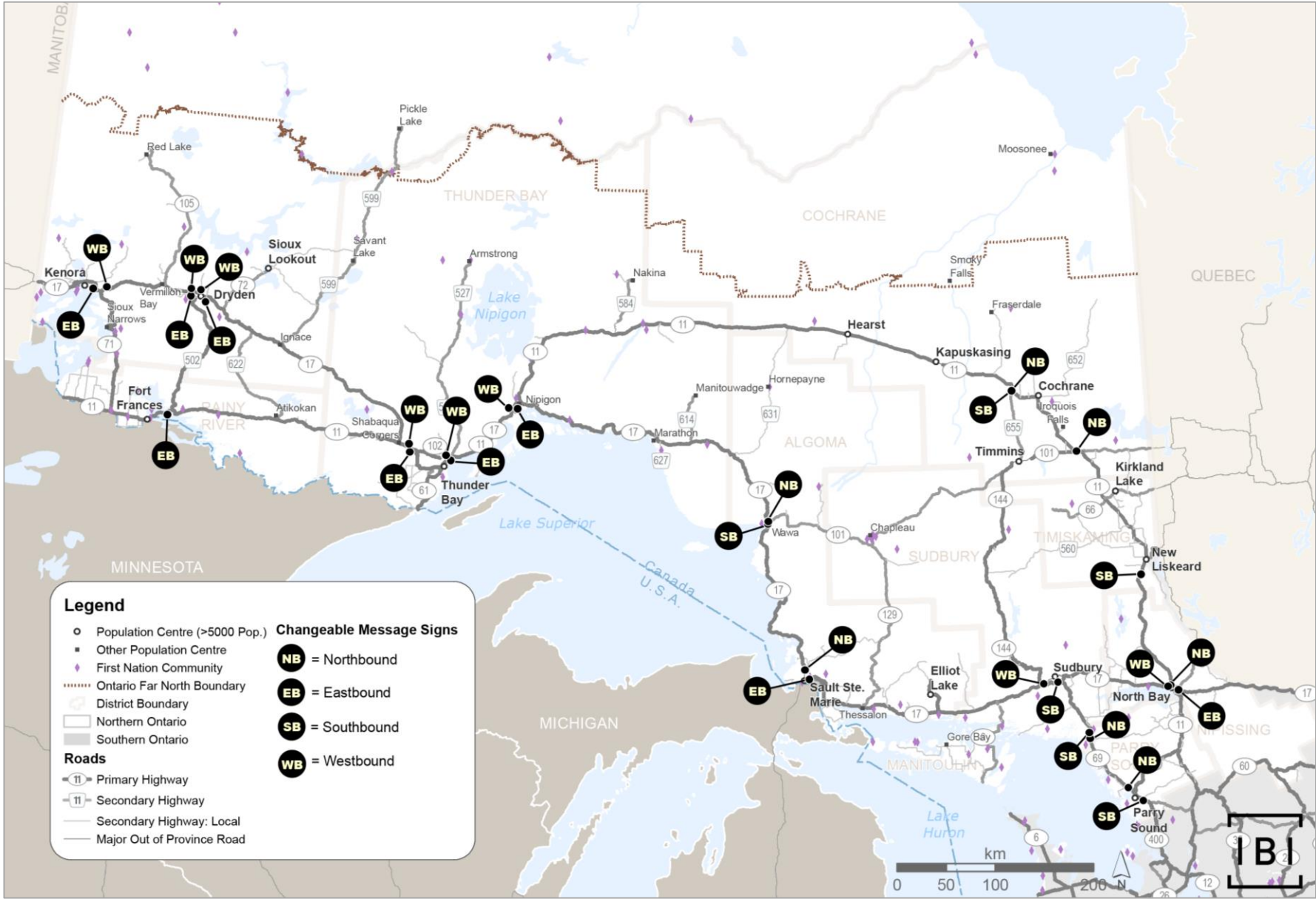
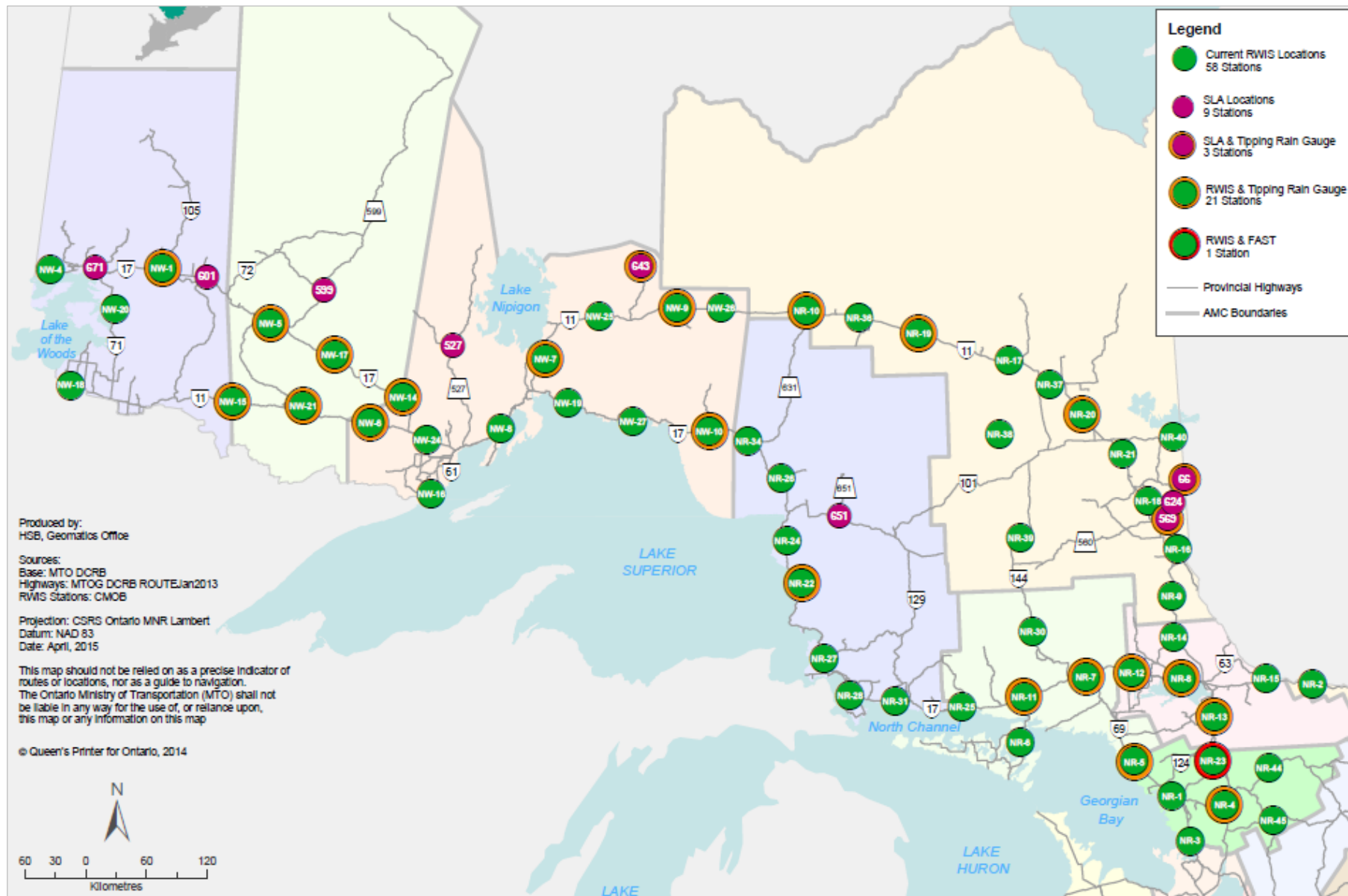


Exhibit 8.3: Northern Ontario Road Weather Information System (RWIS)



Source: MTO

Exhibit 8.4: Sample Road Closure Listing on Ontario 511 Website

[Skip to content](#)
FRANÇAIS




[Drivers & Vehicles](#) | [Highways](#) | [Road Safety](#) | [Trucks & Buses](#) | [Travel](#) | [Publications](#)

[HOME](#) > [Traveller's Information](#) > [TRIP](#) > [Road Closures](#)

Search | Text size + -

ONTARIO 511

- Home
- About Ontario 511
- Frequently Asked Questions
- Winter Maintenance
- Winter Driving
- Feedback

INTERACTIVE MAPS

- Province of Ontario
- Burlington/Mississauga (QEW)
- Greater Toronto Area (400/401/403/410/427)
- London (401)
- Niagara (QEW/405/58)
- Ottawa (417)
- Sarnia (402)
- North Bay
- Thunder Bay
- Windsor

PLAIN TEXT

- Road Closures
- Winter Road Conditions
- Construction Reports
- Traffic Cameras
- Traffic Reports
- Carpool Lots
- HOV Lanes

ROAD CLOSURES

[Show/Hide Twitter](#)

Tweets by @511Ontario



Gravenhurst: [#HWY11](#) SB, SB exit 169 ramp to Bethune Dr North-South Entrance - Oak Ridge Rd E, is reduced to one SB lane

2h

511Ontario @511Ontario

[Embed](#) [View on Twitter](#)

Please press the Refresh or Reload button at the top of your screen to see the most recent updates.

Unscheduled road closures and events for provincial highways:

Unscheduled Events

- [410 Northbound \[407ETR - \] - Disabled Vehicle](#)
- [HWY 11 Southbound \[SB exit 169 ramp to Bethune Dr North, South ent - OAK RIDGE RD \(E\) \] - Other](#)
- [HWY 11 Southbound \[SPARROW LAKE RD-ROUTE D - \] - Other](#)
- [HWY 400 Northbound \[TOWER RD \(W\) - Twelve Mile Bay Rd \(Exit 185\), Mactier \] - Other](#)
- [HWY 400 Southbound \[HEALEY LK RD UP - TOWER RD UP \] - Other](#)
- [HWY 585 Northbound \[LOFQUIST LAKE RD \(W\) - NIPIGON TWP - \] - Other](#)
- [HWY 600 Westbound \[FADDEN RD \(E\) - \] - Other](#)

☐ **Scheduled Events**

410 Northbound [407ETR -] - Disabled Vehicle

Exhibit 8.5: Sample Road Closure Information on Ontario 511 Website, Interactive Map

INTERACTIVE MAP

Road closure, condition and construction information is available through our hands free 511 automated service or on Twitter! Simply dial 511 or follow us @511Ontario!

Select information to display on map:

- Closures & Restrictions**
 - ☒ Incidents and Closures
 - ☒ Today's Roadwork
 - ☒ Planned Roadwork
- ☒ **Traffic & Road Info**
 - ☐ Construction
 - ☐ Google Traffic
 - ☐ HOV/HOT Lanes
- ☒ **Road Conditions**
- ☐ **Weather Cameras**
- ☐ **Electric Vehicle Chargers Ontario Network**
- ☐ **Traffic Cameras**
 - Select a Traffic Camera
- ☐ **Commuter Info**
 - ☐ Carpool Lots
- ☒ **Traveller Info**
 - ☒ Service Centres
 - ☒ Ferry Services
 - ☒ Provincial Parks
 - ☒ Travel Information Centres

HWY 585 Northbound [LOFQUIST LAKE RD (W) - NIPIGON TWP -] - Other

HWY 585 NORTHBOUND [LOFQUIST LAKE RD (W) - NIPIGON TWP -] - OTHER

Last Updated: August 05, 2016 09:34

Event Id: 83673

Highway: HWY 585

Direction: Northbound

Stream:

From/At: LOFQUIST LAKE RD (W) - NIPIGON TWP

To:

Lanes Affected: lane blocked

Comment : Hwy 585 Nipigon Cameron Falls Road Construction starts 2.5 km North of Hwy 11/17 and Hwy 585 Jct or at Lofquist Lake Road, work is being done northerly for 14 km. Surface treatment is in progress. Traffic control is in place when work is being conducted from August 05 to September 16, 2016.

Traffic Impact :

Type/Reason Unplanned - Other

Event Start: August 05, 2016 09:34

Event End:

Last Change: Entered 2016-08-05 09:34

Exhibit 8.6: Sample Road Closure Detail on Ontario 511 Website

HWY 600 Westbound [FADDEN RD (E) -] - Other	
Highway:	HWY 600
Direction:	Westbound
From/At:	FADDEN RD (E)
To:	
Lanes Affected:	lane blocked
Traffic Impact :	
Reason	Other
Comment :	Hwy 600 Rainy River ~ Surface Treatment on Hwy 600 starting 300 meters North of Fadden Road northerly for 19 km to Harris Hill. Traffic control may be in place during operations. Please use caution in the area. Work to be completed by September 12, 2016
Event Start:	September 01, 2016 12:25
Event End:	
Last Change:	Entered 2016-09-01 12:25

One drawback of Ontario 511 is that it does not provide information on roads maintained by municipalities. Using the service also requires internet connection/ wireless reception and/or a safe place to pull off the road to use the telephone or internet service.

Route Planner

In addition to its main service, Ontario 511 also operates a pilot route planner (ontario511routeplanner.ca). Users can enter their origin and destination, and the service provides a suggested driving route and alternate routes, taking into account current road conditions and closures. The route planner gives the options of “drive” “transit” and “drive + transit”. For the “drive + transit” option, the service provides directions to the nearest transit hub with parking, where the user can then transfer to their transit connection.

Other Intelligent Transportation Systems (ITS) Technology

The Changeable Message Signs and Seasonal Load Advisory locations noted above are examples of ITS technology that has been applied by MTO and are being expanded as required.

Other ITS technology is also being applied in parts of Ontario, for example to provide automatic monitoring of traffic volumes. Induction-loop counters have been installed for many years in the pavement of several 400-series highways in Ontario as part of the Freeway Traffic Management System. Significant changes in traffic volumes compared to the expected range of volumes can signal that a traffic incident has occurred in the vicinity, which can be verified by traffic cameras. The traffic camera footage can also be accessed by drivers if desired via Ontario511 to assess roadway conditions visually before heading out on the route.

Another example is ITS technology that measures road icing conditions and automatically applies anti-icing measures. For example, the Highway 11 crossing of the Magnetawan River expands upon the RWIS functionality to incorporate Fixed Automatic Spray Technology (FAST) to mitigate bridge icing. FAST combines the RWIS data with sensors and spray nozzles in the bridge deck to apply pre-emptive anti-icing chemicals as warranted.

9 Highway Rest Areas and Amenities

Highway rest areas are an important element of the highway network in Northern Ontario, where highway travel distances are often long, and periodic rests are needed along the journey. Passenger vehicle drivers rely on highway rest areas for a safe place to stop to rest, and depending on the facilities, to use washroom facilities, to picnic, or to take in a natural vista. For commercial vehicle drivers, truck-appropriate rest areas are critical for complying with hours-of-service regulatory requirements.

MTO maintains a number of roadside rest areas in Northern Ontario, while other privately-owned facilities, such as fuel stations, restaurants, and hotels also serve as rest areas.

Roadside rest areas are discussed in this section in terms of provision and gaps. Mobile phone coverage is also discussed as an important factor in safety and real-time information on highway operations.

9.1 Highway Rest Area Provision

MTO Rest Areas

MTO provides and maintains three main types of rest areas on Northern Ontario's highway:

- Park/picnic areas;
- Scenic lookouts; and
- Roadside pull-offs — ranging from small pull-offs with no grass or other barrier between road and rest area, to large pull-offs separated from traffic and including washrooms.

Examples of each of the above are shown in Exhibit 9.1. Park/picnic sites are by far the most common type of rest area in Northern Ontario.

MTO-maintained rest areas are all located on primary (King's) highways; there are no MTO-maintained rest areas on secondary and tertiary highways. The rest stops typically are maintained only seasonally (May through October), though a small number are maintained year-round. Park/picnic areas tend to be gated closed and not maintained November through April. There are seven year-round rest areas in Northern Ontario: six are located on Highway 17, and one is located on Highway 11 just north of North Bay.

Exhibit 9.1: Examples of MTO-Maintained Roadside Rest Areas in Northern Ontario

A. SEASONAL PICNIC AREA: HIGHWAY 11 WEST OF HIGHWAY 631



@49.7683599,-84.7724517

B. YEAR-ROUND SCENIC LOOKOUT: HIGHWAY 17 SOUTH OF MONTREAL RIVER HARBOUR



@47.1609266,-84.6975037

C. YEAR-ROUND ROADSIDE PULL-OFF: HIGHWAY 17 WEST OF IGNACE



@49.5073747,-92.0576131

Image Source: Google Maps

The rest areas also vary in their ability to accommodate large commercial vehicles, and have varying amenities such as washrooms and shelter.

Provision of MTO rest areas on the Northern Ontario provincial highway network is shown in **Exhibit 9.2**, indicating the type of rest area and whether it is open seasonally or year-round. The exhibit also shows fuel stations and electric vehicle (EV) charging stations, which are discussed further in subsections below.

Exhibits 9.3 through 9.6 are a series of four regional maps showing rest areas, this time highlighting whether the rest area is able to accommodate commercial vehicles and whether washrooms are available. These maps also show fuel stations and EV charging stations.

Fuel Stations

It is helpful to fill up on fuel when possible when driving long distances in Northern Ontario, especially through some of the less populated areas and on secondary highways. Exhibits 9.2 through 9.6 show the locations of fuel stations in Northern Ontario. Some notable gaps in fuel station provision on the Trans-Canada highway can be seen, including the following:

- Highway 11 from Calstock to Longlac (180 km);
- Highway 17 from Wawa southerly to Batchewana (150 km);
- Highway 17 from Ignace easterly to west of Raith (130 km);
- Highway 11 from Shabaqua Corners to Atikokan (140 km); and
- Highway 11 & 17 from Nipigon to Thunder Bay (100 km).

Distances between fuel stations on other primary highways, such as Highways 101, 129 and 144, and on secondary highways, can be comparably long compared to the gaps listed above, and at times even longer.

Drivers are given advance warning of large gaps in fuel provision through signs that note the distance to the next gas station. These signs are posted where there are no gas stations for long distances on highways, and on dead-end secondary highways.

Operating hours for fuel stations vary, and many are not open during overnight hours. At some of the more remote fuel stations, such as at the north end of Hwy 599 near Pickle Lake, it is helpful to call ahead to make sure that a staff member is available on site at the fuel station to provide service.

The potential to run out of fuel is more of an issue for passenger vehicles than for commercial vehicles, as the latter have larger fuel tanks and can travel longer distances on a full tank of fuel, but having a network of fuel stations benefits both passenger and commercial vehicle drivers nonetheless.

