



# Appendix H

Road Capacity Analysis and Safety Review



BURNSIDE



Innisfil

# Appendix H | Road Capacity Analysis and Safety Review

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**Project Name:** Innisfil Transportation Master Plan Update  
**To:** Town of Innisfil  
**From:** R.J Burnside & Associates Limited / TraffMobility

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## 1.0 Road Capacity Analysis

A road capacity analysis was conducted for existing and future conditions using EMME, a modelling software for travel forecasting. The travel demand model for the Town of Innisfil was previously developed by HDR Inc. as part of the 2018 Transportation Master Plan.

The model was updated as part of the 2022 Transportation Master Plan Update through network refinements and input changes to reflect existing “base” conditions, planned improvements and land uses, and the latest population and employment allocations. Updates to the model have been documented and summarized below. This updated model was used to inform future traffic conditions and recommended improvements as part of this TMP.

### 1.1 Previous EMME Model

The model was developed to reflect the worst-case peak hour travel conditions, which occurs during the PM peak period for the Town. The geographic scope of the model covers the Town of Innisfil and connectors that represent travel to the surrounding municipalities. Data from the 2011 Transportation Tomorrow Survey (TTS) was used to determine trip rates and mode shares as inputs to the base year model.

#### 1.1.1 Base Model Calibration and Validation

The model was calibrated using hourly vehicle count data provided along Town, County and Provincial roads to better reflect existing conditions. The validity of the model was assessed based on a screenline analysis, whereby modelled and observed peak hour volumes crossing Town boundaries and major corridors were compared. The results showed that most of the modelled screenline volumes were within a 10% difference of observed volumes, which indicates an acceptable level of model accuracy.

#### 1.1.2 Previous Growth Forecasts

A key input in the travel forecasting model is future population and employment, as it directly impacts travel demand. Growth projections for the Town and adjacent municipalities were

derived based on the latest Provincial Growth Plan targets and Simcoe County 2041 targets. The Town’s growth forecasts were allocated to the various settlement areas based on the 2012 Innisfil Town-Wide Water and Wastewater Master Servicing Plan. Allocation of growth within settlement areas accounted for intensification of the lands near the future GO Rail Station (i.e., The Orbit), the Sleeping Lion Town Settlement area, Friday Harbour (located in Big Bay Point) and the potential economic expansion areas near Innisfil Heights. The 2041 population and employment forecasts used for the previous 2018 TMP is summarized in Table H-1. Note that the 2051 forecasts were not included in the scope of the previous TMP.

**Table H-1: Previous 2041 Population and Employment Forecasts**

Location	2041 Population	2041 Employment
Big Bay Point	9,911	1,233
Sandy Cove	9,551	303
Leonard's Beach	1,238	-
Alcona North Expansion Area	4,000	-
Alcona North Existing Settlement	13,075	974
Alcona South Existing Settlement	13,075	755
Alcona South Expansion Area	7,150	770
Big Cedar Point	819	-
Lefroy - Belle Ewart	8,218	534
Gilford	2,141	139
Fennell's Corners	196	-
Churchill	761	155
Campus Node	-	-
Stroud	2,494	509
Hwy 400 & 89 Employment Lands	-	-
Cookstown	3,477	709
Innisfil Heights Expansion	-	3,600
Innisfil Heights	321	5,388
Total	76,400	15,100
Place to Grow Target	67,100	15,070

## 1.2 EMME Model Updates

As part of the updated TMP, the model was reviewed and updated to account for all future proposed road improvements, the latest 2041 and 2051 population and employment forecasts and changes in mode split.

### 1.2.1 Network Refinements

The modelled road network, along with its associated model attributes, were reviewed to confirm all planned road improvements are incorporated into the model. The network was also reviewed for discrepancies. Table H-2 summarizes the changes made to the model network.

**Table H-2: Network Refinements Summary**

Road	From	To	Network Edit
<b>“Existing” Base Conditions</b>			
King Street (County Road 27)	Riley Street	Kidds Lane	Capacity changed from 400 veh/lane to 900 veh/lane 1
King Street (County Road 27)	Kidds Lane	Victoria Street	Changed to 4 lanes
20th Sideroad	Innisfil-Bradford Boundary	Shore Acres Drive (County Road 3)	Capacity changed from 400 veh/lane to 800 veh/lane 2
Innisfil Beach Road	20th Sideroad	Jans Boulevard	Changed to 4 lanes
<b>By 2041</b>			
Lockhart Road	Huron Road	20th Sideroad	Widened to 4 lanes (Hewitt’s Secondary Plan)
County Road 89 / County Road 3 (Shore Acres)	County Road 53 (5th Sideroad)	County Road 39 (20th Sideroad)	Widened to 4 lanes (Simcoe County 2014 Transportation Master Plan)
6th Line	County Road 27	St. Johns Road	Widened to 4 lanes (6th Line Class EA)
McKay Road / Hwy 400 interchange3	-	-	Parclo-A3 interchange coded

Notes: 1. Capacity increased to reflect a freer flow condition, with few accesses along this road segment.  
 2. This segment is considered a local road; however, it interfaces with the segment of 20<sup>th</sup> Sideroad that is designated as a major Town road and does not restrict flow.  
 3. Interchange recommended as per the City of Barrie 2019 Transportation Master Plan.

**1.2.2 Updated Growth Forecasts**

After the completion of the Town’s 2018 TMP, the County of Simcoe undertook a Municipal Comprehensive Review (MCR), as required by A Place to Grow: Growth Plan for the Greater Golden Horseshoe, 2020 (Growth Plan). In the process of bringing the Official Plan of the County of Simcoe and all 16 lower-tier municipalities into conformity with the Growth Plan, the MCR allocates amongst all lower-tier municipalities, the population and employment forecasts contained in Schedule 3 of the Growth Plan for the County of Simcoe to the year 2051.

