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DHL Shelburne Pit Expansion

TRAFFIC REVIEW

Duivenvoorden Haulage Ltd.

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Document Control

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Document Contents

Tables

Figures

Appendices

1 Introduction

Tatham Engineering Limited was retained by Duivenvoorden Haulage Ltd. (DHL) to prepare a traffic review in support of a proposed expansion to their existing Shelburne Pit. The traffic review addresses the site access, site traffic volumes, and the potential impacts to the adjacent road network.

The existing DHL Shelburne Pit is located on the west side of 4th Line, approximately 1.35 km north of Dufferin Road 17 in the Township of Melancthon. The legal property description is Part Lot 13, Concession 4, Township of Melancthon. Figure 1 illustrates the location of the site, in addition to a number of neighbouring gravel pits and/or proposed pits (ie. Strada expansion). Figure 2 illustrates the same in context of an aerial photograph.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations for the existing conditions.

2.1 ROAD NETWORK

The road network to be addressed by this study consists of the following:

- 4th Line from the existing site access to Dufferin Road 17;
- Dufferin Road 17;
- the intersection of the site access with 4th Line; and
- the intersection of 4th Line with Dufferin Road 117.

Photographs of the road system are provided in Figure 3 (date of photos: January 15, 2021).

2.1.1 4th Line

As per the *Township of Melancthon Official Plan,* 4th Line is considered a local road albeit designated a Mineral Aggregate Haul Route (refer to Figure 4 for an excerpt of Schedule A-1 of the Official Plan). The road is oriented north-south through the study area and has a 2-lane rural cross section (ie. gravel ditches and open ditches), providing one lane of travel per direction. Where designated a haul route (recognizing that this extends only to the most northerly pit), 4th Line has a paved width of 6.6 metres with 1.5 metre gravel shoulders (hence a 9.6 metre road platform). The road does not have a posted speed limit and thus an 80 km/h speed limit has been assumed, which then dictates a 100 km/h design speed of 80 km/h (posted speed limit + 20 km/h). As a local road, a capacity of 400 vehicles per hour per lane (vphpl) has been assumed.

In the vicinity of the site access, the road maintains a relatively straight horizontal alignment with a varied vertical profile to the north and south.

2.1.2 Dufferin Road 17

Dufferin Road 17 is a County road under the jurisdiction of Dufferin County. The road is oriented east-west and has a 2-lane cross section, providing one lane of travel per direction. The road has a posted speed limit of 80 km/h, thus a design speed of 100 km/h has been assumed. As an arterial road, a theoretical planning capacity of 900 to 1,100 vehicles per hour per lane (vphpl) would apply; 900 vphpl has been assumed to ensure a conservative approach.

The road is relatively straight and flat in the area of 4th Line, with vertical and/or horizontal curves to the east and west.

2.1.3 Key Intersections

The key intersections considered in this study are detailed below and illustrated in Figure 5.

The intersection of 4th Line with Dufferin Road 17 is a 4-leg intersection with stop control on the minor approach (4th Line) and the following configuration:

- east approach - shared left-through lane plus a right turn lane (40 metre parallel length + 30 metre taper);
- west approach - shared left-through-right lane;
- north approach - shared left-through-right lane; and
- south approach - shared left-through-right lane.

The intersection of 4th Line with the existing DHL Shelburne Pit Access is a 3-leg 'T' intersection with stop control on the minor approach (pit access) and the following lane configuration:

- west approach - shared left-right lane;
- north approach - shared through-right lane; and
- south approach - shared left-through lane.

2.2 ROAD CONDITION

2.2.1 4th Line

The *Traffic Review, Strada Aggregates Inc. Melancthon Pit Extension*[1] noted the following pertaining to 4th Line (based on a visual assessment completed on June 20, 2017):

- fair pavement condition given general cracking and signs of normal wear although there are localized areas in poor condition due to unsupported pavement edges;
- alligator cracking from County Road 17 to the most northerly Strada driveway on both sides (which extends beyond the subject DHL site); and
- early signs of rutting.