Exhibit 9.2: Rest Areas, Gas Stations and Charging Stations in Northern Ontario

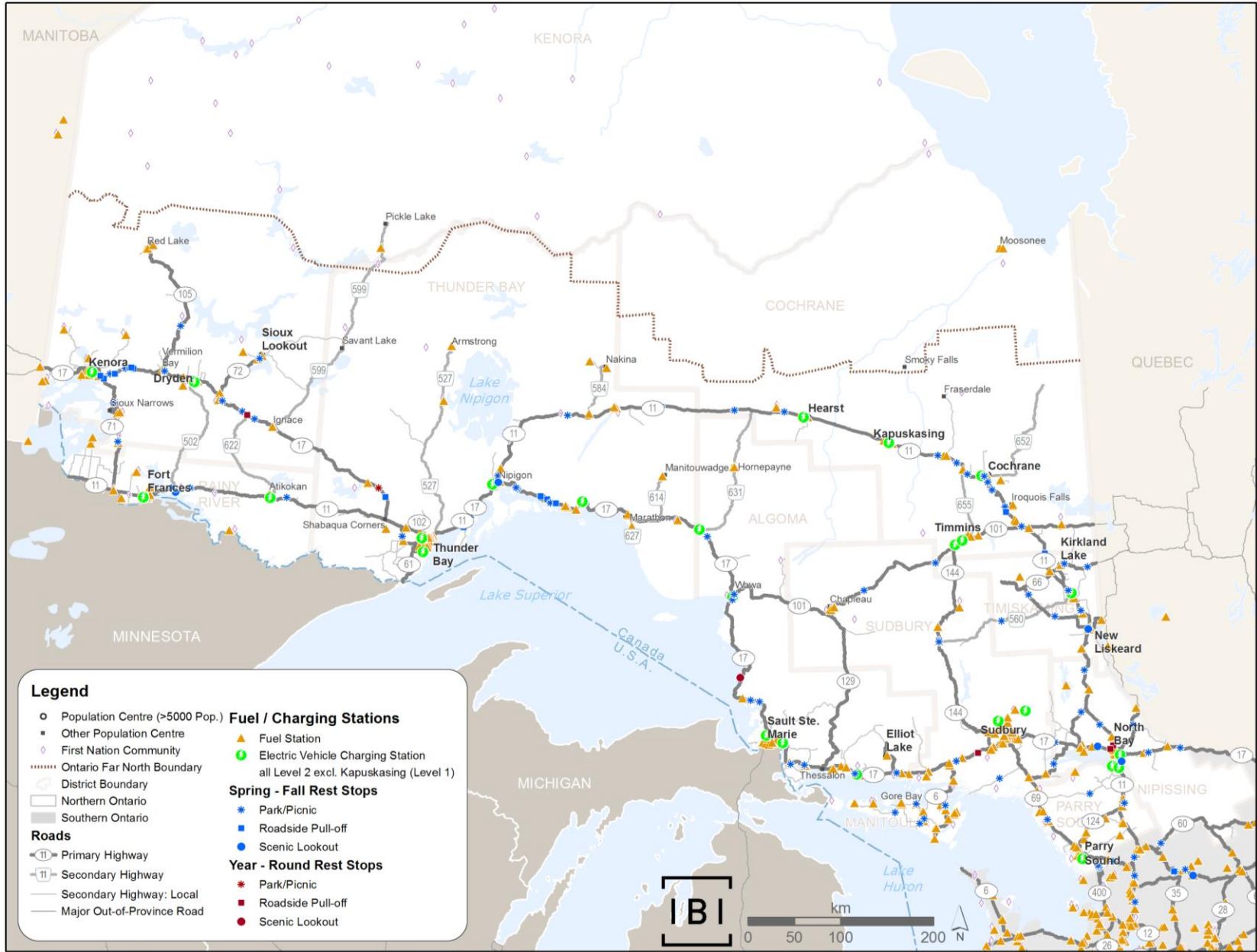


Exhibit 9.3: Rest Areas, Gas Stations and Charging Stations: Northwest View

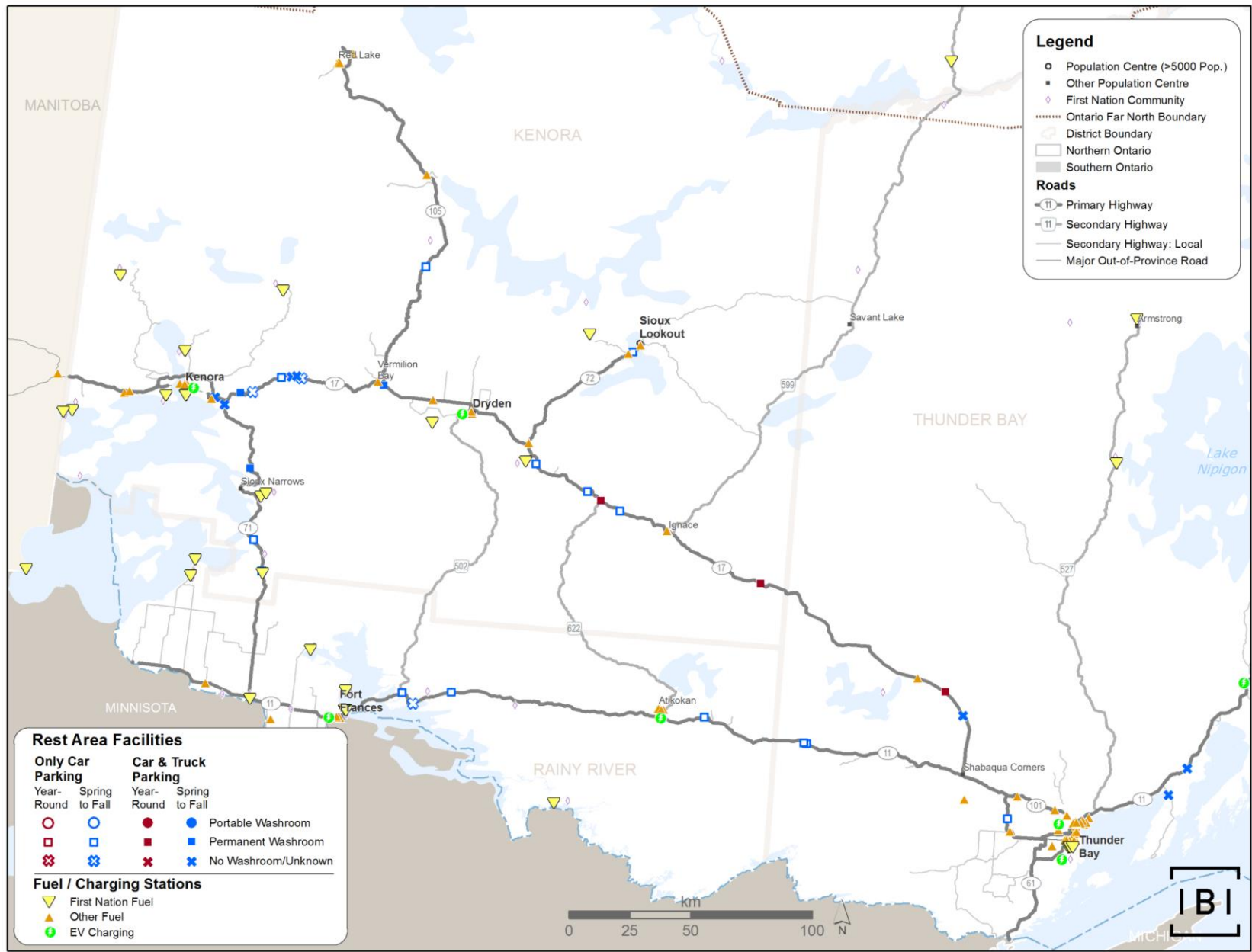


Exhibit 9.4: Rest Areas, Gas Stations and Charging Stations: Central View

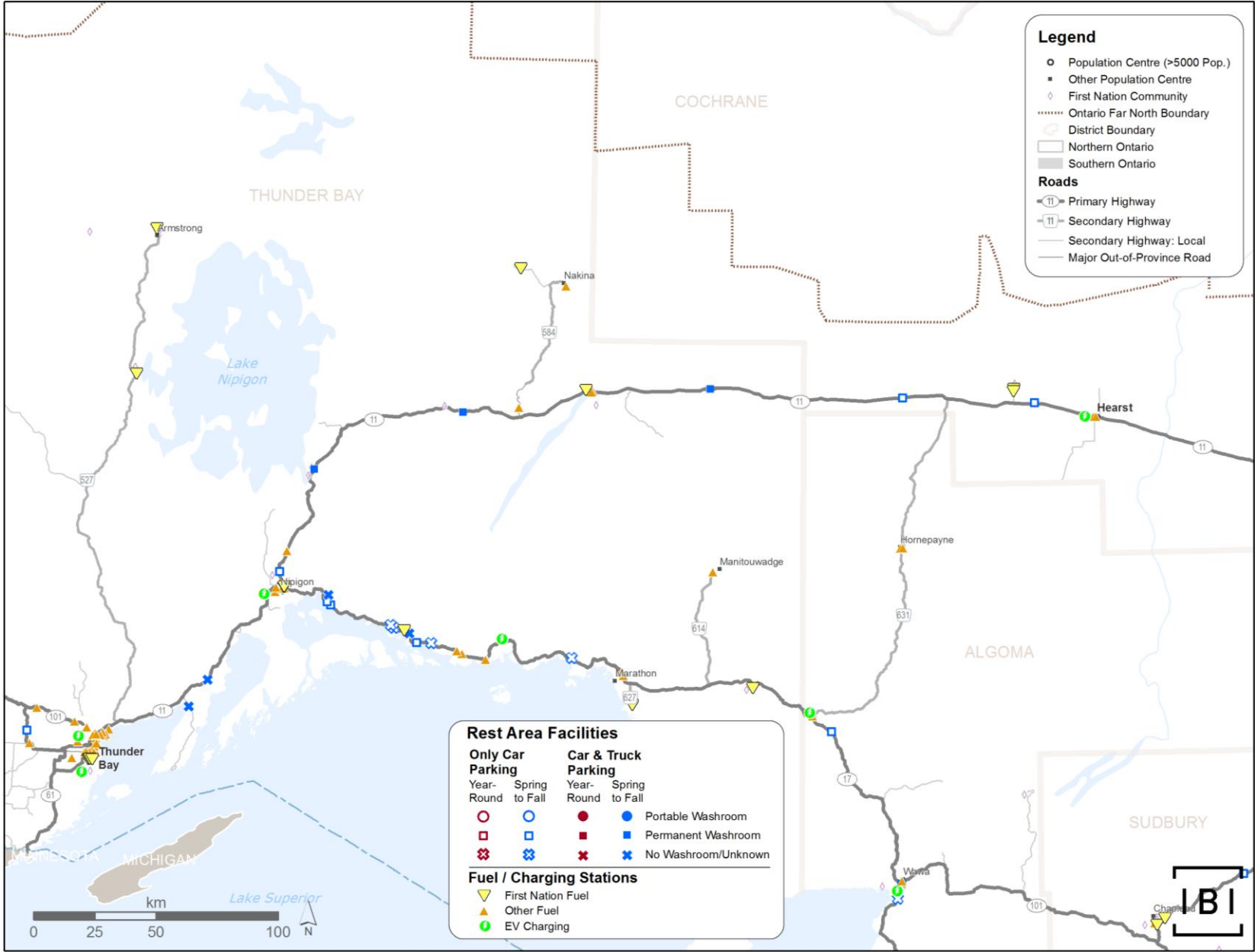


Exhibit 9.5: Rest Areas, Gas Stations and Charging Stations: Northeast View

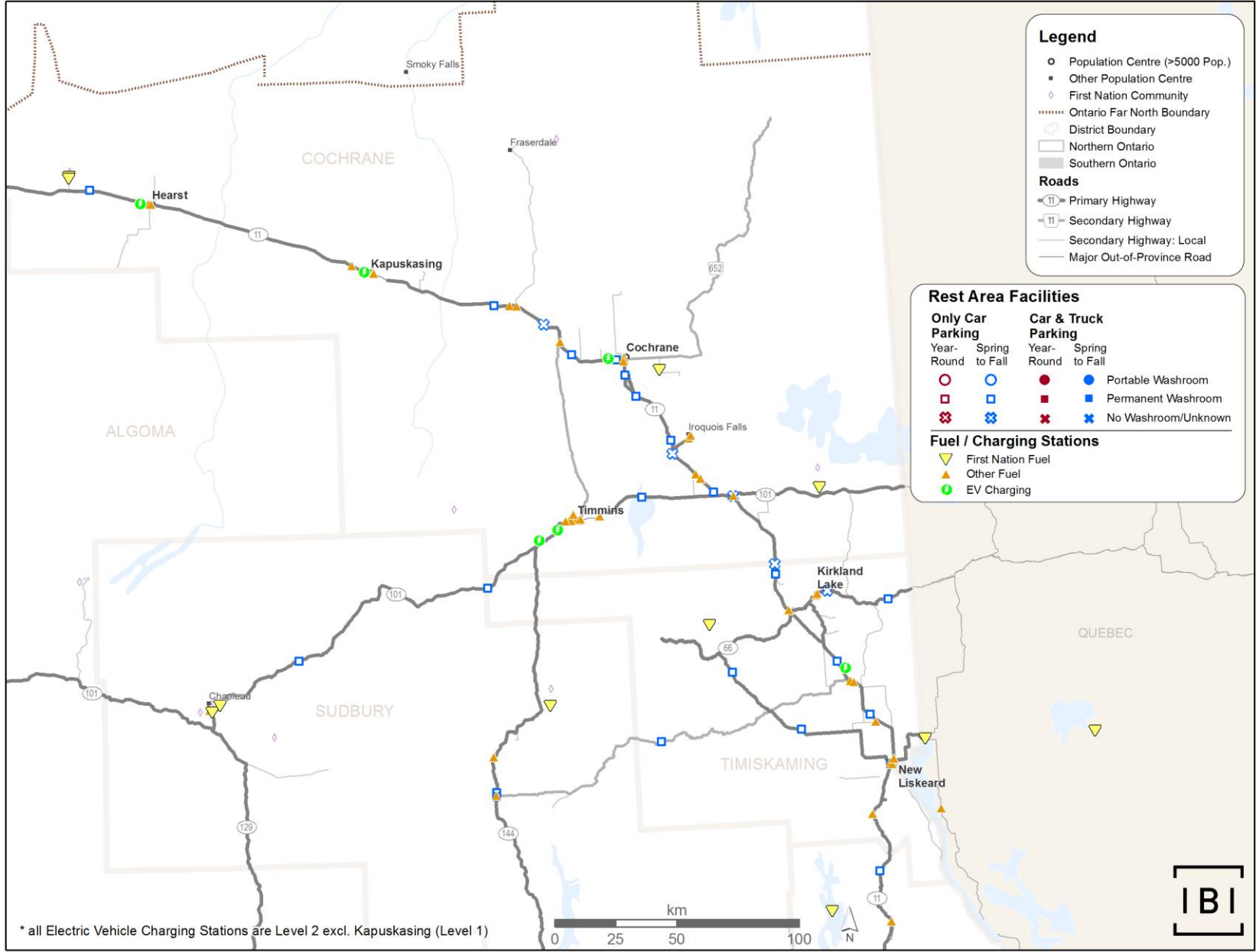
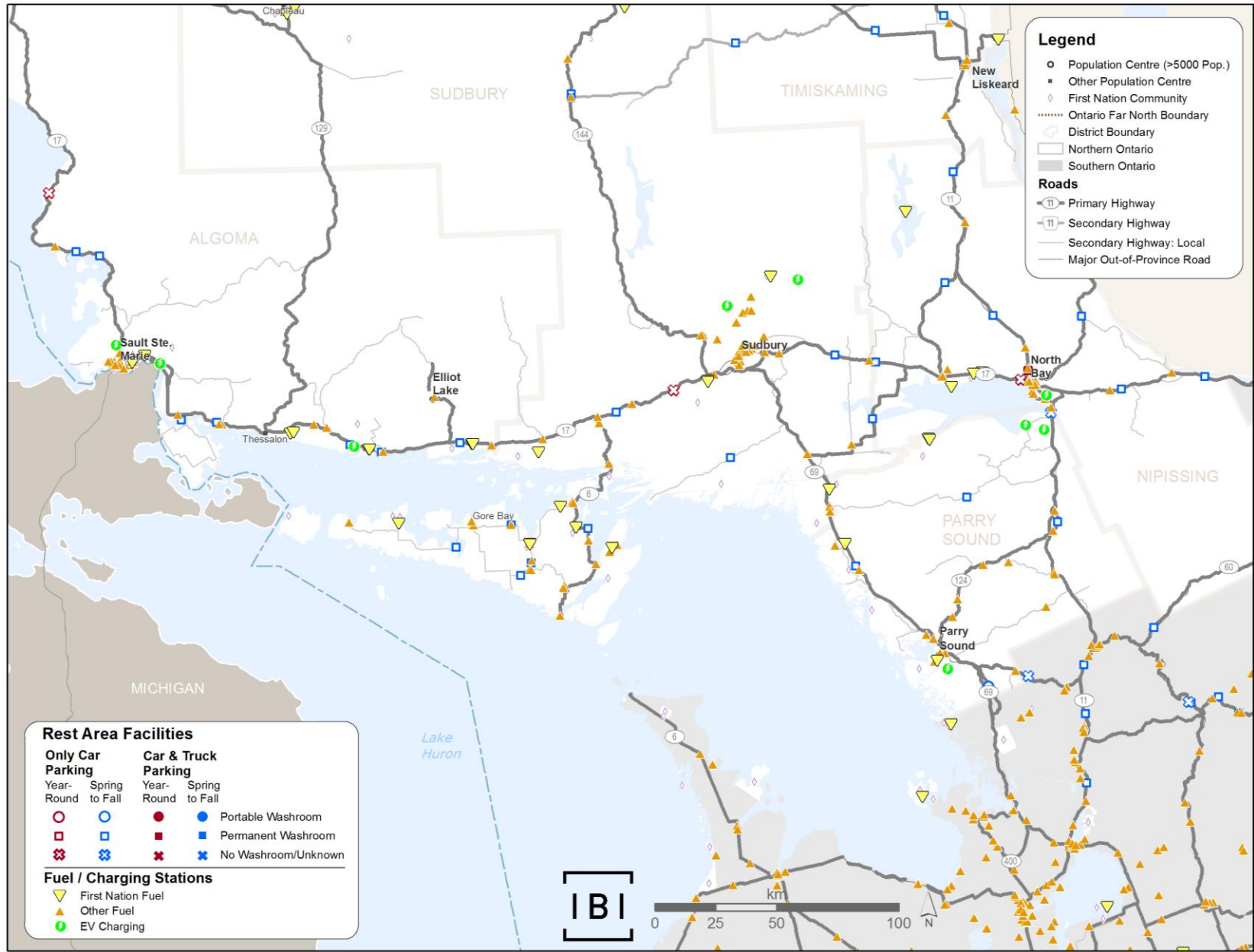


Exhibit 9.6: Rest Areas, Gas Stations and Charging Stations: Southeast View



Electric Vehicle Charging Stations

Public interest in and adoption of electric vehicles (EVs) and hybrid vehicles have been increasing in recent years. The energy efficiency of these vehicles compared to gasoline-powered vehicles is typically maximized in urban traffic and stop-and-go conditions, but they are also being used for longer-distance travel.

As recently as 2012, EV charging stations were installed in Northern Ontario at Trans-Canada highway locations, primarily at hotels, making long distance drives through Northern Ontario more feasible. Electric vehicle charging stations are of three types:

- Level 1 (110 volts): 8–20 hours to fully charge an EV;
- Level 2 (240 volts): 4–6 hours to fully charge an EV; and
- Level 3 (480 volts), also called DC Fast Charging: 30 minutes to charge an EV to 80%.

Most of the EV charging stations in Northern Ontario are Level 2; their locations as of fall 2016 are shown in Exhibits 9.2 through 9.6. As part of an MTO funding program, Tim Horton's and McDonald's will soon be hosting 25 additional Level 3 EV charging stations across Northern Ontario by March 31, 2017 (*North Bay Now*, 2016).

9.2 Rest Area Needs

For rest areas, the essential need is to have a safe place, cleared of snow in the winter, to pull away from the flow of traffic for a short time. Beyond ensuring that the rest area is separated from the flow of traffic, other features are highly desirable:

- Animal-proof garbage facilities help maintain cleanliness of the site and of the highways.
- Night-time lighting provides additional security.
- Washrooms are always required by long-distance travellers.
- Cell-phone reception allows access to real-time highway information.
- Potable water, electricity, shelter, snacks and other amenities would also be appreciated, at least periodically throughout the system.

In good weather conditions, drivers can often travel several hours, but in case of inclement weather, at night, in slow traffic, or due to other factors, more frequent rest areas should be provided.

Exhibits 9.8 through 9.10 and the subsections below provide some context to better understand the potential locations on the highway network where geographically there is a need for new or enhanced rest areas on the Northern Ontario highway network.

Rest areas can take various forms, ranging from basic roadside pull-off areas to full-service centres. A new year-round truck-suitable rest area would likely be in the form of a truck stop / restaurant / gas station and be operated by the private sector.

Daily Trucking Hours-of-Service Regulations

Exhibit 9.7 shows typical travel times on the Northern Ontario highway network. The blue links indicate travel times between individual communities. (It can be noted that the cumulative travel time from North Bay to Nipigon is essentially the same when traveling along either Highway 11 or along Highway 17.) The red lines on the plot indicate how far one can travel across Northern Ontario from three major long-distance trucking hubs — Montreal, Peel Region (Brampton, Mississauga, and Caledon) and Winnipeg — within the 13-hour daily hours-of-service regulations for truckers. Meanwhile, Exhibit 9.8 provides an indication of where truck drivers tend to take their breaks, based on reported breaks in MTO's 2012 Commercial vehicle survey. Trucking breaks as shown in this plot are not comprehensive; truckers may not have reported all breaks on their trip during the surveys, and the breaks shown are of varying duration (break duration was not recorded as part of the survey).

Truckers strive to maximize their daily hours of service. Drivers familiar with the route plan their end-of-day rest stops accordingly, and at times stop ahead of their 13-hour limit to ensure a suitable overnight break location. Having to cut their daily travel time short because of a lack of suitable rest areas makes their work day less productive. Conversely, when drivers exceed their daily hours of service as they continue to drive until they find a suitable rest area, they can pose a traffic safety risk due to driver fatigue and can face penalties. Commercial vehicle drivers sometimes stop directly at roadside when no suitable rest area can be found.

When traveling along Highway 11 through Northeastern Ontario either eastbound or westbound from the three major trucking hubs, hours of service limits tend to be reached between Hearst and Longlac. As can be seen in Exhibit 9.8, there are virtually no trucks stopping in this stretch of highway, as there are no suitable rest areas. While there are some rest areas that can accommodate trucks between Nipigon and Hearst, none are maintained year-round.

When long-distance truckers travel instead along Highway 17 through Northeastern Ontario either eastbound or westbound from the major trucking

hubs, hours of service limits tend to be reached in the vicinity of Marathon or Wawa. There are some fuel stations along this route, but MTO rest areas tend not to be suitable for trucks, and none are maintained year-round.

As can be seen in Exhibit 9.8, truckers often stop in Nipigon for their breaks, potentially due to uncertainty about finding a suitable rest area east of Nipigon on either Highway 11 or 17 in this area. The exhibit also shows that trucking breaks take place almost exclusively on the Trans-Canada highway and on Northern-Southern Ontario links, corresponding to routes with the highest truck volumes.

Tourism Considerations

Exhibit 9.9 is a road network assignment plot of the tourism-related trips reported in MTO's Northern Ontario 2011–2012 passenger vehicle surveys, and provides an indication of the highway routes that are used by tourists who would likely have a greater need of rest areas and fueling than local travellers. Note that the green flows are based on licence-plate recording of Ontario-plated passenger vehicles, and do not represent out-of-province vehicles such as those based in Manitoba. Based on this map, Northern Ontario highway corridors with the highest volumes of tourism travel, in decreasing order, are the following:

- The Northern-Southern Ontario links of Highways 69/400 and 11;
- Highway 17 west of Sudbury, especially as far as Highway 6, and continuing westerly;
- Highway 17 east of North Bay
- Highway 17 west of Kenora (flows shown on the exhibit do not include Manitoba-plated vehicles, which are known to be a large proportion of tourism traffic on this highway);
- Highway 11 & 17 between Thunder Bay and Nipigon; and
- Highway 11 north of North Bay, especially as far north as New Liskeard.

Highway 17 along the north shore of Lake Superior also has significant tourism flows along its length, and this is often promoted as a tourism route (promoted tourism routes are discussed in the *Tourism* technical backgrounder).

Exhibit 9.7: Travel Times between Northern Ontario Communities, Including Trucking Daily Hours-of-Service Travel Time Limits (13 hours) for Travel from Major Trucking Centres