Draft 2041 and 2051 population and employment allocations for the Town, as summarized in Table H-3 were provided from Simcoe County in October 2021 as part of the County’s Growth Management and Lands Needs Assessment.

**Table H-3: Draft Growth Allocations for Innisfil (Simcoe County, October 2021)**

Horizon Year	Population	Employment
2041	68,880	19,650
2051	84,570	26,190

The modelled 2041 and 2051 population and employment to settlement areas within the Town were allocated based on these draft targets, as summarized in Table H-4. It is understood that these are interim growth allocations, and the model will need to be re-run when growth allocations have been approved.

**Table H-4: Updated 2041 and 2051 Population and Employment Assumptions**

Location	Population		Employment	
	2041	2051	2041	2051
Big Bay Point	9,400	9,881	1,608	2,380
Sandy Cove	7,987	9,736	395	585
Leonard's Beach	1,035	1,088	0	0
Alcona North Expansion Area	3,345	4,951	0	0
Alcona North Existing Settlement	9,010	13,338	1,270	1,403
Alcona South Existing Settlement	10,934	11,493	985	1,088
Alcona South Expansion Area (i.e., The Orbit MTSA)	18,550	28,999	1,004	1,338
Big Cedar Point	685	685	0	0
Lefroy - Belle Ewart	6,872	7,405	696	769
Gilford	1,790	1,882	181	200
Fennell's Corners	164	164	0	0
Churchill	636	636	202	246
Campus Node	0	0	2,000	2,000
Stroud	2,086	2,420	664	885
Hwy 400 & 89 Employment Lands	0	0	0	0
Cookstown	2,908	3,374	925	1,021
Innisfil Heights Expansion	0	0	4,694	6,949
Innisfil Heights	268	268	7,026	9,364
Total	75,670	96,320	21,650	28,228
Place to Grow Target	68,880	84,570	19,650	26,190

### 1.2.3 2041 Growth Assumptions

The 2041 growth allocations to settlement areas within Innisfil were developed to consider the updated 2041 population and employment target of 68,880 persons and 19,650 jobs, respectively.

The 2041 population target was allocated to the various settlement areas within the Town based on the same proportions as the 2018 Transportation Master Plan (TMP), except in the Alcona South Expansion Area (i.e., the lands surrounding The Orbit) and Friday Harbour area (Big Bay Point). A population of 18,550 was assumed in The Orbit by 2041. Future population from the development in Friday Harbour (+6,790 people) was included in addition to the growth targets, like the 2018 TMP.



The 2041 employment target was allocated to the settlement areas in the same proportion as the 2018 Transportation Master Plan (TMP), except for the Campus Node which represents the location of the future Royal Victoria Regional Health Centre (RVH) campus. The RVH was assumed to provide an additional 2,000 jobs by 2041.

#### 1.2.4 2051 Growth Assumptions

The approach to derive 2051 population and employment allocations include applying compounded annual growth rates to settlement areas that are expected to grow based on discussions with Town staff and Council reports.

The 2051 population allocations to settlement areas within Innisfil were developed to consider the updated 2051 population target of 84,570 persons. In addition, growth assumptions consider the following excerpt from the Town's Council Report, subject "County of Simcoe Municipal Comprehensive Review - Update No. 2" (September 22, 2021), which noted the following:

*Based on the above Provincial and County policy directions, the majority of Innisfil's population growth will therefore be directed to Alcona, which is the Town's sole designated PSA in the Growth Plan. Furthermore, the majority of Alcona's growth will be directed to The Orbit/Innisfil GO Station (Major Transit Station Area) as well as intensification of the Downtown Commercial Area along Innisfil Beach Road. Outside of Alcona, only a limited amount of growth may be considered for the Town's other fully serviced settlements of Sandy Cove and Lefroy, and only to Cookstown and Stroud if the current servicing restrictions are planned to be resolved.*

Therefore, the following assumptions were applied to derive population in 2051:

- 0.50% per annum growth from 2041 to 2051 in Big Bay Point, Leonard's Beach, Alcona South Existing Settlement, and Gilford.
- 0.75% per annum growth from 2041 to 2051 in Lefroy-Belle Ewart.
- 1.50% per annum growth from 2041 to 2051 in Stroud and Cookstown.
- 2.00% per annum growth from 2041 to 2051 in Sandy Cove.
- 4.00% per annum growth from 2041 to 2051 in Alcona North Expansion Area and Alcona North Existing Settlement.
- A population of 29,000 was assumed for The Orbit MTSA.
- Additional population in Friday Harbour (+6,790 people) was added, like the 2041 population assumptions.

The 2051 growth allocations to settlement areas within Innisfil were developed to consider the updated 2051 employment target of 26,190 jobs.

The following assumptions were applied to derive employment in 2051:

- 1.00% per annum growth from 2041 to 2051 in Alcona North Existing Settlement, Alcona South Existing Settlement, Lefroy-Belle Ewart, Gilford, and Cookstown.
- 2.00% per annum growth from 2041 to 2051 in Churchill.

- 3.00% per annum growth in Alcona South Expansion Area, Stroud, Innisfil Heights.
- 4.00% per annum growth in Big Bay Point, Sandy Cove, and Innisfil Heights Expansion.

### 1.2.5 External-External Trip Growth

The previous model derived existing external-to-external (through) trips using 2011 Transportation Tomorrow Survey (TTS) data, which was then distributed based on directional splits from existing traffic counts. Future external-to-external trips were estimated based on population and employment growth in surrounding municipalities.