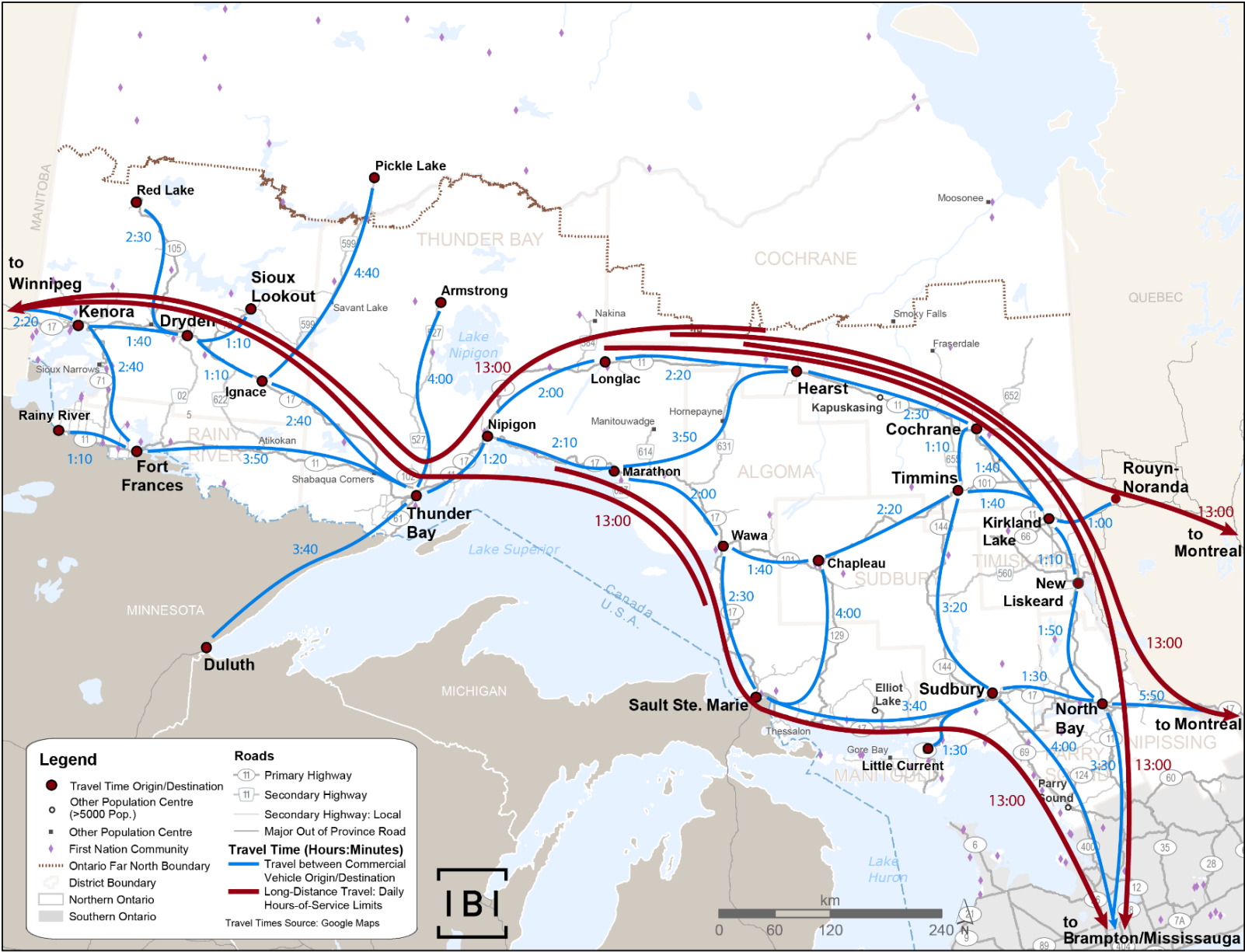
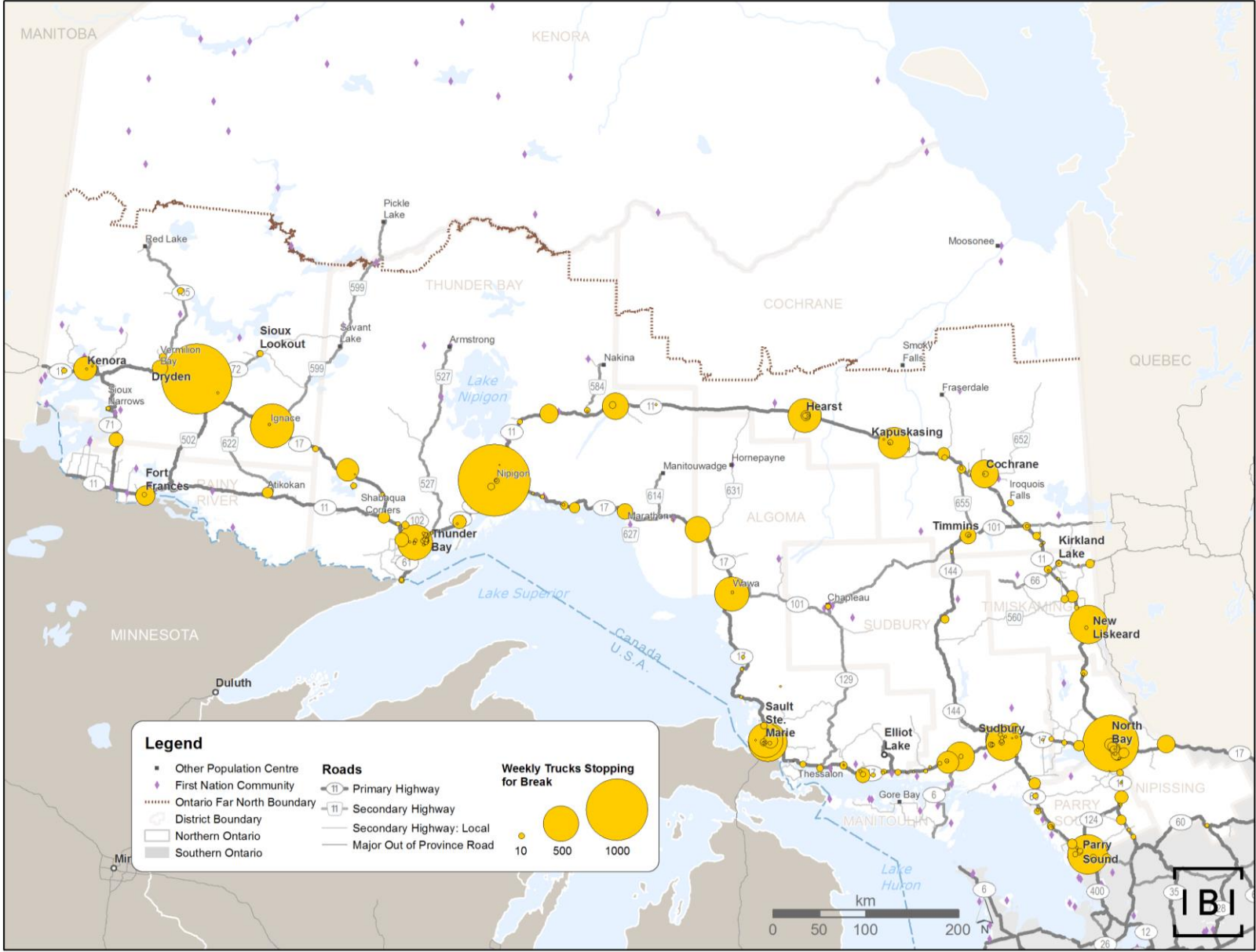
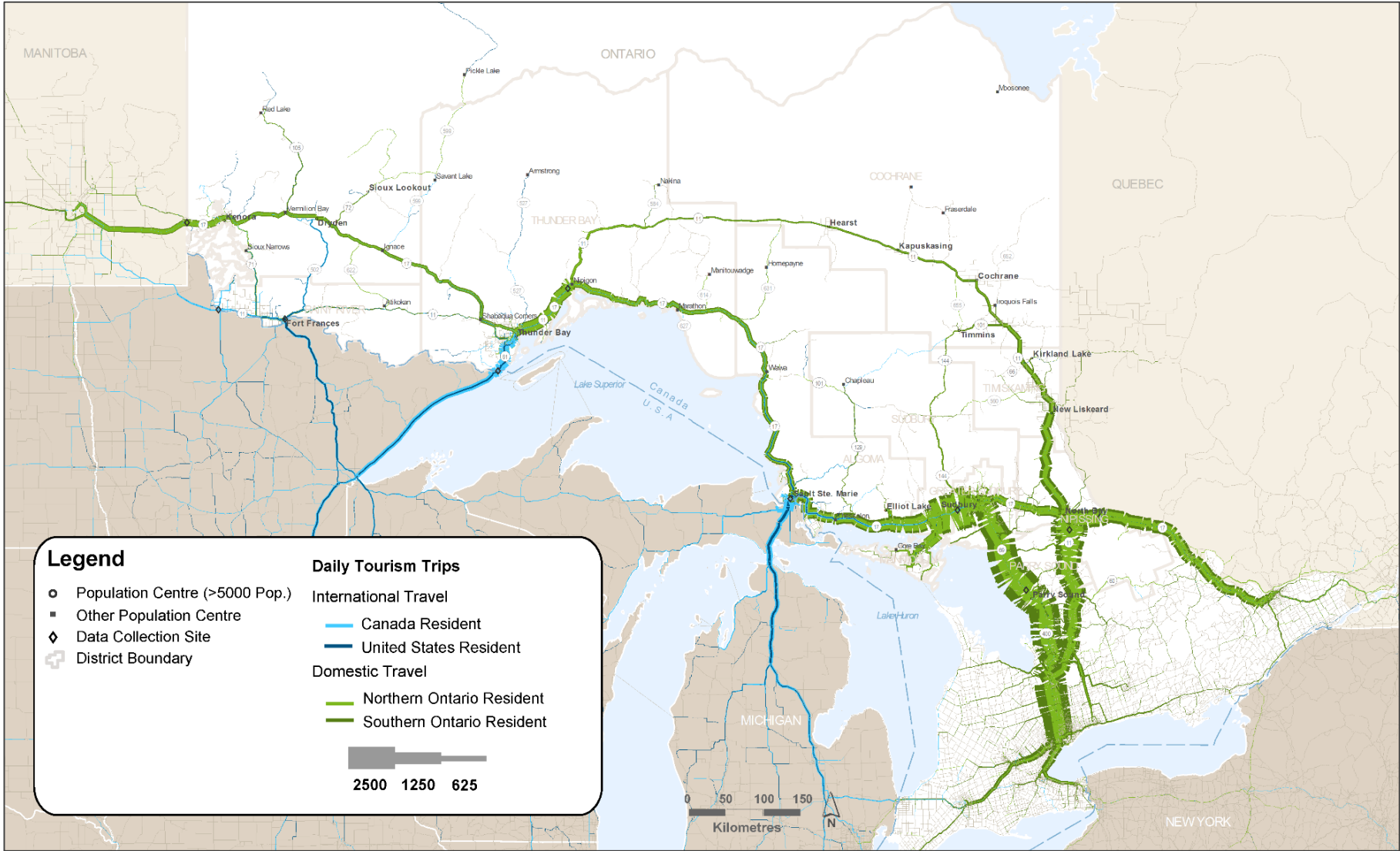


Exhibit 9.8: Commercial Vehicle Break Locations in Northern Ontario



Source: IBI analysis of 2012 Ontario CVS data. Note that break locations are representative, not comprehensive, as not all break locations were reported.

Exhibit 9.9: Tourist Travel Flows across Northern Ontario Border Crossings and Selected Provincial Highway Sites, 2011-2012



Source: IBI Group analysis of MTO Northern Ontario 2011-2012 passenger vehicle survey data.

Rest Areas and Network Resiliency Considerations

When considering the placement of rest areas along the highway network, it can be helpful to locate the rest areas at intersections of major highway routes, as these can be the decision points for choosing to take an alternate route in case of a road closure. For example, a year-round truck-suitable rest area in the vicinity of the intersection of Highways 17 and 631 or at the intersection of Highways 11 and 631 would not only benefit the trucking industry by providing a rest area closer to where drivers tend to approach their daily hours-of-service limits on the Trans-Canada routes, but also, as Highway 631 could be used as an alternate route in case of temporary road closures (e.g. due to collisions or winter storms), it can be a place to stop and determine whether the alternate route should be taken or to wait out the closure.

Driver Fatigue-Related Collision Considerations

Driver fatigue due to large travel distances is a concern throughout Northern Ontario, and collisions attributable to driver fatigue may be more prevalent due to insufficient rest areas. Some primary highways, including Highways 144 and 105, and most secondary highway routes have essentially no rest area provision. The lower traffic volumes on these routes may not warrant a full-service rest area, but motorists benefit from the provision of even a few safe truck-suitable roadside pull-over areas.

Summary of Rest Area Needs

Based on the current level of rest areas provision as well as the rest area needs discussed above, Exhibit 9.10 summarizes on a map of the Northern Ontario highway network some of the potential priority highway rest area needs for the region. In general, any improvement to any current rest areas, such as making them more accessible to trucks, extending the operating season, etc. would improve the driving experience for motorists on the Northern Ontario highway network. Other potential improvements could include working with local businesses to improve existing services (e.g. extending hours of service, installing additional lighting or fencing to improve security, etc.).

Currently, there are no official guidelines relating to rest areas in Northern Ontario. Guidelines providing direction as to the maximum distances between rest areas, consistent signage, and physical design, etc. would be of great benefit for the North. MTO's Northwest Region office recognizes that the current provision of rest areas is insufficient in Northern Ontario, and has taken the initiative to assess the rest area needs for the region; identifying a hierarchy of three different types of rest areas, and identifying candidate locations for each type of rest area. The NOMTS Strategy development will build on the findings of this work.

9.3 Mobile Phone Coverage

Motorists rely increasingly on mobile phones while travelling, including accessing current information on traffic conditions and road closures, contacting people at their destination end of the trip in case of delays, and having a way of contacting help in case of collisions, vehicle breakdowns, and other emergencies.

Gaps in mobile phone coverage carry significant implications for road users. Without cell phone coverage, motorists facing safety-related issues cannot use their cell phones to contact help and instead must rely on a passing motorist to assist. This situation is made worse in extreme cold and other inclement weather.

There are also road user information implications, as Ontario's major highway information service, Ontario 511, is only accessible by phone and internet. Given that many of the highways without service have no alternate routes, motorists are potentially missing out on critical travel planning information that could save them from travelling towards a road closure.

Exhibit 9.11 is a map showing approximate mobile phone reception areas in Northern Ontario. These are approximate only based on a set distance from transmission towers for Bell and Rogers networks. Signal strength can be affected by topography, current weather conditions, and other factors.)

Mobile phone reception is focused on population centres in the Near North and on the Trans-Canada highway network. Service on both major networks is available on most of the Trans-Canada Highway with the following exceptions:

- There is a roughly 100-km gap on Highway 11 between Longlac and Highway 631 with no mobile phone coverage;
- On Highway 17 between Wawa and Marathon, only the Rogers network provides service; and

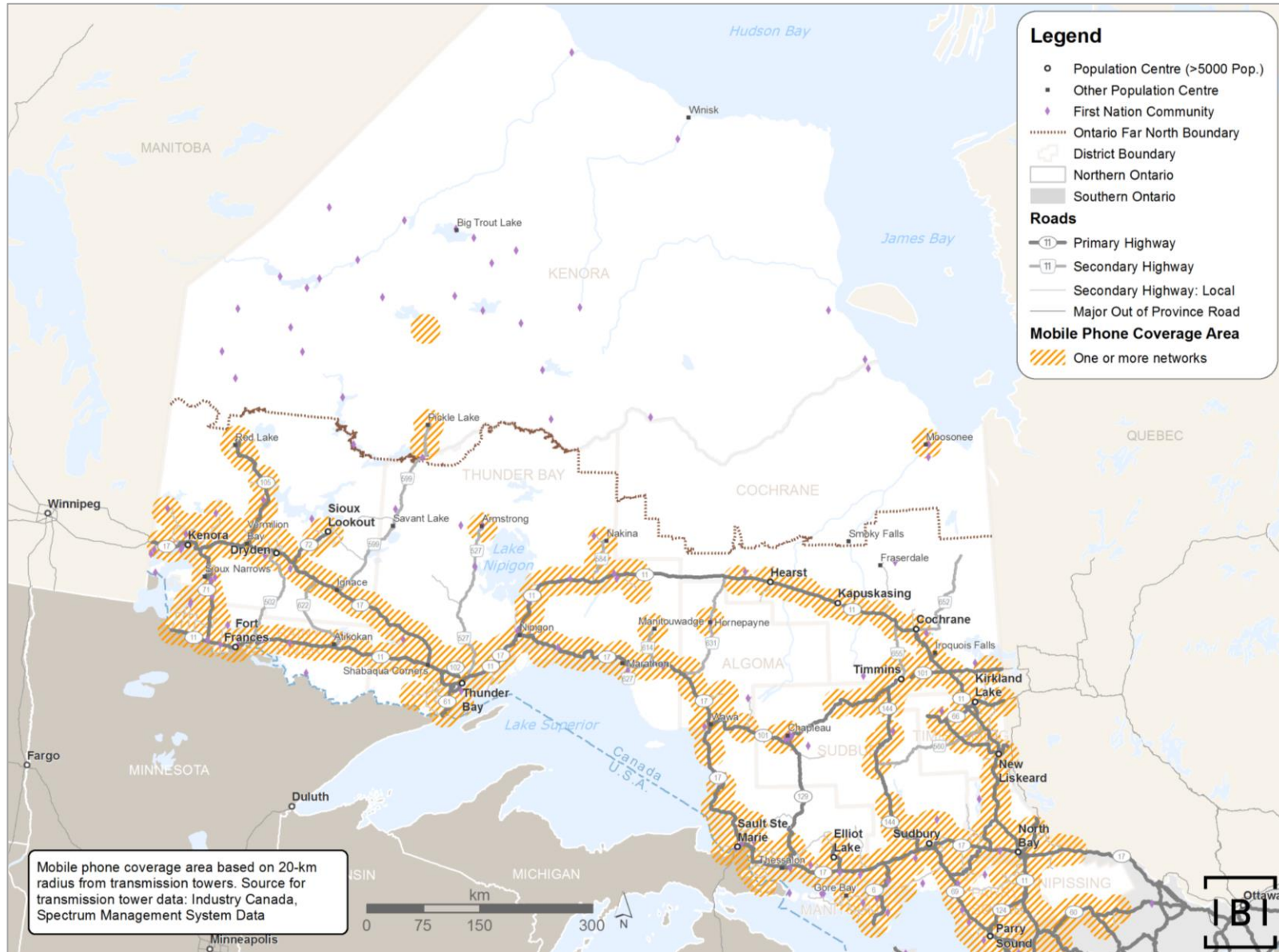
- On Highway 11 between Cochrane and Highway 631, only Bell service is available (except in Kapuskasing, where Rogers is also available).

Network coverage is much less comprehensive outside of the Trans-Canada highways. In Northeastern Ontario between the two Trans-Canada highways, nearly the entire stretch of Highway 129 is without coverage and only Bell provides coverage on most of Highways 144 and 101. There is no cell phone service available on Northern Ontario's secondary highways outside of larger population centres.

There is limited mobile phone coverage in the Far North. As shown in Exhibit 9.11, Moosonee, Pickle Lake, and the Musselwhite Mine areas have cell phone coverage. In addition, a number of remote First Nations have also recently started to have cell phone service. For example, Attawapiskat, located on James Bay, has had basic cell phone service since 2012, coordinated through Attawapiskat First Nation administration (note that this offers basic service only, not a 3G or 4G network that would allow the use of Smartphones). Meanwhile, Kashechewan and Fort Albany, also on James Bay, do not yet have cell phone service.

Other real-time communication options include land-line telephones, Internet, two-way radios, or satellite phones.

Exhibit 9.11: Mobile Phone Coverage in Northern Ontario



Note: The coverage area indicated is an estimate only, and is based on a set distance from transmission tower locations.

Signal strength will vary within the coverage area due to topography, environmental conditions, etc., and there may be gaps or coverage not reflected in the map.

10 Outlook: Future Traffic Trends

The future outlook for the Northern Ontario highway system is tied closely to anticipated travel and traffic trends on the network. As part of the Northern Ontario Multimodal Transportation Strategy development, forecasts of traffic volumes were prepared for the study horizon years of 2031 and 2041. An overview of this forecasting process is provided below, and the forecasting results and implications for the highway system are discussed.

10.1 Overview of Traffic Forecasting Process

The traffic forecasting process used as a base MTO's 2011/2012 commercial vehicle and passenger vehicle origin-destination travel survey datasets representing travel through international border crossings and strategic provincial highway locations, as well as 2011 network-wide traffic volumes.

Population and employment forecasts used in the traffic forecasting process correspond to the Reference Scenario described in the NOMTS *Socio-Economic Context Working Paper* (February 2016) and in the *Phase 1 Report: The Northern Ontario Context: Implications and Considerations for Strategy Development* (May 2016). These forecasts correspond to the Ontario Ministry of Finance's provincial socio-economic forecast, and anticipate overall a relative stabilization of the Northern Ontario population after larger decreases in recent years, overall decreasing slightly (approximately a 1.6% decrease from 807,700 to 794,400 persons) from 2011 through 2041, with a decrease in employment as well (an 8% decrease from 349,000 to 321,700 jobs). MTO's macroeconomic model relates these Reference Scenario forecasts to gross domestic product (GDP) growth by industry and by Census subdivision. GDP is anticipated to increase approximately 50% for the region over this same time period. This growth rate is higher than employment, anticipating greater efficiencies in industry over the study horizon. These population, employment and GDP forecasts are summarized in Exhibit 10.1 by Census Division within Northern Ontario, as well as by Canadian Region outside of Northern Ontario, as these also have an impact on the forecasting process, especially as they have stronger growth rates than those anticipated for Northern Ontario.

Forecasts were prepared for passenger vehicle and commercial vehicle traffic separately. Flows between origins and destinations were factored/adjusted based on related growth in population and employment for passenger vehicle trips and on growth in GDP for related industries for commercial vehicle trips, for the origin and/or destination Census Division (Ontario) or province (outside of Ontario) of the trip, as appropriate.

Exhibit 10.1: Summary of Socio-Economic Factors Used in Traffic Forecasting Process

District	POPULATION				EMPLOYMENT				GDP (\$2007 MILLIONS)			
	2011	2041	2011-41 Growth	2011-41 % Growth	2011	2041	2011-41 Growth	2011-41 % Growth	2011	2041	2011-41 Growth	2011-41 % Growth
Northern Ontario												
Kenora	69,600	73,000	3,400	5%	25,400	28,200	2,800	11%	2,100	3,400	1,300	62%
Rainy River	20,900	17,500	-3,400	-16%	9,300	6,900	-2,400	-26%	700	800	100	14%
Thunder Bay	150,000	147,400	-2,600	-2%	68,100	60,600	-7,500	-11%	5,700	7,800	2,100	37%
Algoma	119,400	108,300	-11,100	-9%	49,000	41,100	-7,900	-16%	4,300	6,200	1,900	44%
Cochrane	83,300	74,400	-8,900	-11%	37,100	29,000	-8,100	-22%	3,600	5,600	2,000	56%
Greater Sudbury	164,900	172,300	7,400	4%	77,800	78,400	600	1%	8,100	13,200	5,100	63%
Manitoulin	13,300	14,600	1,300	10%	5,100	5,700	600	12%	300	400	100	33%
Nipissing	87,600	91,500	3,900	4%	40,600	40,200	-400	-1%	3,200	4,600	1,400	44%
Parry Sound	43,200	43,700	500	1%	14,900	14,400	-500	-3%	900	1,300	400	44%
Sudbury	21,600	18,500	-3,100	-14%	7,600	5,000	-2,600	-34%	500	600	100	20%
Timiskaming	33,900	33,200	-700	-2%	14,100	12,200	-1,900	-13%	1,300	2,100	800	62%
Northern Ontario Total	807,700	794,400	-13,300	-2%	349,000	321,700	-27,300	-8%	30,600	46,100	15,500	51%
Other Regions												
Eastern Ontario				30%				30%				75%
South-Central Ontario				48%				43%				88%
Southwestern Ontario				27%				22%				74%
Manitoba				37%				35%				80%
Other Western Provinces				40%				42%				88%
Quebec				39%				35%				81%
Atlantic Provinces				32%				29%				67%

Source: Population, employment for Northern Ontario - Hemson Consulting Ltd. based on Statistics Canada data. Other figures: MTO macro-economic allocation model results.

Note: Figures above have been rounded.

For international trips, trips were factored based on growth rates in Canada only, as detailed socio-economic forecasts were not available for US States, and because of significant uncertainty about factors that affect international trips such as changes in currency exchange rates.

Assuming a direct correlation between GDP growth and growth in truck trips is a conservative approach for determining roadway capacity impacts, in that the resulting truck trip levels may be higher. There may be industry trends that decrease the number of truck movements in relation to GDP, such as fuller truck loads or a change in focus to higher-value goods per unit weight. A sensitivity analysis is included in Section 10.5 whereby truck growth is reduced to 50% or 80% of GDP growth to take into account this potential.

A more detailed description of traffic forecasting process is included in Appendix C.

10.2 Overview of Traffic Forecasting Results

Overall traffic forecast results for Northern Ontario are summarized in Exhibit 10.2, showing the number of trips and number of vehicle-kilometres travelled on the Northern Ontario provincial highway network for 2011, 2031 and 2041. This information is shown both in terms of direct vehicles by type, and in terms of approximate passenger car equivalents, recognizing that one truck has much more impact on roadway operations than one car. Exhibit 10.3 summarizes how the number of trips is broken down by Northern Ontario origin-destination type for passenger and commercial vehicles separately¹⁴.

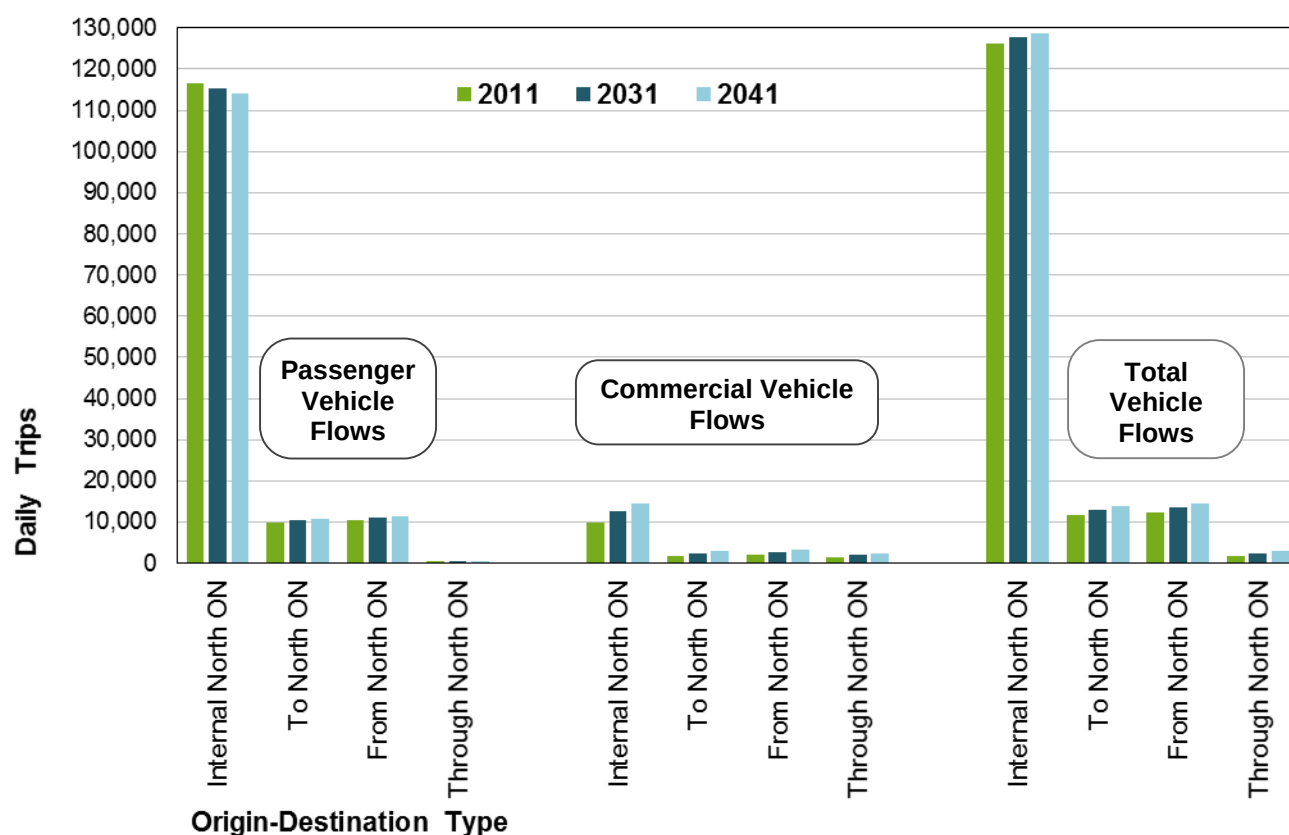
Over the study horizon, passenger car trips remain relatively stable, decreasing only slightly (0.5%) overall. However, some of the highest growth in trips is due to longer-distance trips to/from higher-growth areas within and outside of Northern Ontario. Therefore, in terms of passenger vehicle kilometres, the overall impact on the network is a slight traffic flow increase of 3% on the Northern Ontario highway network.

¹⁴ Note that for both plots, internal Northern Ontario trips not represented by the origin-destination surveys are estimated from changes in vehicle-kilometres travelled on Provincial Highways in the region after taking into account the same for the trips represented by the origin-destination surveys. An average trip length of 100 km was assumed for local passenger vehicles trips, and 150 km for local truck trips to estimate the number of trips.

Exhibit 10.2: Summary of Forecasting Results

Vehicle Type	Daily Trips (thousands)				Daily Vehicle km Travelled (Millions)			
	2011	2031	2041	2011-2041 % Growth	2011	2031	2041	2011-2041 % Growth
Vehicles								
Passenger Vehicle Flows	137.2	137.2	136.5	-0.5%	15.16	15.52	15.62	3.0%
Commercial Vehicle Flows	14.7	19.7	23.1	58%	3.88	5.51	6.60	70.3%
Total	151.9	156.9	159.7	5%	19.04	21.03	22.23	16.7%
Passenger Car Equivalents (1 truck = 2.5 passenger vehicle equivalents)								
Passenger Vehicle Flows	137.2	137.2	136.5	-0.5%	15.16	15.52	15.62	3.0%
Commercial Vehicle Flows	36.7	49.2	57.8	58%	9.70	13.77	16.51	70.3%
Total	173.9	186.4	194.4	12%	24.86	29.29	32.13	29.2%

Exhibit 10.3: Summary of Forecasting Results by Origin-Destination Flow Type



Commercial vehicles represent 10% of trips using the Northern Ontario highway network in 2011, increasing to 14% of trips in 2041, but their impact on the highway network is much greater when considering that trucks travelling to, from and especially through Northern Ontario travel extremely long distances along the Northern Ontario highway network. In 2011, trucks make up 20% of vehicle-kilometres travelled on the Northern Ontario highway network, a proportion that is expected to increase to 30% in 2041, given the anticipated growth in areas outside of Northern Ontario and the related growth in truck trips to and from these areas. When considered in passenger car equivalents, trucks make up approximately half of the flows on the Northern Ontario highway network in 2041.

10.3 Highway Link-Level Traffic Forecasting Results

Exhibits 10.4 through 10.6 show the results of the NOMTS traffic forecasting process for link volumes and flows of vehicles using the Northern Ontario road network in terms of growth in passenger vehicle, commercial vehicle and total vehicle volumes, respectively. Exhibit 10.7 shows the resulting travel flows in 2041 for cars and trucks separately, and can be compared to Exhibit 1.2, which shows the same for 2011.

Exhibit 10.7 shows that passenger vehicle flows are relatively stable throughout most of the Northern Ontario highway network over the study horizon. The highest anticipated increases in travel volumes are on Highways 69/400, 11 and 17 in the Sudbury and North Bay areas, and along Highway 17 in the Kenora/Dryden area. This passenger vehicle traffic growth continues the growth trend seen on these highways over the last decade, as was discussed in Section 4.3. The Northern-Southern Ontario links have among the highest growth on the network: an increase of 20% (from 5,700 to 6,800 average daily passenger vehicle flows) on Highway 69/400 south of Sudbury, and an increase of 12% (from 7,800 to 8,700) on Highway 11 south of North Bay. These values increase even more during the summer season with increased tourism and recreation traffic.

In terms of commercial vehicle flows, it is anticipated that there will be a marked increase in through trips on the main routes connecting the major trucking centres of Montreal, Peel Region and Winnipeg through Northern Ontario. Combined with increasing truck flows to and from Northern Ontario centres, the largest increases in truck flows from 2011 through 2041 will be seen along the following highway corridors:

- Highway 69/400 south of Sudbury: over 70% increase in truck flows from approximately 1,400 to 2,300 daily;
- Highway 11 south of North Bay: over 70% increase in truck flows from approximately 1,400 to 2,500 daily;

- Highway 17 west of Thunder Bay: approximately a 72 to 87% increase in truck flows from approximately 1,100 to 1,400 daily in 2011 to 2,100 to 2,500 daily in 2041.

For combined passenger and commercial vehicle flows, the growth in commercial vehicle flows both drives the overall growth in volumes on the network — especially on the Trans-Canada highways and on the Northern-Southern Ontario links — and also increases the overall percentage of commercial vehicles on the roadways.

10.4 International Border Crossing Flows

International border crossing flows are summarized in Exhibit 10.8 in terms of number of daily vehicle crossings by type of vehicle in 2011 and anticipated for 2031 and 2041 for each of the four Northern Ontario international border crossings. International commercial freight flows are also shown in terms of number of trucks, value of goods moved, and tonnes of goods moved, in Exhibit 10.9.

There is anticipated to be almost a two-thirds increase in the number of international truck flows across the four Northern Ontario crossings, corresponding to a 78% increase in commodity value and an 80% increase in tonnes of freight moved. Because trucks are only a relatively small portion of flows at each of the crossings and because of the low or negative population growth anticipated in the vicinity of the border crossings, a decline in overall number of crossings is anticipated at each of the four Northern Ontario international border crossings in spite of this anticipated growth in cross-border truck flows.¹⁵

¹⁵ Note that the passenger vehicle forecasts did not incorporate the relatively high population growth rate anticipated for the states of Minnesota and Michigan, which could increase the portion of flows representing trips by US tourists significantly.

Exhibit 10.4: Flows of Passenger Vehicles using the Northern Ontario Highway Network, 2011 and 2041

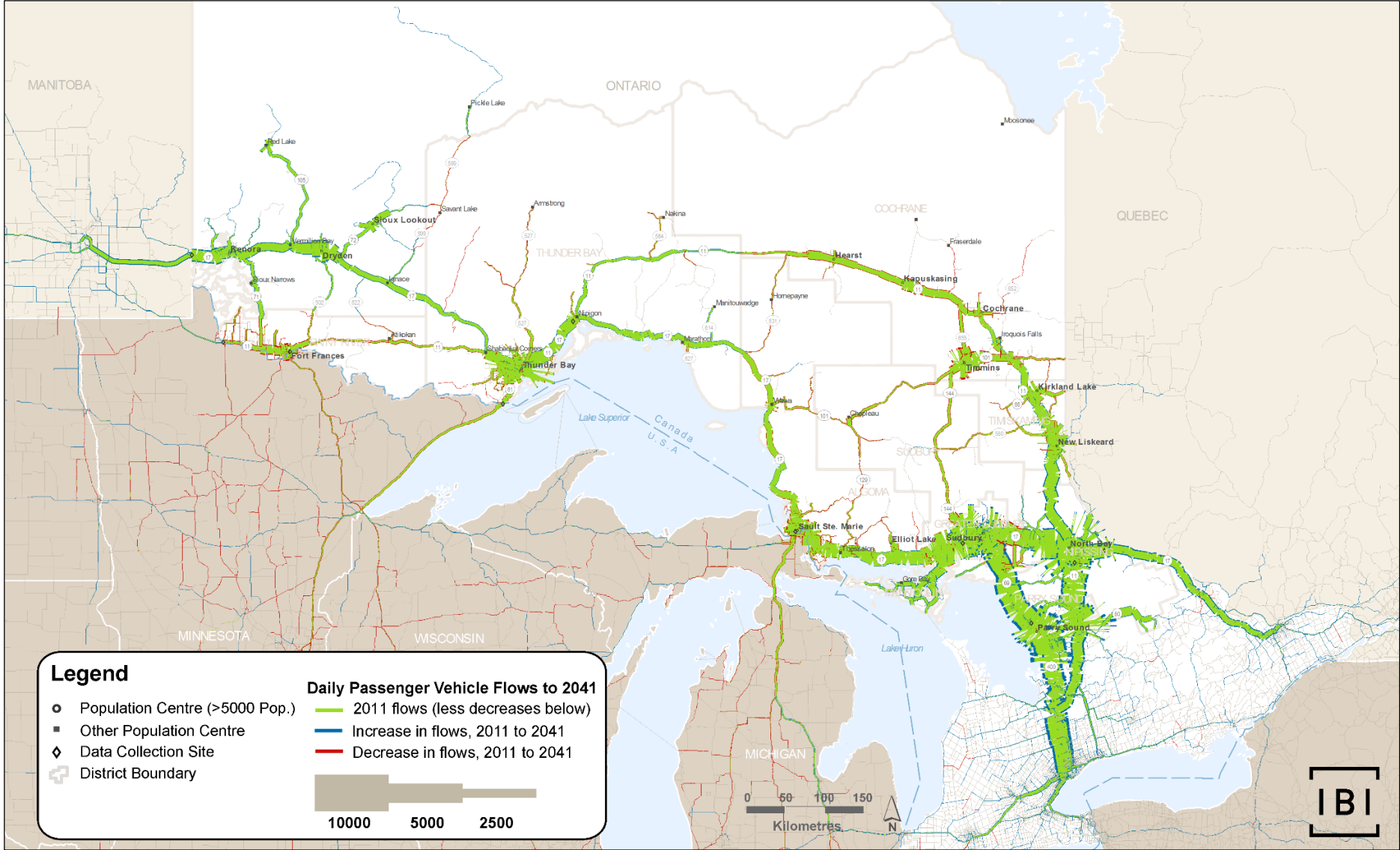


Exhibit 10.5: Flows of Commercial Vehicles using the Northern Ontario Highway Network, 2011, 2031 and 2041

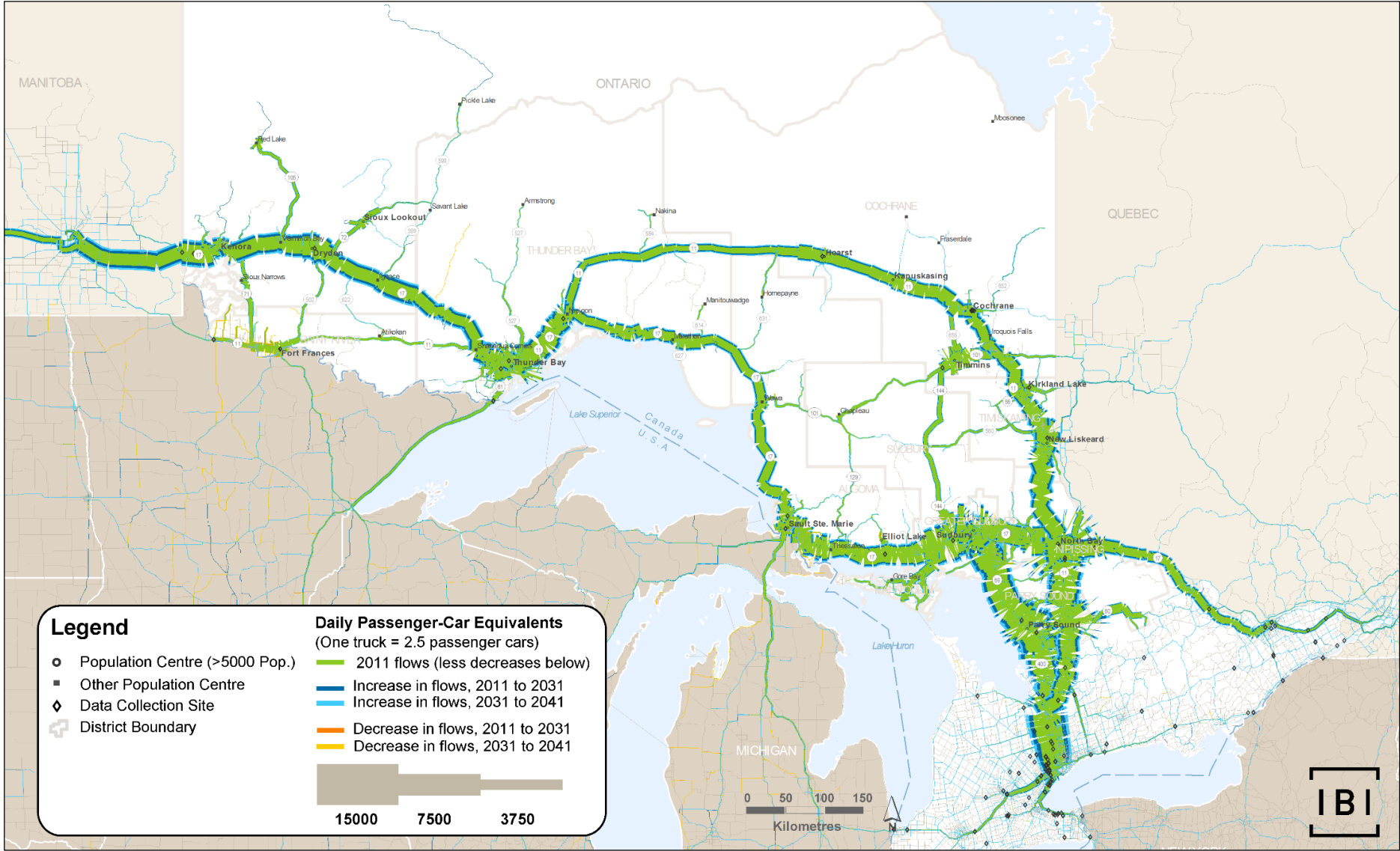


Exhibit 10.6: Flows of Total Vehicles Using the Northern Ontario Highway Network, 2011, 2031 and 2041

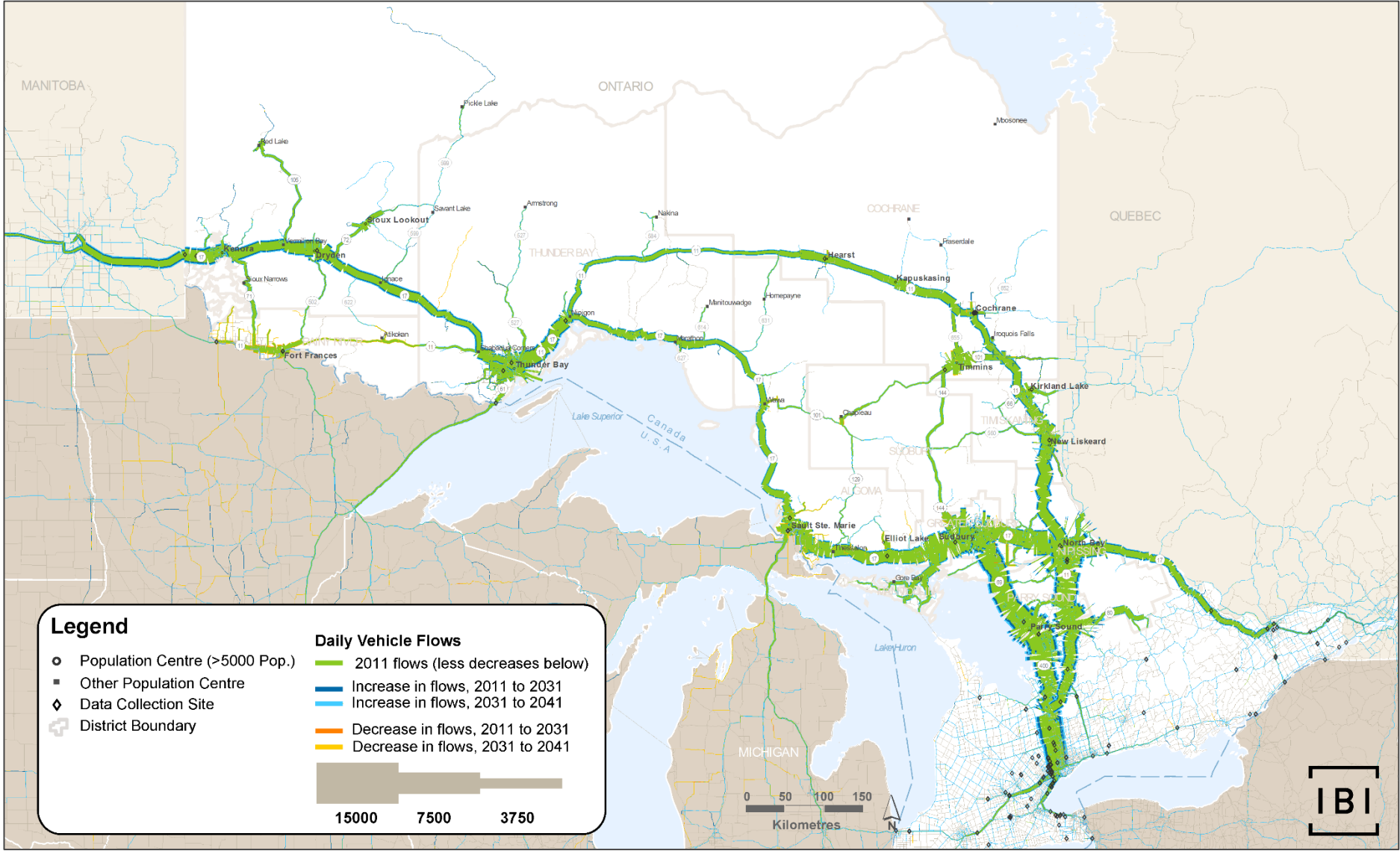


Exhibit 10.7: Flows of Passenger and Commercial Vehicles Using the Northern Ontario Highway Network, 2041



Exhibit 10.8: Summary of Passenger and Commercial Vehicle Flows Anticipated at International Border Crossings

Border Crossing	Daily Passenger Vehicles				Daily Commercial Vehicles				Total Daily Vehicles			
	2011	2031	2041	2011-2041 % Growth	2011	2031	2041	2011-2041 % Growth	2011	2031	2041	2011-2041 % Growth
Rainy River	940	870	831	-12%	73	81	98	33%	1,013	952	928	-8%
Fort Frances	2,064	1,881	1,774	-14%	119	140	165	39%	2,183	2,020	1,939	-11%
Pigeon River	1,408	1,408	1,391	-1%	150	216	260	73%	1,558	1,623	1,651	6%
Sault Ste. Marie	5,102	4,824	4,694	-8%	264	393	480	82%	5,366	5,217	5,174	-4%
Total	9,514	8,983	8,689	-9%	607	830	1,003	65%	10,120	9,813	9,692	-4%

Note: Passenger vehicle flow forecasts were based largely on population growth in the Census Divisions neighbouring the crossings. Flows at Rainy River and Fort Frances do not take into account the anticipated growth in tourism flows from Minnesota as described in the *Tourism* technical backgrounder.

Exhibit 10.9: Summary of Forecasting Results relating to Commercial Vehicle Commodities Flows at International Border Crossings

Border Crossing	Daily Commercial Vehicles				Daily Commodity Value (\$2012 Millions)				Daily Commodity Tonnes (thousands)			
	2011	2031	2041	2011-2041 % Growth	2011	2031	2041	2011-2041 % Growth	2011	2031	2041	2011-2041 % Growth
Rainy River	73	81	98	33%	0.07	0.10	0.11	72%	0.66	1.01	1.23	86%
Fort Frances	119	140	165	39%	1.43	1.95	2.31	62%	1.05	1.48	1.79	70%
Pigeon River	150	216	260	73%	2.44	3.39	4.06	67%	1.12	1.64	2.00	79%
Sault Ste. Marie	264	393	480	82%	5.78	8.78	10.79	87%	3.64	5.45	6.66	83%
Total	607	830	1,003	65%	9.71	14.21	17.27	78%	6.48	9.57	11.68	80%

10.5 Implications on Highway Network Capacity

Exhibits 10.10, 10.11 and 10.12 show anticipated traffic volumes in 2041 for Northern Ontario, for the Sudbury/North Bay area, and for Thunder Bay, respectively, in terms of passenger car equivalents (PCEs), in 5,000 PCE increments. Exhibits 10.13 through 10.15 show similar information to that in Exhibits 10.10 through 10.12, but for anticipated summer season volumes.

Traffic operations in the vicinity of Sudbury and North Bay are significant regarding the NOMTS planning theme of enhancing connections between Northern and Southern Ontario. Traffic volumes are among the highest on the Northern Ontario provincial highway network in the vicinity of these cities. Both Sudbury and North Bay are stable urban areas that are anticipated to grow slightly in population over the study horizon. Local traffic related to this local population growth, together with increased passenger and commercial vehicle traffic from Southern Ontario will put increasing pressure on highway operations in this vicinity.

Maintaining good highway levels of service through North Bay is especially relevant to maintaining good connections between Northern and Southern Ontario, as all travel between Southern Ontario and the Highway 11 corridor north of North Bay passes through the City of North Bay. Currently, where Highways 11 and 17 are merged through North Bay, the roadway has daily traffic volumes of over 20,000 PCEs negotiating signalized intersections in an urban setting. A study has been conducted in the past and a corridor has been protected toward building the North Bay Highway 11&17 expressway to the east of the current highway alignment through North Bay, which would help ensure this connection can be maintained with a good level of service. Another potential concern is that currently Highway 11 is 4-laned only as far north as Cedar Heights Road, a few hundred metres north of the urban area, though Highway 11 currently exceeds 10,000 daily PCEs for a few kilometres north of this 4-laning, with anticipated future traffic growth putting further pressure on service levels on this segment.

One highway capacity consideration, among others, is the question of when it is appropriate to increase the capacity of a 2-lane road to a 4-lane road. As noted in Section 4, much of the Northern Ontario highway network has a 2-lane arterial road design. A daily traffic volume of 10,000 is considered to be approximately the threshold at which widening the roadway from 2 lanes to 4 lanes could begin to be considered from a road capacity perspective, among other factors. A number of highway links are expected to exceed 10,000 daily PCEs by 2041 are located in the vicinity of Sudbury or North Bay:

- Highway 11 south of North Bay: This corridor has recently been 4-laned.