A comparison between previous (2018 TMP) and updated (based on the 2019 Barrie TMP and County’s Growth Management and Lands Needs Assessment) population and employment forecasts are summarized in Table H-5 and Table H-6, respectively. These updated population and employment allocations were used to inform the growth rates used to estimate 2051 external-to-external trips.

**Table H-5: Population Growth in Surrounding Municipalities**

Municipality	Updated Population		Previous Population	
	2041	2051	2041	2051
City of Barrie	253,000	298,000	253,000	-
Town of Bradford West Gwillimbury	72,290	85,610	60,267	-
Township of Essa	30,730	34,800	25,658	-
Town of New Tecumseth	68,540	81,530	66,831	-

**Table H-6: Employment Growth in Surrounding Municipalities**

Municipality	Updated Employment		Previous Employment	
	2041	2051	2041	2051
City of Barrie	129,000	150,000	132,000	-
Town of Bradford West Gwillimbury	23,170	30,470	21,543	-
Township of Essa	12,330	13,890	10,772	-
Town of New Tecumseth	29,970	35,780	31,717	-

### 1.2.6 Orbit Mode Split Adjustment

Considering The Orbit is planned be developed surrounding the future GO station at 6<sup>th</sup> Line and 20<sup>th</sup> Sideroad, it is expected that trips generated to/from this area would have a greater non-auto mode share due to the proximity to higher-order transit and the potential for the station to be serve as a transit hub for a Town-wide transit system.

According to the Metrolinx GO Rail Station Access Plan (December 2016), the daily auto mode split (including carpooling passengers, pick up/drop off and drive and park) for trips accessing the station is estimated to be 77% by 2031. The current daily auto mode share for Town trips is 94%. Therefore, auto trips travelling to/from The Orbit development were factored down accordingly for the future 2041 and 2051 horizon year.

## 2.0 Safety Analysis

A safety assessment was conducted using the most recent pre-COVID (2019 and prior) five-year collision data. A hotspot analysis was performed at a macro level to highlight locations where collisions are more frequent. Any observed trends or patterns were further analyzed to understand the potential casual factors and to determine areas of safety improvements.

The collision dataset contains attributes pertaining to impact type, severity, time of year and day of week, road surface conditions, lighting conditions and locations. These attributes were analyzed to identify any trends and patterns that may inform future transportation improvements.

### 2.1 Collisions by Month

The number of collisions by month is illustrated in Figure H-1. A total of 4,276 collisions were recorded between 2015 and 2019. Majority (3,595 or 84%) of collisions were property-damage-only (PDO), followed by non-fatal injury (671 or 16%) and fatal collisions (10 or less than 1%).

Higher number of collisions has been observed during the winter months between November and February when compared to any other time of the year. During the winter months, lack of visual clarity due to environmental conditions such as snow and rain was a contributing factor to 46% of collisions, which is 18% higher than the yearly average. More collisions have also occurred outside of daylight hours during the winter months when compared to the annual average (47% vs. 33%). Road conditions do not appear to be a contributing factor to vehicle collisions during winter months as 84% of collisions occurred on a dry road surface.

**Figure H-1: Collision Summary by Month**

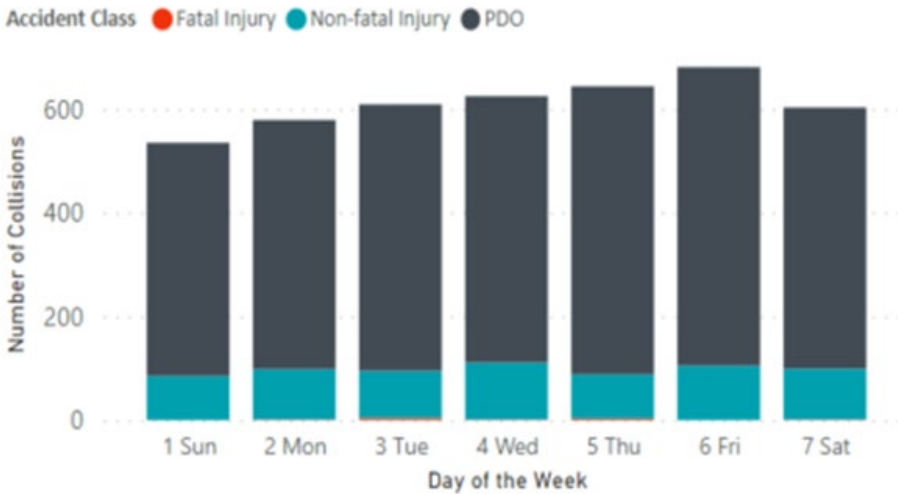




## 2.2 Collision by Day of the Week

Collision trends by day of the week are illustrated in Figure H-2. There appeared to be a steady increase in PDO collisions from Sunday to Friday. No other patterns can be observed with respect to the day of the week.

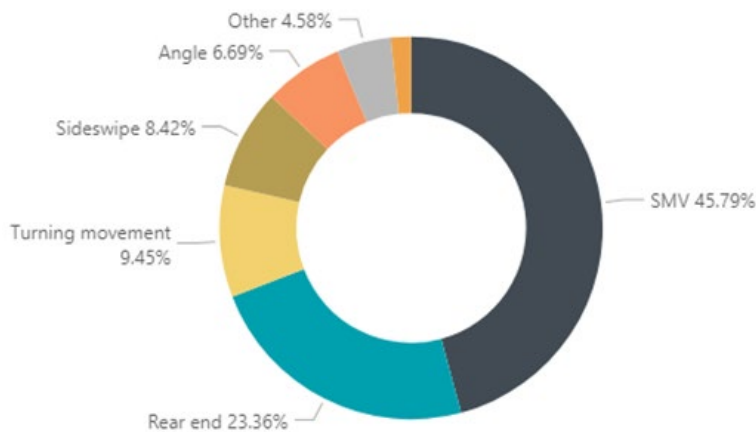
**Figure H-2: Collision Summary by Day of the Week**



## 2.3 Collisions by Impact Types

Collision by impact type is illustrated in **Figure H-3**. The predominant impact type is Single-Motor-Vehicle (SMV) collisions (46%), followed by rear-end (24%), turning movement or angle (16%), sideswipe (8%) and other (5%). SMV and rear-end collisions were further analyzed to identify any specific patterns and contributing factors that might warrant special attention.