- Highway 69/400 south of Sudbury: There are plans to complete 4-laning in the near term.
- Highway 17 south bypass of Sudbury: This is currently a two-lane staged freeway¹⁶ between Regional Road 55 (Old Highway 17) to the west and Coniston to the east, with a very small 4-lane portion at the Hwy 69 interchange.
- Highway 17 west of Sudbury: As was noted in Section 4, Current and Historic Traffic Trends, Highway 17 from Sudbury westerly to Highway 6 has currently exceeds 10,000 daily PCEs by 2011, and while the potential to 4-lane this section has been studied, there is no commitment making this improvement as yet. Highway 17 is a 4-lane divided highway from Regional Road 55 west of Sudbury for approximately 25 km westerly, bypassing the communities of Walden, Naughton and Whitefish. The exhibit indicates that continuing 4-laning this section a few kilometres west of Highway 6 could be considered as well.
- Sections of Highway 17 from Sudbury to North Bay: Sections of Highway 17 from Sudbury to approximately Garson as well as a section through the community of West Nipissing are anticipated to exceed 10,000 daily PCEs by 2041. A study has previously been conducted to assess the potential to realign and 4-lane Highway 17 between Sudbury and Markstay.
- Highway 17 a few kilometres east of North Bay:

Similarly, Highway 11&17 from Thunder Bay to approximately 10 km east of the city exceeds 10,000 daily PCEs, and is already being 4-laned.

Other 2-lane sections exceeding 10,000 daily PCEs over the study horizon include the following:

- Highway 17 for approximately 5 km west of Kenora from Highway 17A;
- Highway 17 through Dryden;
- Highway 17 through Mattawa;
- Highway 17 from Thessalon to Bruce Mines; and
- Highway 11 through New Liskeard.

With an increasing proportion of trucks, the current operational issues relating to having a high proportion of trucks in the traffic mix will intensify on two-lane roads, namely driver frustration when there are limited passing opportunities, which could result in increased collisions due to overtaking. Trans-Canada highway links with at least 5,000 daily PCEs as shown in the exhibits could be

¹⁶ A two-lane staged freeway is a two-lane roadway constructed in a way that allows its future conversion to a four-lane divided freeway to be done without much difficulty.

given consideration for, at minimum, periodic passing lanes where they are not already provided.

Summer Network Volumes

Considering the increase in traffic in the summer months, additional provincial highway sections are seen to exceed 10,000 daily PCEs, as can be seen in Exhibits 10.13 through 10.15, including the following (in many cases these are extensions of sections already identified above):

- Highway 17 west of Kenora;
- Highway 17 through Dryden;
- Highway 11&17 east of Shabaqua Corners and near Nipigon;
- Sections of Highway 17 approximately from Sault Ste. Marie to Thessalon; and
- Sections of Highway 11 from New Liskeard southerly.

Exhibit 10.10: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

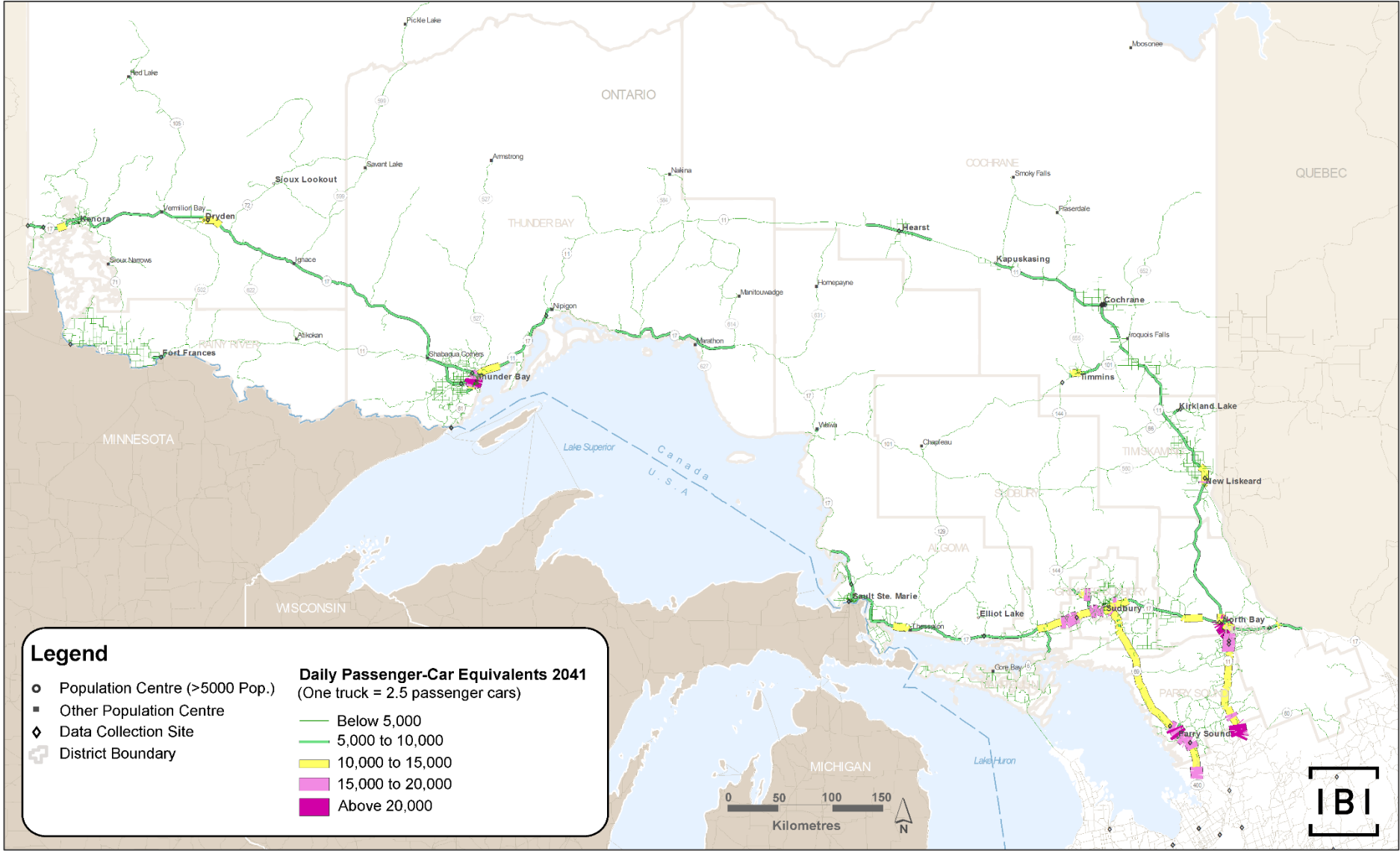


Exhibit 10.11: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

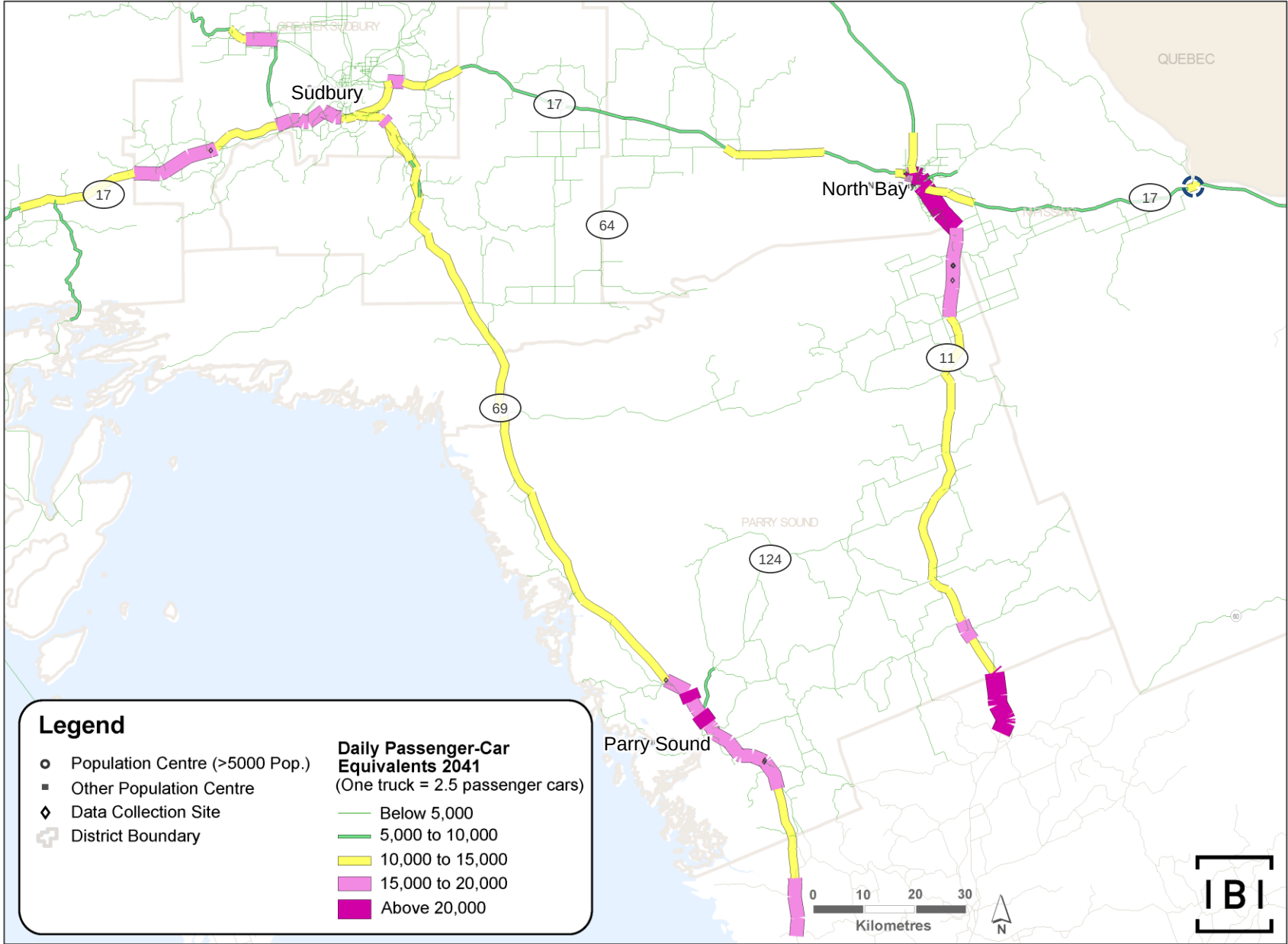


Exhibit 10.12: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

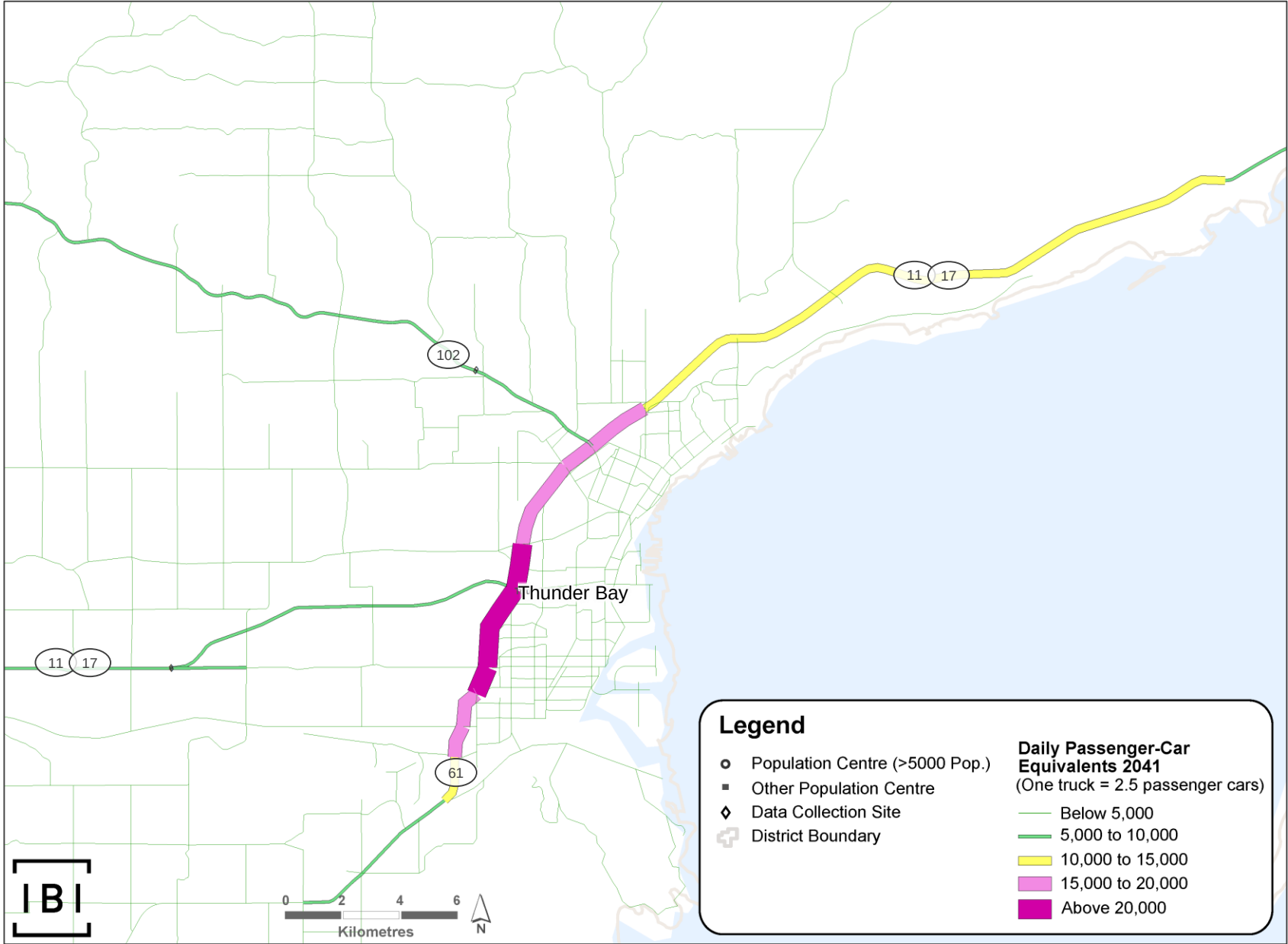


Exhibit 10.13: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer

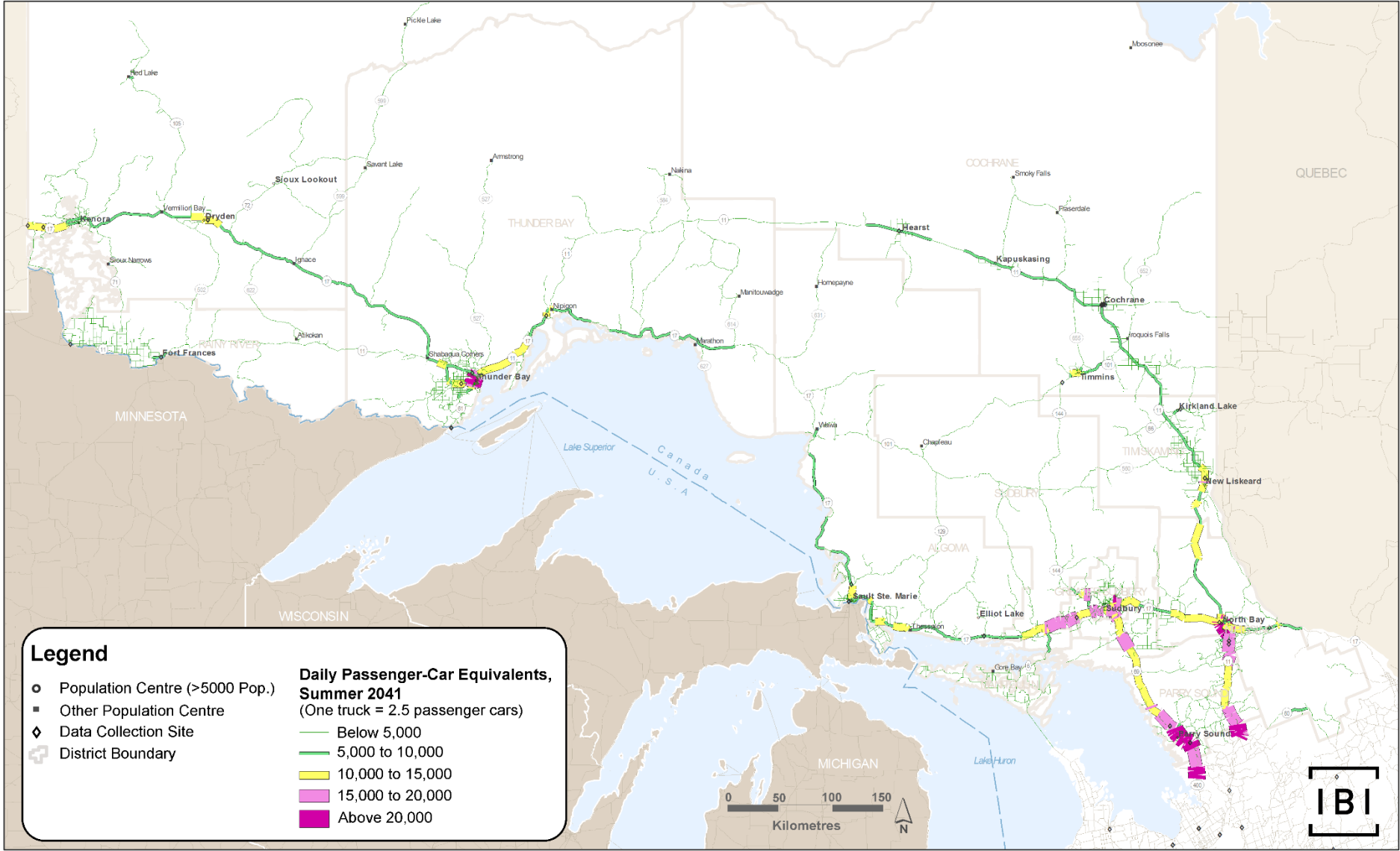


Exhibit 10.14: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer

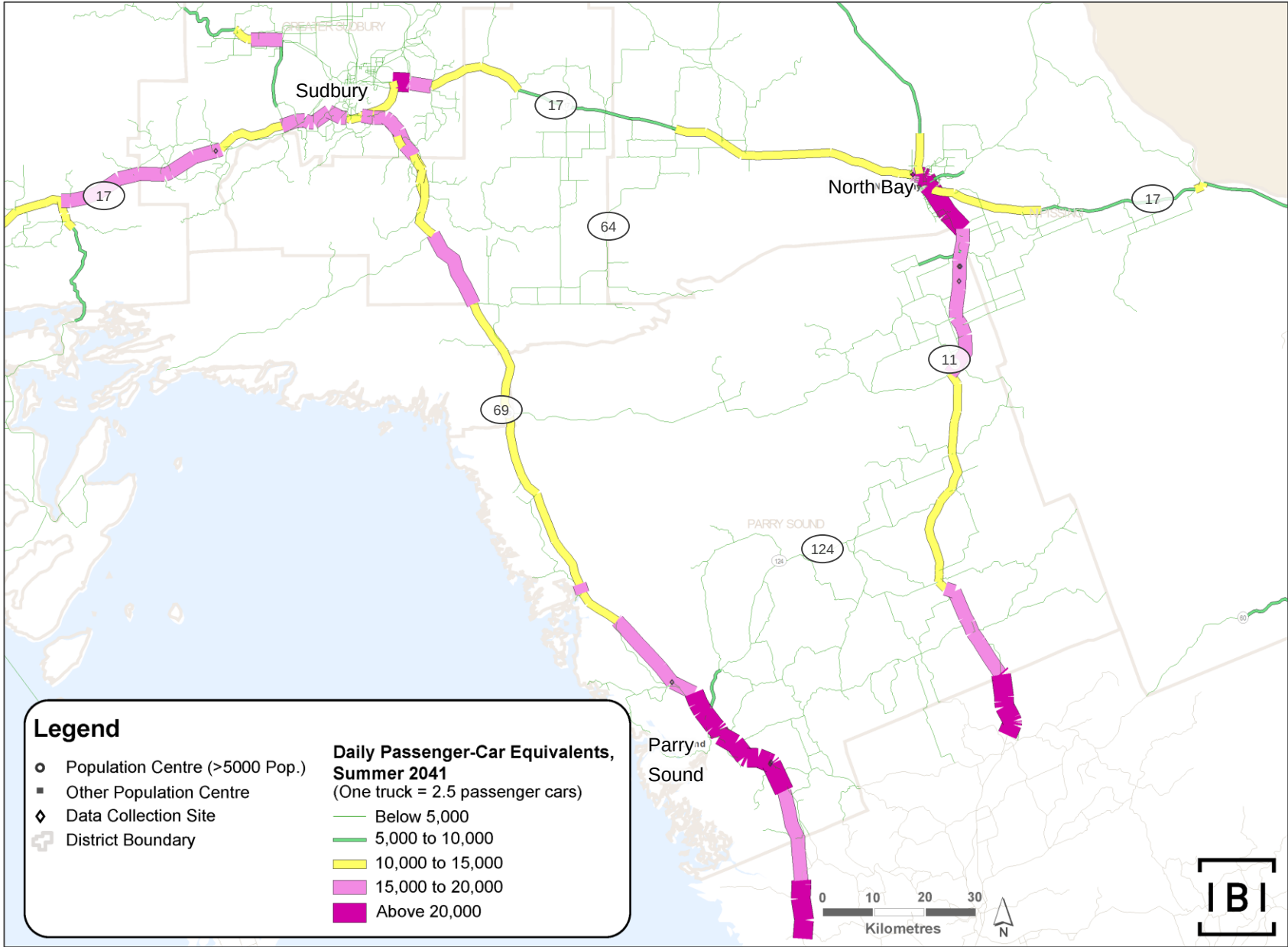
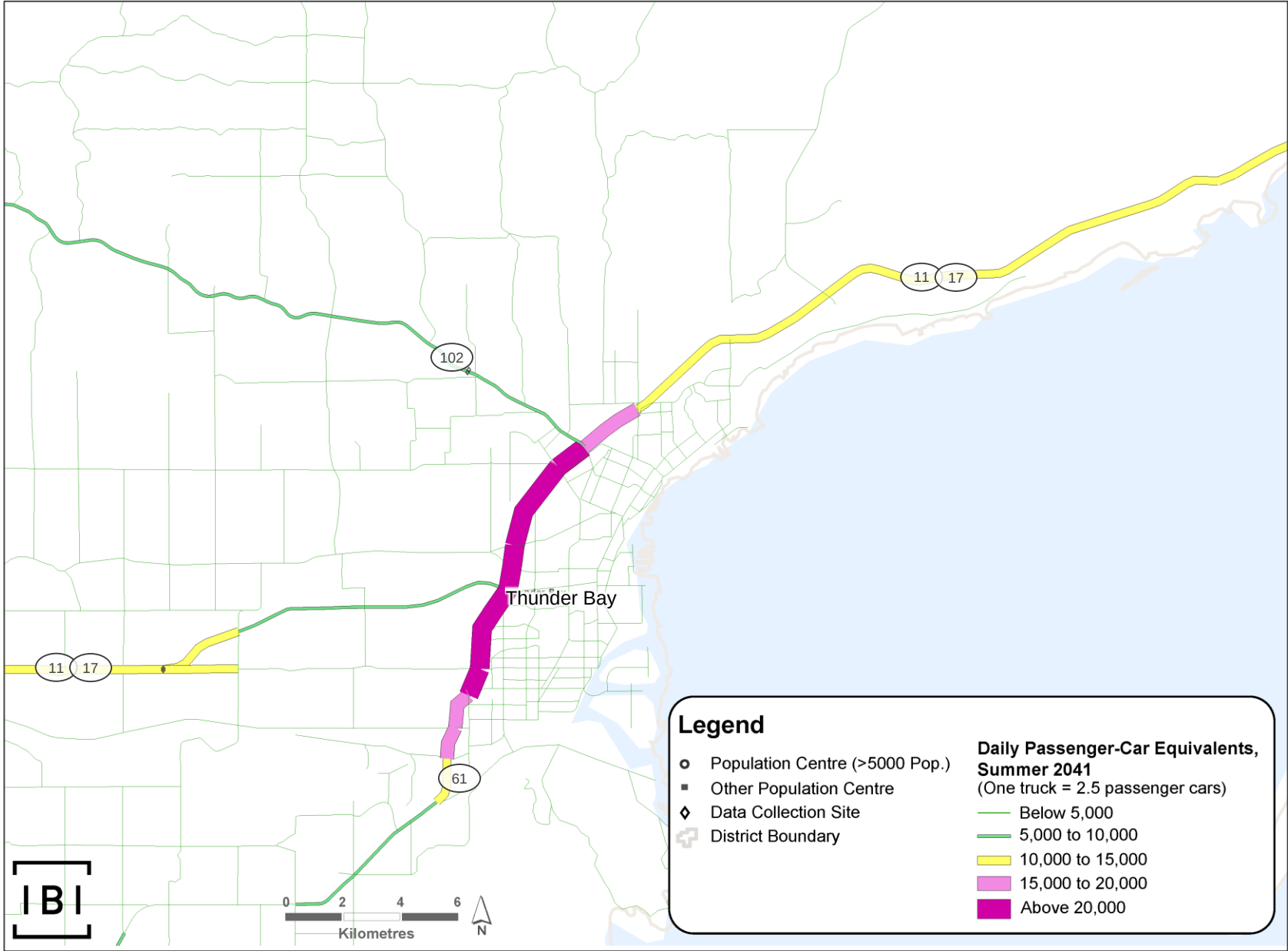


Exhibit 10.15: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer



Truck Traffic Forecasting Sensitivity Analysis

The highway traffic forecasting process resulted in significantly higher truck traffic growth compared to passenger vehicle growth, and the resulting total traffic growth has potential capacity implications on several sections of the Northern Ontario highway network over the NOMTS horizon.

The truck traffic forecasts assumed that truck trips increase at the same rate as GDP growth by industry. However, it is possible that this assumption does not take into account potential changes in industry, such as a shift to higher-value goods within each industry, or increased loading of trucks, or larger vehicles, each of which would mean that truck traffic would increase not quite as fast as GDP growth.

Two scenarios were tested as a sensitivity analysis on the commercial vehicle traffic forecasts:

- the first has truck trips increase at a rate equivalent to 80% of the GDP growth rate, indicating a moderate change in industry; and
- the second has truck trips increase at a rate equivalent to 50% of the GDP growth rate, indicating a more extreme change in industry practices.

The resulting number of commercial vehicle trips by origin-destination flow type under the base, 80% growth, and 50% growth scenarios are shown in Exhibit 10.16.

The resulting daily traffic volumes on the Northern Ontario highway network are shown in Exhibits 10.17 through 10.19 for the 80% growth scenario, and in Exhibits 10.20 through 10.22 for the 50% growth scenario. These plots show volumes in 5,000-PCE increments, for comparison with Exhibits 10.10 through 10.12.

Under the base forecast scenario (100% GDP growth), several two-lane highway segments had been identified as reaching 10,000 daily PCEs over the study horizon and could be considered for 4-laning by 2041 based on roadway capacity considerations.. Some of these segments are already close to capacity, and the reduced growth in truck volumes, as estimated in the sensitivity scenarios, still flags these segments as potentially facing capacity issues (though the segments identified are sometimes shorter under the sensitivity analysis forecasts). These include the following:

- Highway 11 south of North Bay — this corridor has recently been 4-laned;
- Highway 69/400 south of Sudbury — there are plans to complete 4-laning in the near term;

- Highway 17 south bypass of Sudbury — this is for the most part a 2-lane staged freeway;
- Highway 17 west of Sudbury to Highway 6 — traffic volumes exceed 10,000 daily PCEs by 2011 and is partly 4-laned;
- Sections of Highway 17 from Sudbury to North Bay: Sudbury to Garson and a section through West Nipissing;
- Highway 11&17 from Thunder Bay to a few kilometres easterly — this section is already being 4-laned;
- Highway 17 through Dryden;
- Highway 17 in Mattawa; and
- Highway 11 in New Liskeard.

Exhibit 10.16: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments to 2041: Sensitivity Analysis of Truck Traffic Growth vs. GDP Growth

Origin-Destination Flow Type	Daily Truck Trips			
	2011	2031	2041	2041/2011
Truck Growth based on 100% GDP Growth				
Internal Northern Ontario (CVS)	3,425	4,464	5,426	1.58
Internal Northern Ontario (non-CVS)*	6,273	8,127	9,174	1.46
To Northern Ontario	1,752	2,471	2,997	1.71
From Northern Ontario	1,922	2,652	3,210	1.67
Through Northern Ontario	1,294	1,957	2,406	1.86
Total	14,667	19,670	23,213	1.58
Truck Growth based on 80% GDP Growth				
Internal Northern Ontario (CVS)	3,425	4,189	4,957	1.45
Internal Northern Ontario (non-CVS)*	6,273	7,756	8,594	1.37
To Northern Ontario	1,752	2,309	2,728	1.56
From Northern Ontario	1,922	2,481	2,925	1.52
Through Northern Ontario	1,294	1,824	2,183	1.69
Total	14,667	18,559	21,388	1.46
Truck Growth based on 50% GDP Growth				
Internal Northern Ontario (CVS)	3,425	3,785	4,265	1.25
Internal Northern Ontario (non-CVS)*	6,273	7,200	7,724	1.23
To Northern Ontario	1,752	2,074	2,335	1.33
From Northern Ontario	1,922	2,231	2,509	1.31
Through Northern Ontario	1,294	1,624	1,850	1.43
Total	14,667	16,913	18,682	1.27

Note: *Traffic increases for these flows are estimated by adjusting network volumes directly. The numbers of trips for these flows are estimated by assuming a 150-km average trip length.

Exhibit 10.17: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041: 80% GDP Sensitivity Analysis

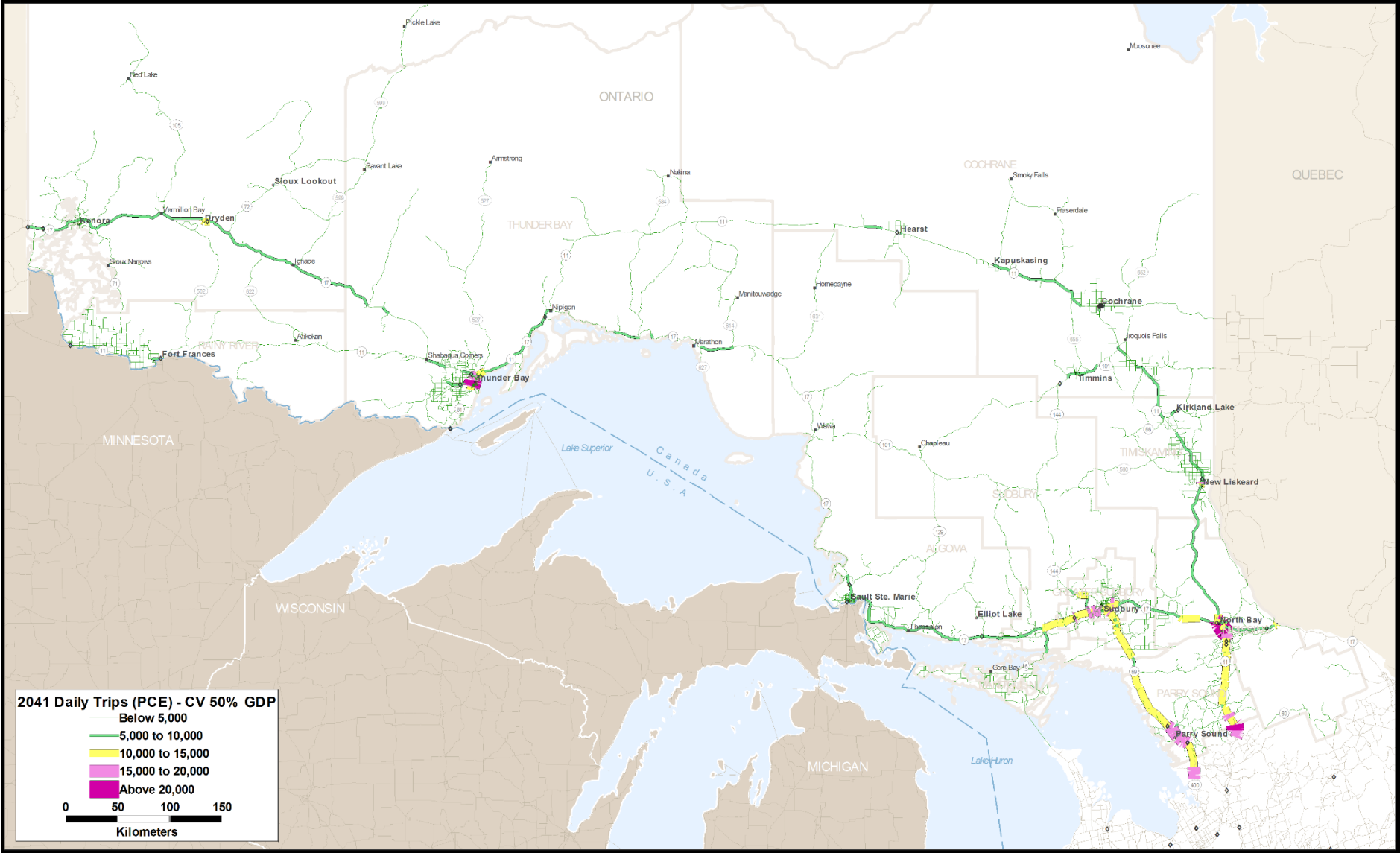


Exhibit 10.18: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 80% GDP Sensitivity Analysis

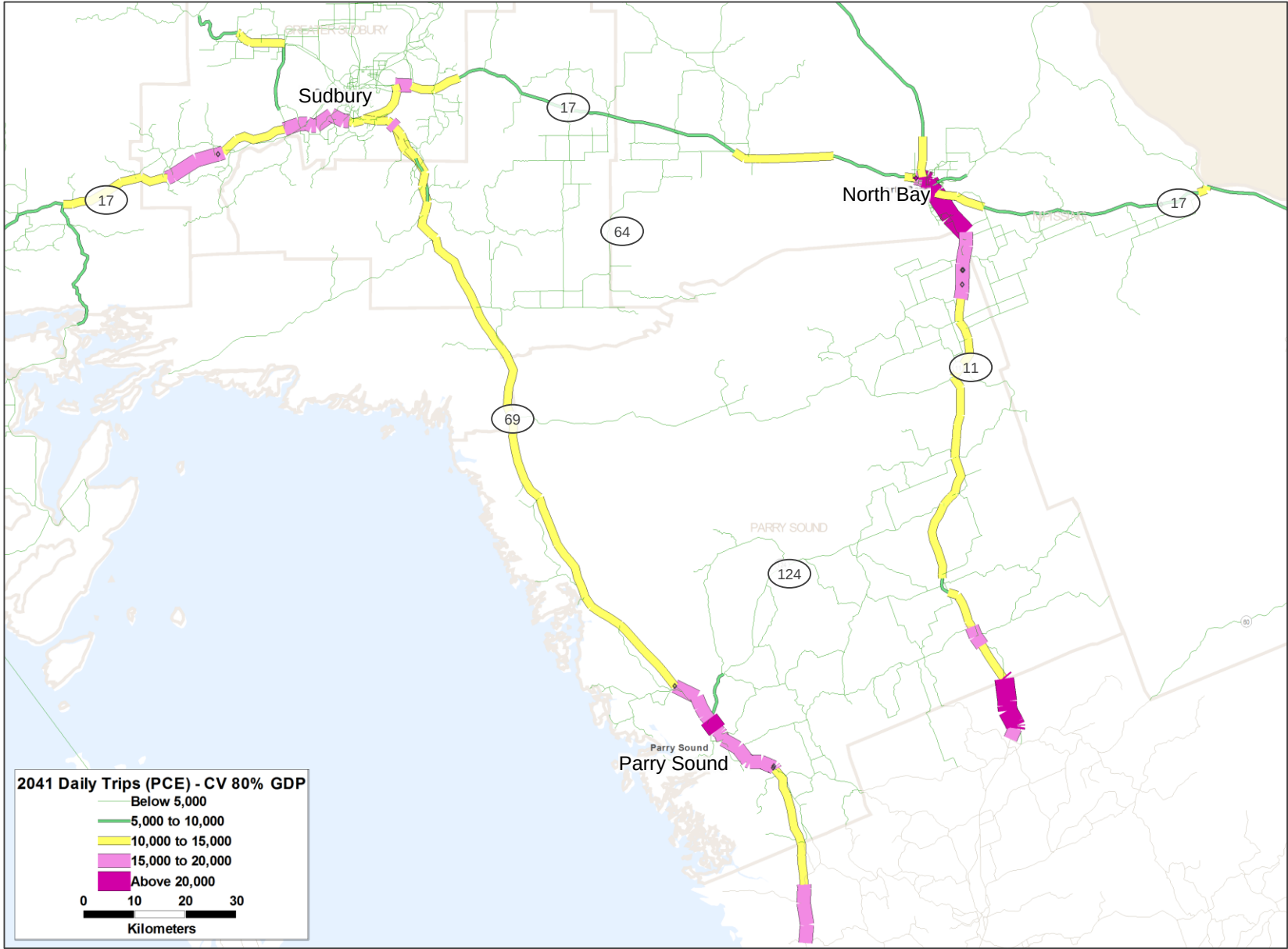


Exhibit 10.19: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 80% GDP Sensitivity Analysis

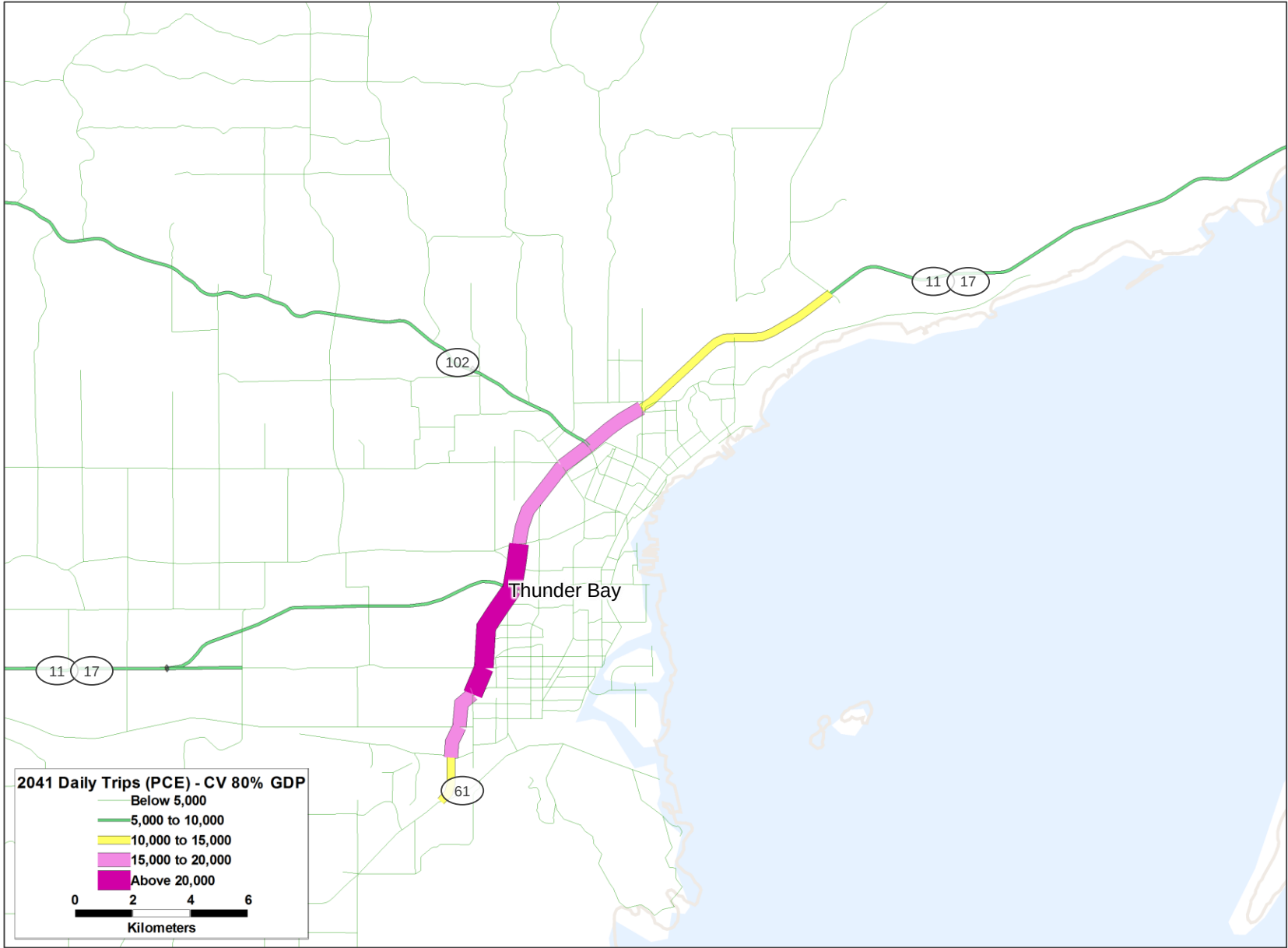


Exhibit 10.20: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041: 50% GDP Sensitivity Analysis

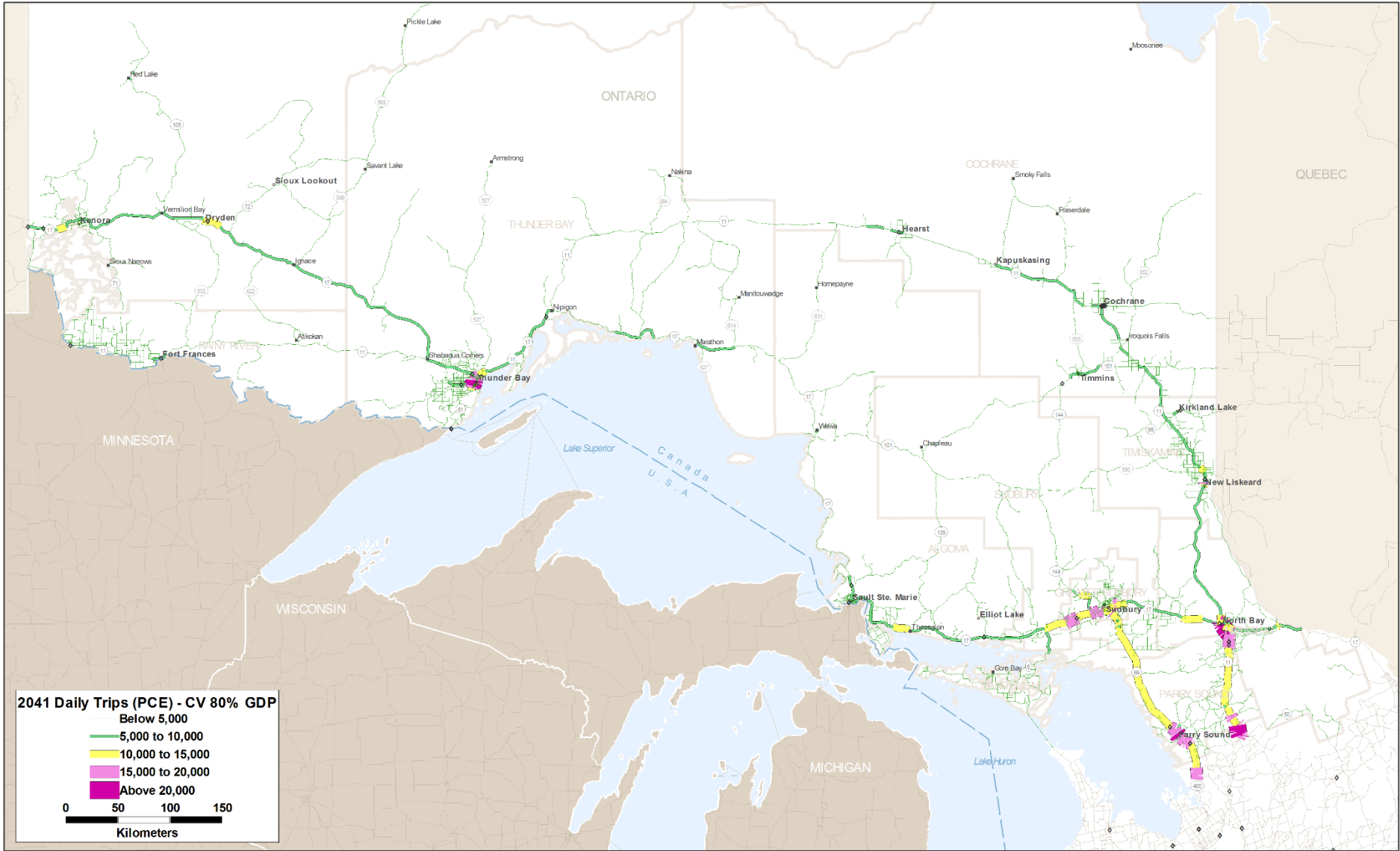


Exhibit 10.21: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 50% GDP Sensitivity Analysis