**Figure H-3: Collision Summary by Impact Type**

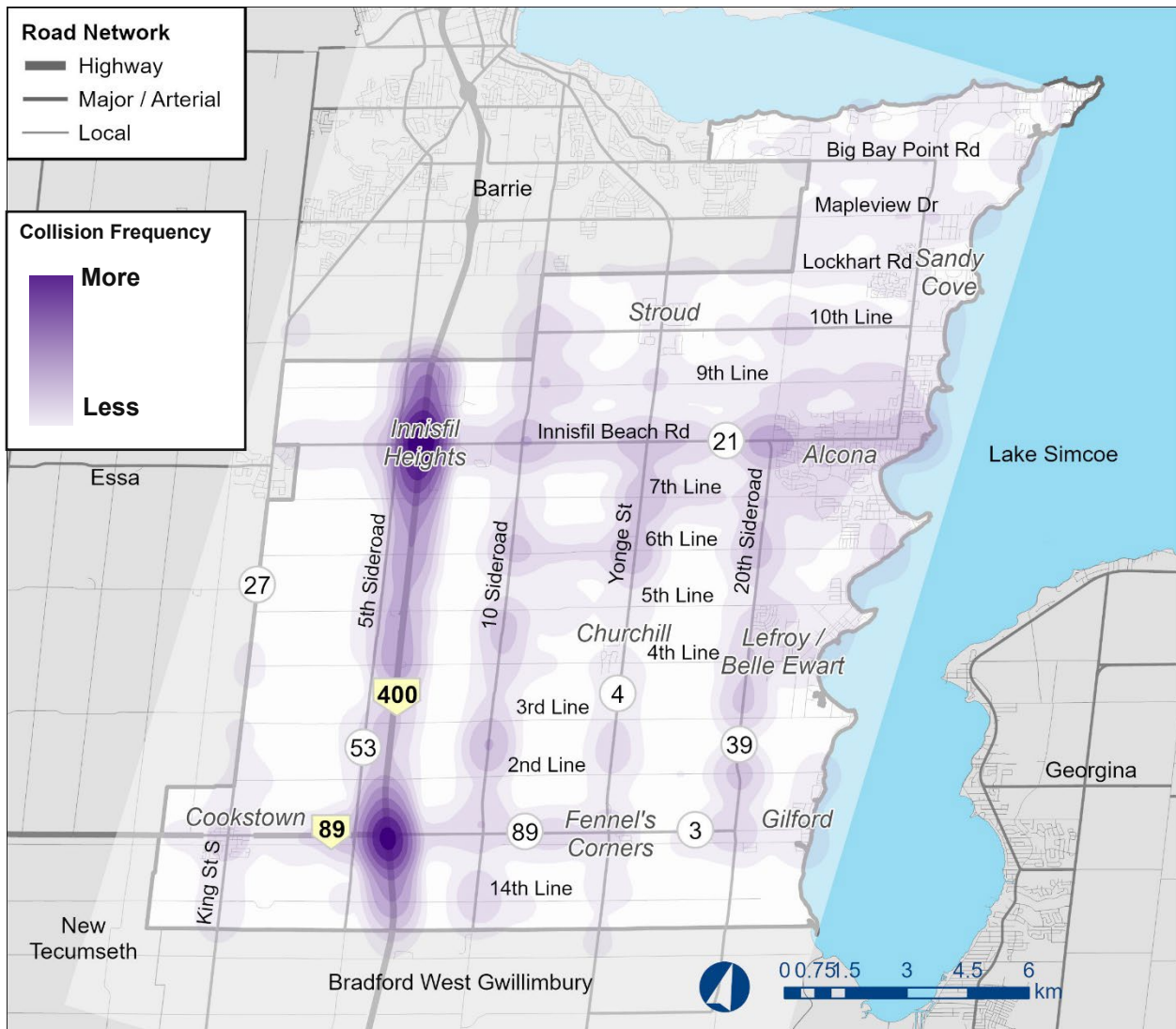


### 2.3.1 Single Motor Vehicle Collision Analysis

Single-Motor-Vehicle (SMV) collisions may include a vehicle colliding with an object along the roadside (i.e., a guardrail), losing control, running off the road, and/or flipping over. There are 1958 (or 46%) SMV collisions that have been recorded during the analysis period, 255 (13%) and 3 (0.2%) of which resulted in injuries and fatalities, respectively.

A geospatial hotspot analysis has been performed for the SMV collision subset and can be seen in Figure H-4. As expected, majority (77%) of SMV collisions occur at mid-blocks. The roadways that have the highest recorded number of SMV collisions are along Highway 400 and Innisfil Beach Road. Collision density along Highway 400 increases near the interchanges.