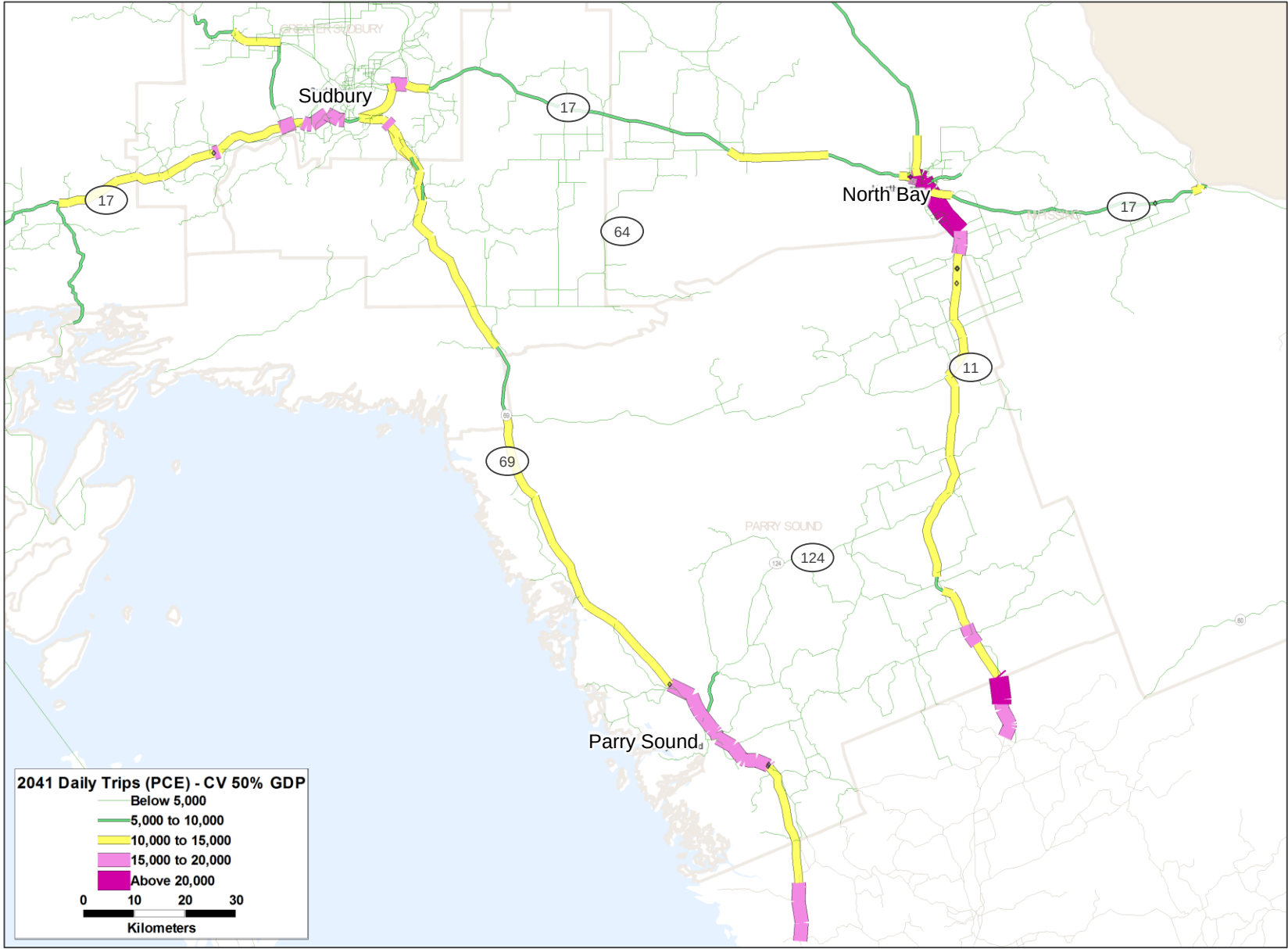
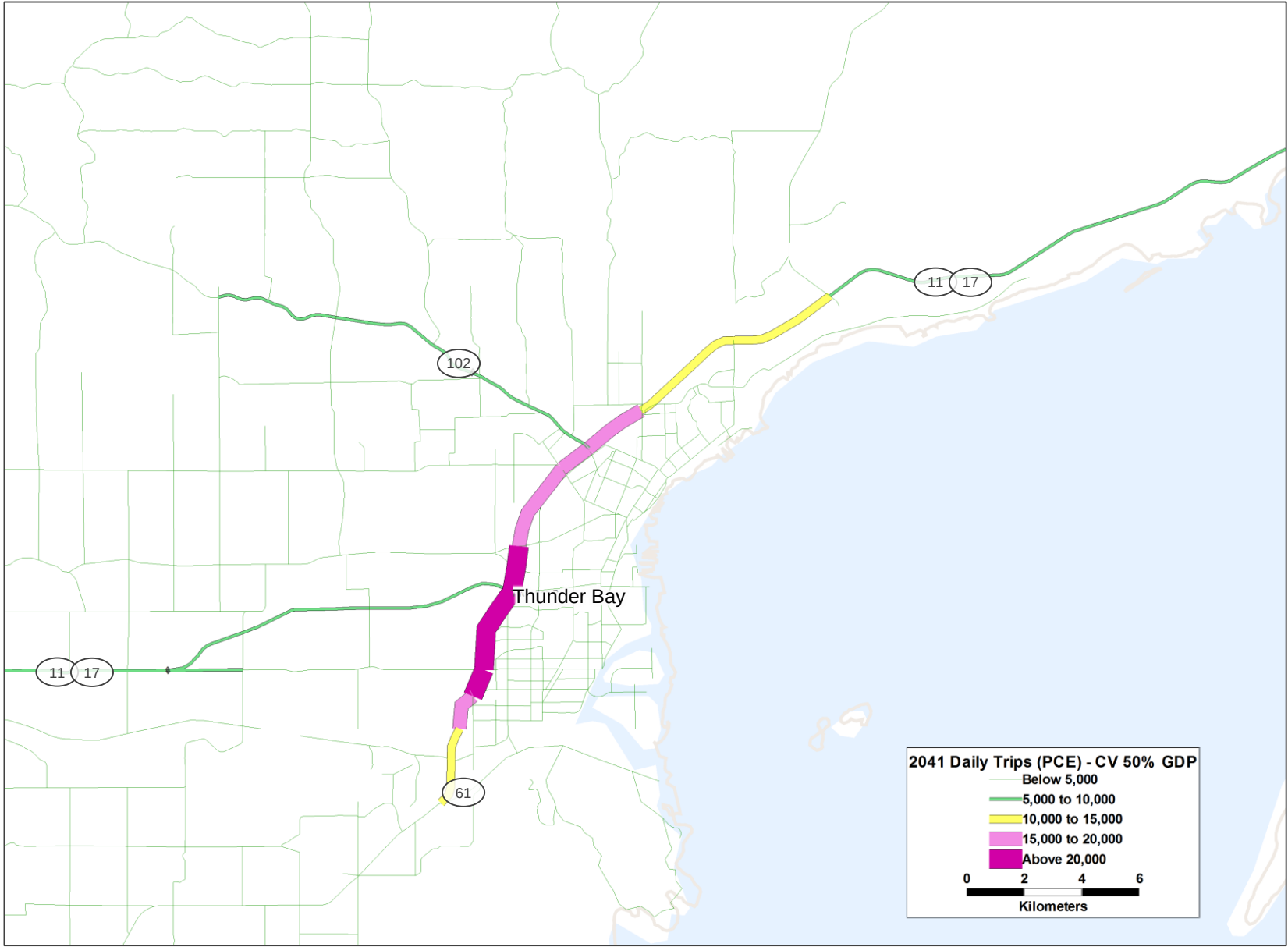


Exhibit 10.22: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 50% GDP Sensitivity Analysis



11 Issues and Opportunities

11.1 Summary of Issues

Traffic Delays and Accidents

Most roads in Northern Ontario are two lanes in width, with some 3- and 4-lane sections, and have sufficient capacity to handle existing and forecasted traffic volumes except in heavily used segments primarily on Highways 11 and 17. A more immediate issue on these and some other road sections is the high proportion of trucks (and recreational vehicles) and their effects in delaying other vehicles, particularly on climbing grades. This can lead to accidents caused by improper passing behavior. Conversely, truck traffic can be delayed by urban traffic congestion and recreational traffic peaks, with negative impacts on the efficiency and costs of goods movements.

Specifically, a number of provincial highway segments in the vicinity of Sudbury and North Bay will potentially have capacity issues over the study horizons, which could warrant consideration of 4-laning segments of the roadway to maintain reasonable operational levels of service.

Issues Relating to Road Network Reliability and Resiliency

Highways in the North are particularly vulnerable to driving hazards and road blockages/closures owing to weather issues, increasingly so with the anticipated impacts of climate change. With the many lakes and waterways throughout Northern Ontario, the many bridges and culverts are susceptible to flooding and damage, which can close critical travel routes. Also, much of the highway network is 2 lanes wide with narrow shoulders, increasing the susceptibility to full road closure in the event of a collision. Where possible, the risks to highway closure need to be mitigated, and real-time information to travellers about highway conditions needs to be strengthened to increase the reliability of Northern travel routes.

Because of the generally wide spacing between parallel highways in Northern Ontario, the network lacks redundancy. Alternative routes around road blockages are often hundreds of kilometres longer than the direct route. The redundant routes are not always of the quality expected of a viable alternate route; for example, they may have narrow shoulders, sections with less than desirable geometric highway design, and may be lacking in rest areas, fuel stations, mobile phone coverage, etc.

Of particular concern is that there are four locations on the Trans-Canada Highway network — namely both east and west of Thunder Bay, and both east and west of Kenora — where there is no alternative travel route in Canada, and traffic may be required to find an alternative route through the United States in the event of an extended road closure on any of these four sections.

There is also a lack of redundancy of routes extending northward toward the Far North from Highways 11 and 17, for example Highway 599 to Pickle Lake (and NORT Road beyond it), and Highway 105 to Red Lake. Steps are therefore needed toward maintaining and improving the reliability of these routes as well as other aspects of their resiliency, i.e. improving the ability to recover from a road closure, and ensuring real-time information to potential drivers of the route in the event of an incident.

Climate Change Impacts on Highway Reliability

Adapting the highway system to deal with the impacts of climate change is another important issue, including the need to conduct vulnerability assessments and develop/apply updated design standards that will maintain and improve the reliability of highway infrastructure in the face of ongoing warming and increasingly severe and frequent extreme weather events.

Bridges are particularly vulnerable to structural problems resulting from more intense freeze/thaw cycles and undermining of foundations from more severe flooding events. Undersized and degraded/blocked culverts — designed in many cases for less intense flooding events as experienced 50 years ago — are increasingly unable to handle such events; highway flooding and, in some cases, washouts, are growing issues.

Washouts and, in the winter and shoulder seasons, increasingly frequent icing conditions on roads and bridges are a growing danger to motorists and a cause of increasing costs owing to road closures. There is an expanding need to provide quick emergency response including real-time information to drivers and, where necessary and feasible, way-finding directions to use an alternative route.

Rehabilitation Challenges

Ongoing highway maintenance and rehabilitation activities are particularly important in Northern Ontario owing to its challenging topography, harsh weather and long distances between population centres. It is important to maintain a sufficient resources for annual expenditures on rehabilitation.

A related issue is the challenge of scheduling highway expansion/improvement work, where possible, to occur concurrently with programmed rehabilitation

activities, in order to avoid unnecessary disruptions if they are carried out separately.

Overweight/Oversize Cargos

The load-bearing capacity of asphalt and gravel roads, which is limited during spring thaw conditions on some road segments, may be increasingly compromised as a result of ongoing climate warming, with increased frequency of freeze/thaw conditions. Higher temperatures can also cause softening of asphalt road surfaces on hot days and consequent rutting caused by vehicles with heavy axle loads.

Way-Finding and Real-Time Communications

Existing coverage of signage to provide way-finding and support tourism activities, and of changeable message signs to provide real-time information on weather conditions and road closures — while extensive in some parts of the network — still leaves gaps in information at critical decision points. This issue is more relevant on secondary highways than on primary highways, and even more so on tertiary highways and other road networks.

Gaps in mobile phone coverage and access to 511 Ontario Traveler Information Services are also an issue, for example, on Highway 11 west of Hearst.

Cross-Border Travel Infrastructure

Smooth and efficient functioning of the four international border crossings between Northern Ontario and the United States is an important requirement. Issues include, at some locations, a lack of:

- designated truck lanes and/or inspection facilities;
- roadside pull-off locations for truckers to submit required manifests; and
- changeable message signs with real-time information to drivers regarding wait times — as noted in the *International Borders* technical backgrounder, wait times at the Fort Frances and Sault Ste. Marie crossings are usually a minimum of 10 minutes, increasing to 30 to 34 minutes at peak times on Friday afternoons and weekends.

While not related to the road border crossings directly, there has been increasing cross-border rail freight traffic using the international rail crossing at Fort Frances. The long freight trains can cause significant delays for travellers destined to/from the Fort Frances international road bridge and vicinity, due to

the at-grade crossing of the CN rail line with Highway 11 at Crozier, approximately 5 km west of Fort Frances.

Connections to First Nation Communities and Resource Development Sites

Several Ontario ministries (e.g. MTO, MNDM, MNRF) have important roles in maintaining road connections to First Nations in Northern Ontario, along with the First Nations themselves, the federal government (through INAC) and resource development firms. This large number of participants can create coordination and funding issues, making it difficult in some cases for First Nations and others to identify who is responsible and how best to move forward.

This applies also to forest access roads, with a related issue in this case of regulation and operation related to public use of primary and secondary forest access roads. These roads are built to serve industry needs, rarely to public highway standards, are not signed for way-finding, and have limited regulations/policing, e.g. for speeding, overweight vehicles, littering, etc.

Rest Areas

In the context of long driving distances between population centres and related issues of way-finding and driver fatigue, rest areas are particularly important as stops required for truck drivers and to support tourism and emergency management. Significant gaps remain, leaving long stretches with no suitable rest areas available.

Many rest areas, particularly in remote areas, operate only during the summer and shoulder seasons and/or only during daylight hours. This reduces the safety and attractiveness of the highway network for residents, tourists, and truck drivers alike.

Freight Connectivity between Modes

There is a need for improved road connections to and between freight terminals to facilitate intermodal connections and the use of the most appropriate transportation mode(s) for freight movements to, from and within Northern Ontario, as well as the efficient transfer of freight between modes.

11.2 Opportunities

The Northern Ontario highway network has been developed, improved and maintained over decades to create a solid basis for road transportation for the region and beyond. Highways 11 and 17 are the main corridors providing connections throughout the region and beyond, and providing the necessary route redundancy for each other. Other primary highways, secondary and tertiary highways, and routes maintained by other ministries and agencies provide efficient connections to communities of varying sizes and to resources and industries.

Road transportation is the workhorse mode for serving both passenger and freight movements generated by Northern Ontario's residents and economic activities; it is therefore critically important that the networks of provincial highways and other roads provide safe driving conditions and sufficient capacity for the efficient movement of people and goods.

Targeted Highway Safety and Capacity Improvements

In the context of ongoing MTO and MNDM highway improvement programs, opportunities exist for targeted infrastructure investments to increase capacity and reduce traffic delays where needed. These improvements can include adding passing lanes or creating 4-lane sections on primary highways, realigning selected highways that currently pass through urban areas, widening shoulders and improving sections with less than desirable standard geometric design for horizontal or vertical curves. Many of the improvements that will be needed over the next 25 years have already been studied to some extent.

Specific, targeted improvements can make a considerable difference to the functioning of the entire network. Overdesigned roads are costly both to build and to maintain, e.g. 4-lane roads with relatively low volumes are much harder to keep clear of snow than 2-lane roads with passing lanes, as low traffic on a four-lane road is not sufficient to naturally help keep both lanes in both directions clear of snow.

Important considerations in setting priorities will include enhancing safety and better accommodating the high proportions of trucks and recreation vehicles in certain corridors. Initiatives will include early-action high-priority improvements, medium-term enhancements, and long-range strategic improvements.

Increased Network Reliability

Northern Ontario highways are especially vulnerable to closure due to winter weather-related issues, the most susceptible being Highway 17 along the north shore of Lake Superior, and Highway 69/400 near the shore of Georgian Bay. Where it can be difficult to mitigate these risks and increase the routes'

reliability, attention needs to be given to increasing the resilience of the system by ensuring that appropriate detour routes with effective wayfinding signage exist, and enhancing the real-time communications to drivers about current highway operations.

Reliability of routes susceptible to flooding can be increased with larger culverts and improved bridge designs, as appropriate.

It will also be important to increase the reliability of the road network by, among other things, investing in climate-adaptive transportation infrastructure aimed at maintaining/recovering operational capability in the face of flooding, high winds, ice storms, heat, and related manifestations of ongoing climate change. As outlined earlier, opportunities for reducing the vulnerability of the highway system to climate change impacts could include the following:

- changes in design standards (e.g. larger culverts);
- use of new materials (e.g. heat-resistant pavement); and
- increased monitoring (e.g. automatic road-ice sensing and spraying equipment);

In addition to conducting vulnerability assessments and setting system adaptation priorities, there is also a timely opportunity to provide enhanced coordination among transportation and related organizations, sectors, First Nations, government levels and within each government level. For example, the Strategy could include designating a designated climate change group in MTO, MNDM and MNRF to ensure that best practices in climate change mitigation measures continue to be applied province-wide.

Improved Network Redundancy

NOMTS provides an opportunity to develop a more resilient highway network through an alternative route strategy, improving the network's ability to continue operations in spite of temporary closures of critical road sections through effective, well-marked detours combined with improved real-time information to motorists. This strategy could include identification of alternative routes for each portion of the primary highway network, consideration of widening to four lanes critical segments lacking in network redundancy, and a robust real-time communications plan.

Improvements to Real-Time Communications

Development of the Strategy provides an opportunity to fill gaps in the existing signage and communications facilities. Of particular importance are the following:

- placing of additional changeable message signs, particularly at forks/interchanges and other decision points in the highway system to improve communication of incidents ahead;
- working with private-sector communications companies to improve coverage of broadband communications along the provincial highway system;
- strengthening Ontario 511 services for Northern Ontario, including the possibility of including information from road users who report road incidents and conditions; and
- potentially adding traffic cameras on routes that are especially susceptible to closure; with footage that can be viewed on the Ontario 511 service.

Design Standards and Rehabilitation

Opportunities exist to improve geometric design elements of highway segments as regular rehabilitation initiatives on the segment are undertaken to address safety, efficient goods movement and passenger travel, and climate change adaptation needs. These can include revised grade, curve and passing lane requirements on primary and secondary highways and the improved enforcement of standards and best practices applicable to temporary and permanent pavement markings.

Roadway Classification and Responsibilities

Developing the Strategy also provides an opportunity to review the classification of provincial highways as primary, secondary or tertiary routes in light of their current role, function and strategic importance for goods movement and access for people and communities. There may also be routes that make more sense to be managed by a different ministry within Ontario, e.g. resource roads or forest access roads that are relied upon by First Nations or other communities for access. Consistency between highway classification and highway design can streamline decision-making for future infrastructure improvements, the provision of rest areas, etc.

Provincial Cycling Network

A provincial cycling strategy is underway. The Strategy provides an opportunity to identify existing Northern roads and highways that are the best candidates for cycling lane expansions and coordinate the implementation of provincial cycling infrastructure projects with highway rehabilitation work.

Improved Transportation Infrastructure at International Border Crossings

The four Northern Ontario international road border crossings between Northern Ontario and the United States generally operate well. There are opportunities to provide improved facilities and communications at the four crossings in order to facilitate goods movement, tourism traffic and other cross-border travel movements.

Improved communications could be achieved by providing changeable message signs with real-time communications to the travelling public approaching borders regarding wait times and other relevant information.

Designated truck lanes and on-site inspection facilities could be provided/improved where there are current deficiencies. Improvements could also be provided in the form of pull-off locations near borders where truckers can submit required manifests.

Enhancing the Availability and Quality of Rest Areas

There is a growing recognition that rest areas in Northern Ontario need to be improved to enhance the driving experience in the north for a variety of users and to reduce driver fatigue over long driving distances. MTO's Northwest Region, for example, has taken an initiative to clarify the need for a range of rest areas and to create a strategic rest areas network.

There is a current network of roadside rest areas throughout Northern Ontario that can provide the starting point for a strategic rest areas network. Current rest areas could be enhanced and made operable year-round to provide additional all-season, full-service rest areas in Northern Ontario, particularly on the primary highway network. In addition to more off-season coverage and more hours of operation, the rest area accommodations could be improved in some cases: e.g. by expanding driveways and parking facilities, installing nighttime lighting and expanding maintenance to year-round services.

Additional secondary rest areas could be provided on secondary or lower-volume primary highways that are in need of additional rest locations for safety reasons but do not have traffic volumes to warrant full-service rest areas. This can be part of increasing network resiliency and safety.

There is currently also a network of privately-operated fuel stations. There is an opportunity for potential partnerships with these businesses to provide extended services beyond what a straight business model may allow.

Improved Connectivity between Freight Modes

The Strategy will include consideration of new or enhanced roads linking the highway network more effectively to freight terminals, particularly rail and marine, recognizing that the vast majority of freight moved, regardless of other modes used, is moved by truck for at least part of the distance.

For example if, as discussed in the Rail backgrounder, a truck/rail Intermodal terminal can be re-established in Northern Ontario, a new or improved road link serving it could be a significant factor in realizing such an opportunity.

Other means could be explored for facilitating truck to rail transfer as an alternative to containerization, such as moving transport truck trailers on intermodal flat cars, or truck-on-flatcar (TOFC) shipping, as this would require significantly less infrastructure at intermodal transfer points than full containerization, and is used in jurisdictions in the United States.

Advancements in Trucking Technologies and Operations

Technological advancements are underway in the trucking industry to improve efficiencies and reduce fuel consumption. These advances include changes to reduce idling, decrease vehicle weight, increase capacity, reduce rolling and aerodynamic resistance, improve propulsion systems, and operate more efficiently. Together with a policy environment that supports these changes, such as selectively allowing longer vehicle lengths to accommodate energy-saving features, these changes can help reduce greenhouse gas emissions and increase operating efficiencies for the industry.

Other potential advancements include automated vehicles. Driverless vehicles, including commercial vehicles, are currently under a pilot testing program, but are restricted to testing purposes only.

Support for Economic Development in the Far North

New highway infrastructure and infrastructure improvements may be an important part of the transportation infrastructure needed to support increased economic activity in the Far North, for example to carry heavy loads associated with development of Ring of Fire mineral deposits. The two nearest highways leading northward to the Ring of Fire area are:

- Highway 599 to Pickle Lake and its NORT Road extension; and
- Highway 643 from Nakina westerly to Aroland First Nation.

A third such opportunity, to serve separate developments farther west, could be Highway 105 to Red Lake and its NORT road extension northward to Pikangikum First Nation.

Initial opportunities exist to upgrade some or all of these roads to a design standard that will service heavy trucks, through measures such as road bed strengthening, asphalt paving, widening to a full two-lane width, and strengthening/replacing bridges and culverts where necessary.

Subsequently, other transportation infrastructure such as new all-season roads or rail lines would be extended north to the Ring of Fire area, involving partnership possibilities and possible joint funding arrangements with resource development companies.

Note that under the Far North Act, 2010, most development in the Far North of Ontario, including all-weather transportation infrastructure, is prohibited from proceeding in advance of a jointly approved community based land use plan for the area, unless an order is made to except or exempt an individual project. Where a community based land use plan is in effect, development must be consistent with the direction contained in the approved plan.

Opportunities to Improve Connections to First Nation Communities

Opportunities exist to clarify and enhance policies and programs, accompanied as appropriate with capital and operating funding, to better support the transportation connections between First Nation communities in Northern Ontario and the broader transportation network. One such action could be to facilitate a one-stop communications protocol regarding funding programs and maintenance of roads connecting First Nation communities, in order to simplify contacts by First Nation communities with MTO, MNDM and other government ministries/departments.

It will be important also to identify existing roads and highways connecting First Nation communities that require reclassification or classification upgrades.

The opportunity also exists for MTO and MNDM to work with MNRF and First Nation communities to fund the road building and maintenance costs for former forestry, mining or other industrial roads serving as the main access route for First Nation communities.

Improved Collaboration and Partnerships

To facilitate implementation activities such as those outlined above, it will be important to work more closely with Indigenous, municipal, federal and

private sector partners for the construction, operations, maintenance and policing of Northern Ontario highways and related road networks.

This could include legislation to make the Aboriginal Procurement Pilot Project a permanent component of transportation infrastructure projects. The resulting strategy would build capacity for communities to participate in the construction of highways and roads in Northern Ontario and would include educational/training tools and programs to assist Indigenous residents to enter and become established in the construction industry.

Related opportunities exist to strengthen processes for sharing information and input between MTO and Indigenous peoples/communities and municipalities on land-use development and transportation planning matters, including access to existing and/or future planned provincial highways.