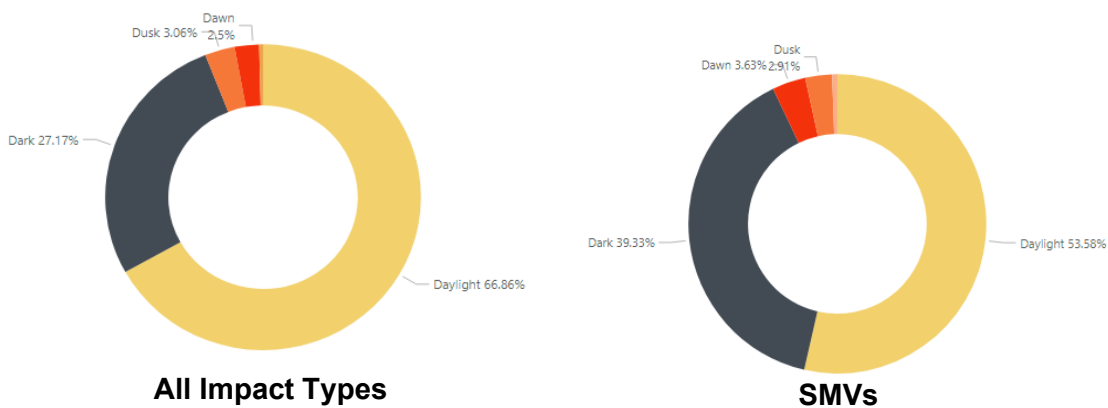
**Figure H-4: SMV Collision Hotspot Map**



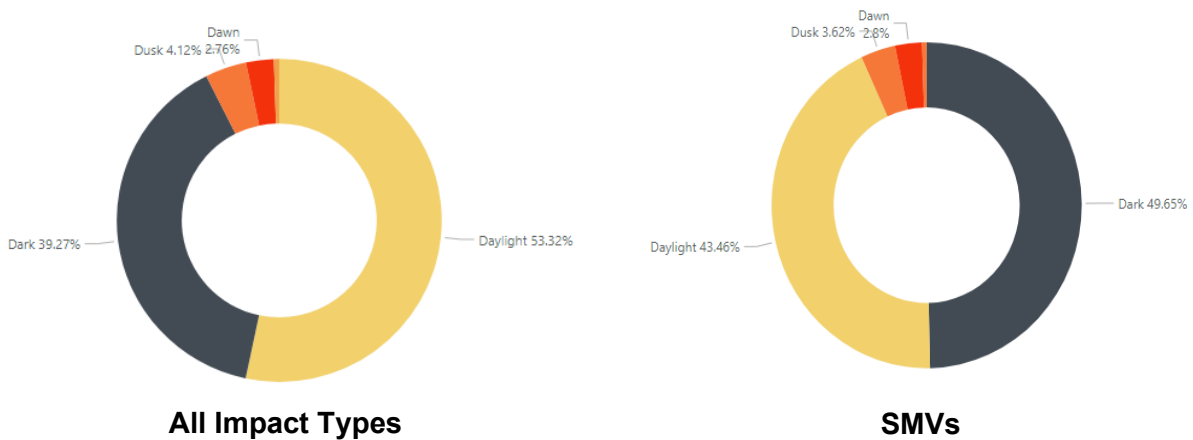
Approximately half of the SMV collisions occurred during the winter months between November and February. Lack of daylight is attributed to 46% of all SMV collisions and (50%) of SMV collisions during the winter months. This is 18% and 3% higher than the yearly and winter months averages for all impact types on the Town roads. No patterns can be observed with road surface conditions.

Figure H-5 illustrates the yearly lighting conditions for all collisions as well as collisions involving SMVs and Figure H-6 compares lighting conditions between SMVs and all impact types during the winter months.

**Figure H-5: Collision Summary by Lighting Conditions – Complete Dataset**



**Figure H-6: Collision Summary by Lighting Conditions – Winter Months Only**



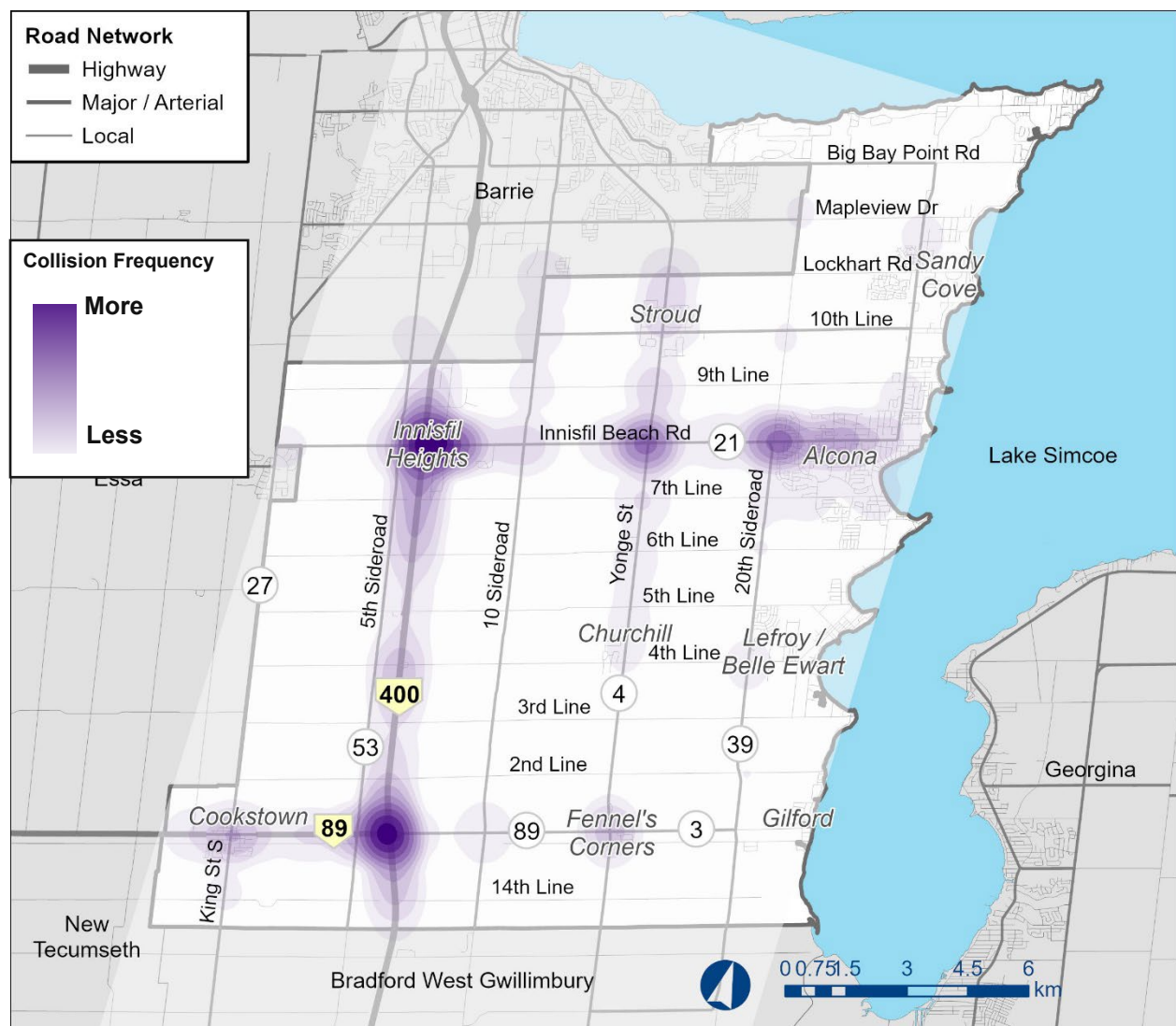
Furthermore, the SMV subset analysis indicates that more incidents of this type occur along undivided two-way roadways (54%) when compared to divided roadways with restraining barriers (25%). Approximately 33% of SMV collision involved impacts with wild animals.

### 2.3.2 Rear End Collision Analysis

Rear-end collisions made up 23% of the studied five-year dataset (999 instances), out of which 167 (16%) resulted in injuries and 2 (0.2%) resulted in a fatality.

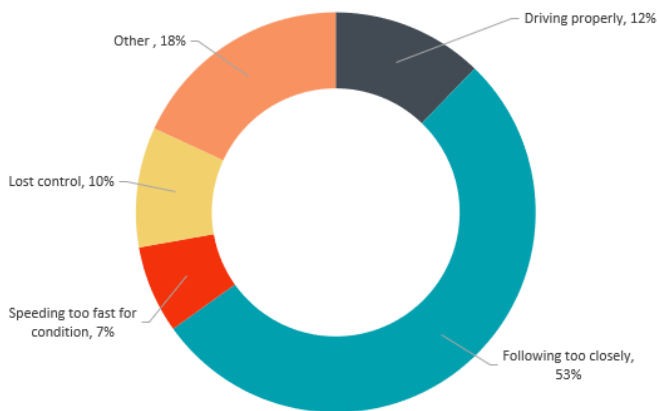
A hotspot analysis was performed for the rear-end collisions, as shown in Figure H-7. Majority of the rear-ended collisions have occurred along major roads. The highest concentration of rear-end collisions can be observed along Highway 400 mainlines followed by Innisfil Beach Road between Highway 400 interchange and 25th Side Road as well as along Highway 89 between the western Town boundary and Highway 400. Out of north-south arterials, Yonge Street has the highest number of rear-ended collisions. In general, higher density of rear-ended collisions can be observed near intersections.

**Figure H-7: Rear End Collision Hotspot Map**



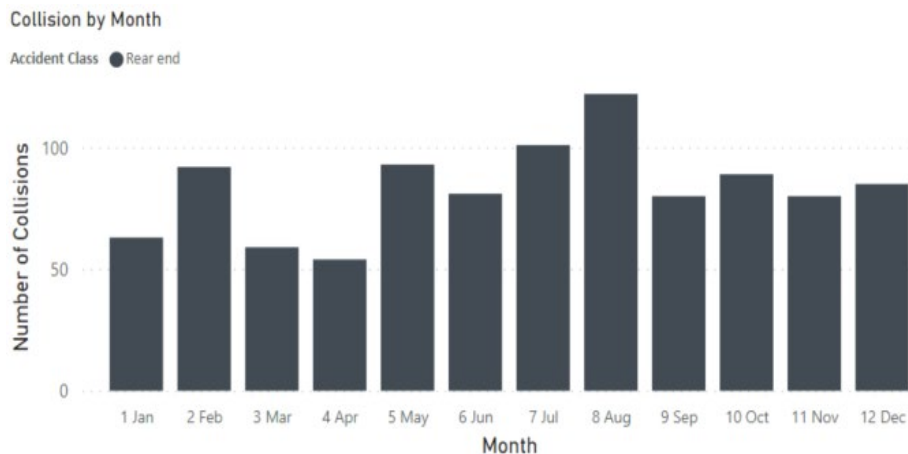
Majority (922 or 92%) of rear-end collisions occurred on dry road surface. Lack of visual clarity due to environmental conditions and time of day was a contributing factor to 22% and 21% of rear-end collisions, respectively. Like the SMV subset, lower number of rear-end collision occurred along divided roadways with restraining barriers (338 or 34%) when compared to those along undivided two-way roadways (600 or 60%). Half (523 or 52%) of rear-ended collisions were associated with drivers following another vehicle too closely. Figure H-8 illustrates rear-end collisions by apparent driver act.

**Figure H-8: Rear End Collisions by Apparent Driver Act**



The five-year collision dataset also indicates that most of rear-ended collisions have happened in August. Figure H-9 provides a summary of rear-end collisions by month.