An important opportunity also exists for improved coordination among provincial ministries and other governments and agencies to align and integrate investments in the highway network.

References

MNRF (2015). Ontario Investing \$60 Million in Forest Access Roads: Province to Make Forestry Sector Eligible for \$2.7B Jobs and Prosperity Fund. Government of Ontario: Newsroom. April 24. Accessed September 2, 2016 from < <https://news.ontario.ca/mnr/en/2015/04/ontario-investing-60-million-in-forest-access-roads.html>>

MNRF (2004). Forest Management Planning Manual for Ontario's Crown Forests. Accessed September 9, 2016 from <https://dr6j45jk9xcmk.cloudfront.net/documents/2833/fmpmanual-2004-aoda.pdf>

North Bay Now staff (2016). Tim Hortons & McDonald's to charge batteries across Northern Ontario. *North Bay Now*. Retrieved September 14, 2016 from <<http://northbaynow.ca/tim-hortons-mcdonalds-charge-batteries-across-northern-ontario/>>.

Alternate Text for Exhibits

Exhibit 1.1: Northern Ontario Multimodal Transportation System Infrastructure

This map shows the roads, railways, and airports that make up Northern Ontario's transportation system. Airports are classified as remote, municipal, or international. Roads are classified as primary, secondary, other all-season, winter, or major out of province. Active railways are distinguished by owner. Marine features are distinguished as major ports, other ports, or provincial ferries. International border crossings are also noted. The Far North boundary is shown, as are the approximate southern limits of continuous permafrost and discontinuous permafrost.

Return to **Exhibit 1.1**

Exhibit 1.2: Traffic Volumes for Trips Using the Northern Ontario Highway Network, 2011

This map shows 2011 daily volumes for total traffic on the Northern Ontario highway network.

Return to **Exhibit 1.2**

Exhibit 2.1: Map of Northern Ontario: Municipalities and Canada Census Districts

This map shows the location of municipalities and Canada Census Districts in Northern Ontario. Areas that are not part of a municipality are unincorporated areas. Roads are also included and are classified as primary, secondary, secondary local, or major out of province.

Return to **Exhibit 2.1**

Exhibit 2.2: Northern Ontario Highway Classifications

This map shows Northern Ontario Highway Classifications. The classifications are primary highway, secondary highway, and secondary highway local. The TransCanada Highway is highlighted and is a primary highway. Major out of province roads are also shown.

Return to **Exhibit 2.2**

Exhibit 2.5: Forest Access Roads and Resource Access Roads: Responsibility

This map shows which Ministry/organization is responsible for which resource roads in Northern Ontario. The options are the Ministry of Transportation, the Ministry of Natural Resources and Forestry, an industry memorandum of understanding, sustainable forest licence, or other. Roads are also shown and classified as primary highway, secondary highway, secondary highway local, winter road, other all season road, or major out of province road.

Return to **Exhibit 2.5**

Exhibit 2.6: Resource Roads: Classifications

This map shows the class of resource roads in Northern Ontario. The categories are primary, branch, operational, or no data. Roads are also shown and classified as primary highway, secondary highway, secondary highway local, winter road, other all season road, or major out of province road.

Return **Exhibit 2.6**

Exhibit 2.7: Resource Road: Number of Lanes

The map shows the number of lanes on Northern Ontario's resource roads. The roads have either one or two lanes. Roads are also shown and classified as primary highway, secondary highway, secondary highway local, winter road, other all season road, or major out of province road.

Return to **Exhibit 2.7**

Exhibit 2.8: Resource Road: Surface Type

This map depicts the surface of Northern Ontario's resources roads. Surface types include paved, gravel, or unsurfaced. Roads are also shown and classified as primary highway, secondary highway, secondary highway local, winter road, other all season road, or major out of province road.

Return to **Exhibit 2.8**

Exhibit 3.1: Northern Ontario Provincial Highways: Number of Lanes

This map displays the number of lanes on Northern Ontario's provincial highways and the location of passing lanes and climbing lanes. Lanes are

categorized as single lane, 2 lane, 4 lane, 4 lane divided highway with centre lane, 4 lane divided highway, and a highway with 6 or more lanes. Passing and climbing lanes are distinguished as southbound/eastbound and northbound/westbound. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.1**

Exhibit 3.2: Northern Ontario Provincial Highways: Number of Lanes, Northwest View

This map displays the number of lanes on provincial highways and the location of passing lanes and climbing lanes in Northwestern Ontario. Lanes are categorized as single lane, 2 lane, 4 lane, 4 lane divided highway with centre lane, 4 lane divided highway, and a highway with 6 or more lanes. Passing and climbing lanes are distinguished as southbound/eastbound and northbound/westbound. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.2**

Exhibit 3.3: Northern Ontario Provincial Highways: Number of Lanes, Central View

This map displays the number of lanes on provincial highways and the location of passing lanes and climbing lanes in the central portion of Northern Ontario stretching from west to east from approximately Thunder Bay to Wawa. Lanes are categorized as single lane, 2 lane, 4 lane, 4 lane divided highway with centre lane, 4 lane divided highway, and a highway with 6 or more lanes. Passing and climbing lanes are distinguished as southbound/eastbound and northbound/westbound. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.3**

Exhibit 3.4: Northern Ontario Provincial Highways: Number of Lanes, Northeast View

This map displays the number of lanes on provincial highways and the location of passing lanes and climbing lanes in the central portion of Northeastern Ontario (Highway 11 between Hearst and New Liskeard). Lanes are categorized as single lane, 2 lane, 4 lane, 4 lane divided highway with centre lane, 4 lane divided highway, and a highway with 6 or more lanes. Passing and climbing lanes are distinguished as southbound/eastbound and northbound/westbound.

Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.4**

Exhibit 3.5: Northern Ontario Provincial Highways: Number of Lanes, Southeast View

This map displays the number of lanes on provincial highways and the location of passing lanes and climbing lanes focusing on the southeastern portion of Northern Ontario (Parry Sound north to New Liskeard and east to Sault Ste. Marie). Lanes are categorized as single lane, 2 lane, 4 lane, 4 lane divided highway with centre lane, 4 lane divided highway, and a highway with 6 or more lanes. Passing and climbing lanes are distinguished as southbound/eastbound and northbound/westbound. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.5**

Exhibit 3.6: Northern Ontario Provincial Highways: Posted Speeds

This map depicts the posted speed limits on Northern Ontario's provincial highway network. The categories are 20 km/h, 30 km/h, 40 km/h, 50 km/h, 60 km/h, 70 km/h, 80 km/h, 90 km/h, and 100 km/h. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.6**

Exhibit 3.7: Northern Ontario Provincial Highways: Bridges

This map shows the length of bridges in metres in Northern Ontario. Categories include 0-30, 30-100, 100-200, and over 200. Roads are distinguished as primary highway, secondary highway, secondary highway: local, and major out of province road.

Return to **Exhibit 3.7**

Exhibit 3.9: Examples of Primary Highway Locations in Northern Ontario with Less than Desirable Standard Highway Elements (Map)

This map shows the location on the Trans-Canada Highway of three locations with less than desirable highway design. These locations include Highway 17 at

Montreal River with sharp curves and steep grades, Highway 29 “Devil’s Gap” with less than desirable horizontal and vertical curves, and Highway 144 throughout with narrow shoulders, alternating rock face, and steep drop-offs. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.9**

Exhibit 3.10: Northern Ontario 5-Year Highways Program

This map displays the locations of planned highway improvements in Northern Ontario by year for the next five years. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.10**

Exhibit 3.11: Previously-Studied Highway Improvements

This map displays the locations of previous highway improvement studies in Northern Ontario. Roads are distinguished as primary highway, secondary highway, secondary highway local, and major out of province road.

Return to **Exhibit 3.11**

Exhibit 4.1: Passenger and Commercial Vehicle Volumes for Trips Using the Northern Ontario Highway Network, 2011

This map shows the total daily vehicles flows in 2011 distinguished by passenger and commercial vehicles.

Return to **Exhibit 4.1**

Exhibit 4.2: Passenger Vehicle Travel Flows by Origin-Destination Type, 2011

This map shows daily passenger vehicle travel flows in 2011 by origin-destination type. Origin-destination types are distinguished as internal Northern Ontario, To Northern Ontario, From Northern Ontario, or Through Trips.

Return to **Exhibit 4.2**

Exhibit 4.3: Commercial Vehicle Travel Flows by Origin-Destination Type, 2011

This map shows daily commercial vehicle travel flows in 2011 by origin-destination type. Origin-destination types are distinguished as internal Northern Ontario, To Northern Ontario, From Northern Ontario, or Through Trips.

Return to **Exhibit 4.3**

Exhibit 4.4: Proportion of Trucks by Northern Ontario Highway Link, 2011

This map shows trucks as a proportion of total traffic on each Northern Ontario highway link. Truck percentages are distinguished as below 10%, 10-20%, 20-30%, 30-40%, 40-50%, 50-70%, and above 70%. The data collection sites are also shown.

Return to **Exhibit 4.4**

Exhibit 4.5: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011

This map shows Northern Ontario traffic volumes in 5000 passenger car equivalent increments. One truck is equal to 2.5 passenger cars. The categories are under 5,000, 5,000 to 10,000, 10,000 to 15,000, 15,000 to 20,000, and above 20,000. The data collection sites are also shown.

Return to **Exhibit 4.5**

Exhibit 4.6: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011

This map shows Northern Ontario traffic volumes in 5000 passenger car equivalent increments in the Sudbury-North Bay area. One truck is equal to 2.5 passenger cars. The categories are under 5,000, 5,000 to 10,000, 10,000 to 15,000, 15,000 to 20,000, and above 20,000. The data collection sites are also shown.

Return to **Exhibit 4.6**

Exhibit 4.7: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2011

This map shows Northern Ontario traffic volumes in 5000 passenger car equivalent increments in the Thunder Bay area. One truck is equal to 2.5 passenger cars. The categories are under 5,000, 5,000 to 10,000, 10,000 to 15,000, 15,000 to 20,000, and above 20,000. The data collection sites are also shown.

Return to **Exhibit 4.7**

Exhibit 4.8: Seasonal Variation of Traffic Volumes in Northern Ontario

This plot shows the seasonal variation of traffic volumes in Northern Ontario. Traffic categories include commercial vehicle, passenger vehicle – winter, passenger vehicle – daily, and passenger vehicle – summer.

Return to **Exhibit 4.8**

Exhibit 4.9: Historic Provincial Highway Traffic Trends in Northern Ontario, 2001 to 2011

This plots shows historic provincial highway traffic trends in Northern Ontario from 2001 to 2011. The categories included are 2001 flows, increase in flows from 2001 to 2011, and decrease in flows from 2001 to 2011.

Return to **Exhibit 4.9**

Exhibit 5.1: Northern Ontario Area Maintenance Contract Areas for Highways

This plot shows historic provincial highway traffic trends in Northern Ontario from 2001 to 2011. The categories included are 2001 flows, increase in flows from 2001 to 2011, and decrease in flows from 2001 to 2011.

Return to **Exhibit 5.1**

Exhibit 6.1: Overview Map of Roads Connecting First Nation Communities

This map provides a pan-Northern Ontario overview of Roads Connecting First Nation Communities. First Nation Reserves and Provincial Parks are marked. Other roads are categorized as primary highway, secondary highway,

secondary highway local, and major out of province road. Active railways are also included and distinguished by owner.

Return to **Exhibit 6.1**

Exhibit 7.3: Origins and Destinations for Truck Trips to/from/within Northern Ontario, 2012 Average Daily Flows

This exhibit consists of four charts. The first two detail daily truck trips and daily commodity values to, from, and within Northwestern Ontario. The vertical axis lists the Origin/Destination Regions, which include Northwest Region, Northeast Region, GTHA, Other GGH, Other East Region, Other West Region, Manitoba, Other Western Canada, Quebec, Atlantic Canada, and USA. The horizontal axis lists the daily truck trips, which are distinguished as within Northwest Region, from Northwest Region, or to Northwest Region. The second two charts detail daily truck trips and daily commodity values to, from, and within Northeastern Ontario using the same categories as the charts for Northwestern Ontario.

Return to **Exhibit 7.3**

Exhibit 7.4: Commercial Vehicle Travel Flows by Trip Origin-Destination Type, 2011

This map shows daily commercial vehicle travel flows in 2011 by origin-destination type. Origin-destination types are distinguished as internal Northern Ontario, To Northern Ontario, From Northern Ontario, or Through Trips.

Return to **Exhibit 7.4**

Exhibit 7.6: Loaded vs. Unloaded Flows of Daily Truck Trips Using the Ontario Highway Network by Truck Body Style

This plot depicts loaded versus unloaded truck flows of daily truck trips using the Ontario highway network by truck body style. Categories include specialized loaded, specialized empty, van style loaded, van style empty, non-cargo carrying, and other non-truck flow.

Return **Exhibit 7.6**

Exhibit 7.8: Additional Vehicle Width Restrictions on Northern Ontario Highways

This map shows the Ontario highways with additional vehicle width restrictions above the standard restrictions. The additional width restriction categories are 3 metres, 3.35 metres, and 3.66 metres. Roads are categorized as primary

highway, secondary highway, secondary highway: local, and major out of province road. On Highway 144 loads between 3.66 and 3.99 metres require two private escort vehicles. Loads between 4 and 4.56 metres require one Ontario Provincial Police vehicle at the front of the load and one private escort vehicle at the rear of the load. For widths greater than 4.57 metres, two Ontario Provincial Police escort vehicles are required: one at the front at one at the back of the load.

Return **Exhibit 7.8**

Exhibit 7.10: Daily Oversize Vehicle Flows Using the Northern Ontario Highway Network

This map shows the Ontario highways with additional vehicle width restrictions above the standard restrictions. The additional width restriction categories are 3 metres, 3.35 metres, and 3.66 metres. Roads are categorized as primary highway, secondary highway, secondary highway: local, and major out of province road. On Highway 144 loads between 3.66 and 3.99 metres require two private escort vehicles. Loads between 4 and 4.56 metres require one Ontario Provincial Police vehicle at the front of the load and one private escort vehicle at the rear of the load. For widths greater than 4.57 metres, two Ontario Provincial Police escort vehicles are required: one at the front at one at the back of the load.

Return to **Exhibit 7.10**

Exhibit 8.1: Northern Ontario Trans-Canada Highway Locations with Significant Redundancy Issues

This map shows locations in the Trans-Canada Highway routes with redundancy issues. The key locations are west of Nipigon, west of Thunder Bay, and both east and west of Kenora.

Return **Exhibit 8.1**

Exhibit 8.2: Changeable Message Sign Locations

This maps shows the locations of changeable message signs on Northern Ontario's highway network. Message signs are depicted as either northbound, eastbound, southbound, or westbound. Roads are categorized as primary highway, secondary highway, secondary highway: local, and major out of province road.

Return to **Exhibit 8.2**

Exhibit 8.3: Northern Ontario Road Weather Information System (RWIS)

This is an Ontario Ministry of Transportation map showing the locations of Road Weather Information Systems (RWIS). The different types of systems included are RWIS locations (58 stations), SLA locations (9 stations), SLA and tipping rain gauge (3 stations), RWIS and tipping rain gauge (21 stations), and RWIS and FAST (1 station). Area Maintenance Contract boundaries are shown.

Return to **Exhibit 8.3**

Exhibit 8.5: Sample Road Closure Information on Ontario 511 Website, Interactive Map

This exhibit shows a sample of road closure information provided on Ontario's 511 road information website. Information provided includes highway, direction, from/at, to (if applicable), lanes affected, traffic impact, reason, comment, event start, event end (if applicable), and last change.

Return to **Exhibit 8.5**

Exhibit 8.6: Sample Road Closure Detail on Ontario 511 Website

This exhibit shows the incident map interface on Ontario's 511 road information website. Users are able to click on incidents to obtain information. Information provided includes highway, direction, from/at, to (if applicable), lanes affected, traffic impact, reason, comment, event start, event end (if applicable), and last change. Users are able to select the types of incidents and information that will appear on the map.

Return to **Exhibit 8.6**

Exhibit 9.2: Rest Areas, Gas Stations and Charging Stations in Northern Ontario

This exhibit shows the incident map interface on Ontario's 511 road information website. Users are able to click on incidents to obtain information. Information provided includes highway, direction, from/at, to (if applicable), lanes affected, traffic impact, reason, comment, event start, event end (if applicable), and last change. Users are able to select the types of incidents and information that will appear on the map.

Return to **Exhibit 9.2**

Exhibit 9.3: Rest Areas, Gas Stations and Charging Stations: Northwest View

This map shows northwestern Ontario's highway network, and the locations of all rest area facilities, broken down by whether they have car and truck parking or car parking only, whether they are year round or seasonal, and whether they have portable, permanent, or no washrooms. First Nation fuel stations, other fuel stations, and electric vehicle charging stations are also shown.

Return to **Exhibit 9.3**

Exhibit 9.4: Rest Areas, Gas Stations and Charging Stations: Central View

This map shows central northern Ontario's highway network, and the locations of all rest area facilities, broken down by whether they have car and truck parking or car parking only, whether they are year round or seasonal, and whether they have portable, permanent, or no washrooms. First Nation fuel stations, other fuel stations, and electric vehicle charging stations are also shown.

Return to **Exhibit 9.4**

Exhibit 9.5: Rest Areas, Gas Stations and Charging Stations: Northeast View

This map shows northeastern Ontario's highway network, and the locations of all rest area facilities, broken down by whether they have car and truck parking or car parking only, whether they are year round or seasonal, and whether they have portable, permanent, or no washrooms. First Nation fuel stations, other fuel stations, and electric vehicle charging stations are also shown.

Return to **Exhibit 9.5**

Exhibit 9.6: Rest Areas, Gas Stations and Charging Stations: Southeast View

This map shows northeastern Ontario's highway network, and the locations of all rest area facilities, broken down by whether they have car and truck parking or car parking only, whether they are year round or seasonal, and whether they have portable, permanent, or no washrooms. First Nation fuel stations, other fuel stations, and electric vehicle charging stations are also shown.

Return to **Exhibit 9.6**

Exhibit 9.7: Travel Times between Northern Ontario Communities, Including Trucking Daily Hours-of-Service Travel Time Limits (13 hours) for Travel from Major Trucking Centres

This map shows travel times between northern Ontario population centres and to and from major trucking centres, as well as showing the potential distance covered by long-distance truck drivers within the daily hours of service limits from major trucking centres. Drivers cannot drive more than 13 hours in a day.

Return to **Exhibit 9.7**

Exhibit 9.8: Commercial Vehicle Break Locations in Northern Ontario

This map shows travel times between northern Ontario population centres and to and from major trucking centres, as well as showing the potential distance covered by long-distance truck drivers within the daily hours of service limits from major trucking centres. Drivers cannot drive more than 13 hours in a day.

Return to **Exhibit 9.8**

Exhibit 9.9: Tourist Travel Flows across Northern Ontario Border Crossings and Selected Provincial Highway Sites, 2011-2012

This map shows the tourist travel flows and volumes across Northern Ontario Border Crossings and selected provincial highway sites from 2011 and 2012. The highest volumes are found between Toronto and Sudbury, and Toronto and North Bay. Data collection sites are shown.

Return to **Exhibit 9.9**

Exhibit 9.10: Summary of Priority Highway Rest Area Needs/Considerations in Northern Ontario

This map shows priority highway rest area needs and considerations in Northern Ontario in three categories - potential new/improved full-service rest area driven primarily by trucking hours-of-service, potential new/improved full-service rest areas driven primarily by tourism need, and new/enhanced secondary year-round rest areas needed.

Return to **Exhibit 9.10**

Exhibit 9.11: Mobile Phone Coverage in Northern Ontario

This map shows existing mobile phone coverage in Northern Ontario. Coverage tends to follow major highways and population centres.

Return to **Exhibit 9.11**

Exhibit 10.3: Summary of Forecasting Results by Origin-Destination Flow Type

This graph shows model results of volumes of passenger vehicle flows, commercial vehicle flows, and total vehicle flows based on origin-destination type - internal Northern Ontario, to Northern Ontario, From Northern Ontario, and Through Northern Ontario, in 2011, 2031, and 2041. Passenger vehicle flows are dominated by internal northern Ontario trips.

Return to **Exhibit 10.3**

Exhibit 10.4: Flows of Passenger Vehicles using the Northern Ontario Highway Network, 2011 and 2041

This map shows passenger vehicle volumes using the northern Ontario highway network in 2011 and 2041. Passenger vehicle volumes are mostly expected to remain stable in Northern Ontario, while they should increase in the more southern areas with Toronto-based traffic.

Return to **Exhibit 10.4**

Exhibit 10.5: Flows of Commercial Vehicles using the Northern Ontario Highway Network, 2011, 2031 and 2041

This maps shows commercial vehicle volumes in 2011, 2031, and 2041. Commercial volumes are expected to increase throughout Ontario.

Return to **Exhibit 10.5**

Exhibit 10.6: Flows of Total Vehicles Using the Northern Ontario Highway Network, 2011, 2031 and 2041

This map shows volumes of total vehicles using the Northern Ontario Highway Network in 2011, 2031, and 2041. Total volumes are expected to increase across most of Ontario.

Return to **Exhibit 10.6**

Exhibit 10.7: Flows of Passenger and Commercial Vehicles Using the Northern Ontario Highway Network, 2041

This map shows the volumes of passenger and commercial vehicles using the Northern Ontario Highway Network in 2041.

Return to **Exhibit 10.7**

Exhibit 10.10: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

This map shows the volumes of passenger and commercial vehicles using the Northern Ontario Highway Network in 2041.

Return to **Exhibit 10.10**

Exhibit 10.11: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

This map shows traffic volumes in 5,000 passenger car-equivalent increments in the area surrounding and south of Sudbury and North Bay. There are several segments above 20,000, more between 15,000 and 20,000 and the majority is between 10,000 and 15,000. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.11**

Exhibit 10.12: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041

This map shows traffic volumes in 5,000 passenger car-equivalent increments in the Thunder Bay area. There are several segments above 20,000, more between 15,000 and 20,000 and the majority are between 10,000 and 15,000. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.12**

Exhibit 10.13: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer

This map shows traffic volumes in 5,000 passenger car-equivalent increments in the summer months of 2041. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.13**

Exhibit 10.14: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer

This map shows traffic volumes in 5,000 passenger car-equivalent increments in the summer months of 2041 in the area surrounding and south of Sudbury and North Bay. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.14**

Exhibit 10.15: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041 Summer

This map shows traffic volumes in 5,000 passenger car-equivalent increments in the summer months of 2041 increments in the Thunder Bay area. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.15**

Exhibit 10.17: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041: 80% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 based on 80% Gross Domestic Product. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.17**

Exhibit 10.18: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 80% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 based on 80% Gross Domestic Product in the area surrounding and south

of Sudbury and North Bay. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.18**

Exhibit 10.19: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 80% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 in the Thunder Bay area based on 80% Gross Domestic Product. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.19**

Exhibit 10.20: Northern Ontario Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041: 50% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 based on 50% Gross Domestic Product. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.20**

Exhibit 10.21: Sudbury – North Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 50% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 based on 50% Gross Domestic Product in the area surrounding and south of Sudbury and North Bay. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.21**

Exhibit 10.22: Thunder Bay Area Traffic Volumes in 5,000 Passenger-Car-Equivalent Increments, 2041, 50% GDP Sensitivity Analysis

This map shows truck volumes in 5,000 passenger car-equivalent increments in 2041 in the Thunder Bay area based on 50% Gross Domestic Product. One truck is equal to 2.5 passenger cars. Data collection sites are also noted.

Return to **Exhibit 10.22**