**Figure H-9: Rear End Collisions by Month**

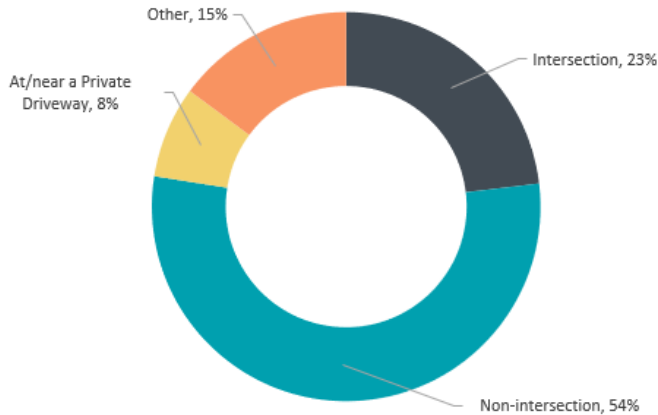


## 2.4 Collisions by Location

Collisions by location is illustrated in Figure H-10. Approximately 61% of all collisions occurred at mid-blocks, followed by intersection (26%) and near private driveways (9%). Collisions that

occurred in mid-block are mainly SMV (56%), rear end (25%) and sideswipe (13%). Collision that occurred near or at intersections are generally associated with rear-end (33%), turning movement (25%) and angled (22%) impact types.

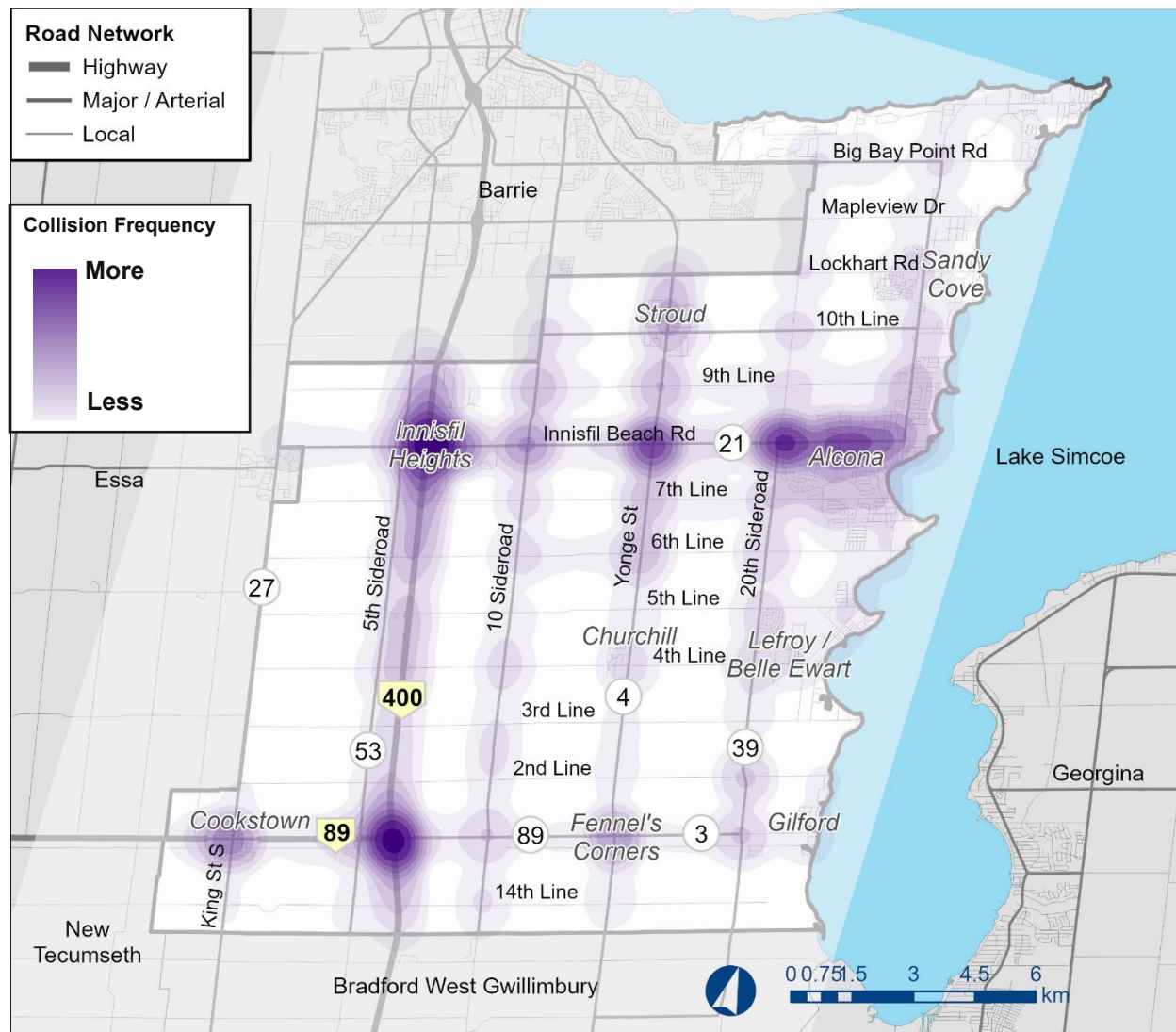
**Figure H-10: Collision Summary by Location**



Results of the collision hotspot analysis are provided in Figure H-11. As shown, a high number of collisions occurred along the Highway 400 mainlines and interchanges. Predominant collision impact types at these locations are rear-ends and SMVs. Three fatal accidents occurred along the Highway 400 segment between Highway 89 and Innisfil Beach Road. Two of the three collisions occurred at the Innisfil Beach Road interchange and one along the mainline north of 5<sup>th</sup> Line. Collision hotspots can also be observed along Innisfil Beach Road. One of the hotspots is in the heart of Innisfil municipal civic campus and the other stretches between 20<sup>th</sup> Sideroad and 25<sup>th</sup> Sideroad in Alcona.



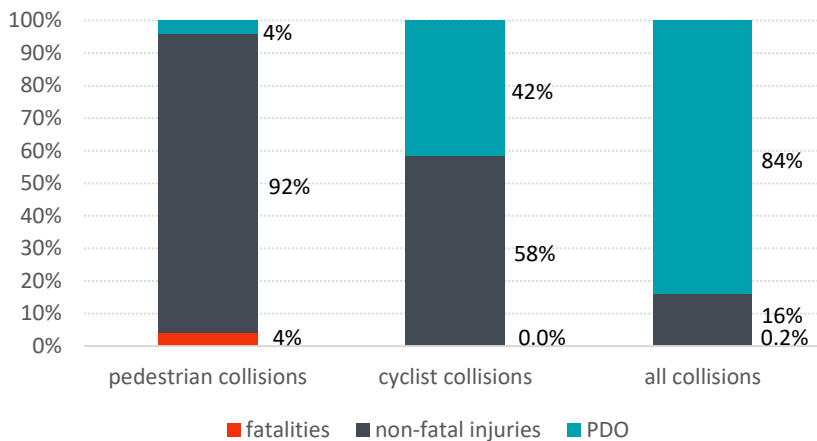
**Figure H-11: Collision Hotspot Map**



## 2.5 Collisions Involving Vulnerable Road Users (VRU)

Additional analysis was undertaken on VRU-related collisions between 2015 and 2019 as these are the road user types that are more susceptible to injuries or fatalities. A comparison between fatality, non-fatal injury and PDO only rates between pedestrian, cyclist and all collisions in Innisfil is provided in Figure H-12.

**Figure H-12: Injury Type Comparison - VRU Collisions vs. All Collisions**



### 2.5.1 Cyclist-related Collisions

Between 2015 and 2019, there were 12 cyclist collisions, seven involved injuries and five resulted in PDO. Despite dedicated bike lanes being provided, most of the cyclist collisions happened in Alcona along Innisfil Beach Road near Crossroads Plaza. Other hotspots along Innisfil Beach Road can be observed nearby local restaurants. Some of the bicycle collisions occurred when the cyclists tried to merge into the road network from private driveways or while turning at the intersections.

### 2.5.2 Pedestrian-related Collisions

In total, 25 pedestrian-related collisions were reported in Innisfil between 2015 and 2019 and one of these collisions was fatal. Like cyclist collisions, most of the pedestrian collisions are concentrated in Alcona. Two pedestrian collisions occurred at or near Jans Boulevard and Anna Maria Avenue intersection, near Nanytr Shores Secondary School. There were also two pedestrian-related collisions near the Innisfil municipal civic campus which resulted in injuries. Key generators of pedestrian traffic such as schools and civic facilities should be identified as the priority areas for improving pedestrian safety.

Overall, sidewalk gaps and lack of pedestrian facilities along rural roads in Innisfil result in some pedestrians using road shoulders to complete their trips. Road shoulders (paved or unpaved) generally decreases user’s level of comfort and safety due to lack of mode separation. During winter months the pedestrian level of service could be further impacted by snow accumulation. An analysis of sidewalk connectivity, gaps and conditions are documented under the active transportation assessment section.

## 2.6 Collision Rates

Collision rates were calculated for intersection and roadway segments using the following formulas:

$$\text{Segment Collision Rate} = \frac{\text{Number of collisions} \times 1,000,000}{\text{Average Annual Daily Traffic} \times 365 \times \text{Length of Segment} \times \text{Years}}$$

$$\text{Intersection Collision Rate} = \frac{\text{Number of collisions} \times 1,000,000}{\text{Average Annual Daily Traffic} \times 365 \times \text{Years}}$$

Annual Average Daily Traffic (AADT) was estimated based on available traffic count data. A hotspot, a location where safety countermeasures should be considered, is identified if the collision rate exceeds approximately 1 or 1.5 crashes per million kilometres traveled. The highest collision rates are shown in **Table H-1** and **Table H-2**.

**Table H-1: Intersections with Highest Incidence of Collisions**

Road Name	Number of Collisions (5 Yrs)	AADT	Collision Average per Year	Collision Rate
Yonge Street at Innisfil Beach Road	38	21,550	7.6	0.97
Innisfil Beach Road at 20th Side Rd	33	20,360	6.6	0.89
Yonge Street at Shore Acres Drive	28	18,590	5.6	0.83
Hwy 89 & CR 27	20	19,150	4.0	0.57
Innisfil Beach Rd & St Johns Blvd-Willard Ave	18	4,330	3.6	2.28
Yonge Street at 9th line	15	14,290	3.0	0.58

**Table H-2: Segments with Highest Incidence of Collisions**

Road Name	Segment Length (km)	Number of Collisions (5 Yrs)	AADT	Collision Average per Year	Collision Rate
Innisfil Beach Road East of 20th Side Rd	3.43	100	15,241	5.84	1.05
Yonge St Churchill to County Road 21	5.91	47	11,699	1.59	0.37
7th Line East of Yonge St	4.09	20	4,292	0.98	0.62
10th Side Rd North of 2nd Line	1.72	19	3,450	2.21	1.76
9th Line East of 20th Side Rd	4.00	18	2,957	0.90	0.83

Note: The traffic counts provided by the Town were dated between 2011 and 2021. Where counts for a single location were available for multiple years, a more recent count year prior to 2020 (pre-covid) was selected for the analysis.