The review further commented on the possible causes of alligator cracking, including excessive loading; weak surface, base or subgrade; thin surface or base; and/or poor drainage. With respect to rutting, the review suggested lateral movement of the pavement layers; insufficient

[1] *Traffic Review, Strada Aggregates Inc. Melancthon Pit Extension*. HDR, July 6, 2017.

design thickness; lack of compaction; and/or weak asphalt as possible causes. The review concluded that the pavement condition should be monitored and that potholes south of the north driveway be fixed.

A subsequent review of 4th Line completed by C.C. Tatham & Associates in November 2017[2] confirmed the presence of potholes, rutting, edge break-up and significant cracking along the full length of the subject section of 4th Line.

Further to the above, a geotechnical investigation was conducted of 4th Line from Dufferin Road 17 to the most northerly Strada Pit (north of the DHL Shelburne site) in May 2018, as part of the Strada application to expand their existing operations. The study recommended the following road improvements:

- pulverize the existing road to a depth of 100 mm;
- repave the road with 50 mm binder + 40 mm surface course asphalt; and
- add additional gravel to the shoulders to match the new paved road surface.

The site visits completed for this study (August 30, 2019 and January 15, 2021) confirmed that the above improvements have yet to be implemented and that the previously noted deficiencies remain, as are evident in the photos of Figure 3. As noted, there is significant alligator cracking and rutting, particularly in the areas of the gravel pit access points, where vehicles slow and complete their turn manoeuvres. It is understood that Strada has agreed to undertake the noted road improvements as part of their application approval (the improvements are expected to occur once all approvals are in place).

2.2.2 Dufferin Road 17

As evident in the photos of Figure 3, Dufferin Road 17 has been recently repaved (within the past several years) and this is considered to be in excellent condition. It is further noted, that as a County road, Dufferin Road 17 is expected to serve all traffic volumes, including heavy trucks, and thus its road condition should reflect this.

2.3 TRAFFIC VOLUMES

To determine existing traffic volumes, a traffic count was conducted at the intersection of 4th Line with Dufferin Road 17 on Thursday September 5, 2019 from 7:00 to 9:00 and 16:00 to 18:00. The corresponding traffic count details are provided in Appendix A. Given the timing of the traffic counts, the observed volumes are considered reflective of average conditions.

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[2] *4th Line Road Review*. C.C. Tatham & Associates Ltd., December 22, 2017.

Recognizing that traffic counts were not completed at the site access points to the DHL or Strada pits, the truck volumes observed on 4th Line at Dufferin Road 17 were allocated as follows (assuming all truck traffic was associated to the area gravel pits):

- 25% to the DHL pit;
- 25% to the Strada south pit; and
- 50% to the Strada north pit.

All car traffic on 4th Line was assumed to continue through the area (ie. not associated with the gravel pits).

To reflect 2021 conditions, the 2019 traffic counts were increased 6.5% per annum for volumes on Dufferin Road 17 and 2% per annum for volumes on 4th Line (no increase was applied to pit traffic). Additional discussion with respect to the noted growth rates is provided in 4.2.2 whereas the resulting 2021peak hour volumes are illustrated in Figure 6.

2.4 TRAFFIC OPERATIONS

2.4.1 Road Section Operations

Road section operations have been addressed in context of the peak hour traffic volumes (considering the maximum volumes obtained through the traffic count), and the road capacities previously noted, as follow:

- 4th Line – 400 vphpl (local road); and
- Dufferin Road 17 – 900 vphpl (arterial road).

A summary of the summer peak hour volumes and resulting volume to capacity ratios (v/c), which reflect the degree to which the available capacity is consumed, is provided in Table 1.

Table 1: Road Operations – 2021 Conditions

ROAD SECTION & DIRECTION OF TRAVEL		CAPACITY	WEEKDAY AM PEAK HOUR		WEEKDAY PM PEAK HOUR	
			Volume	V/C	Volume	V/C
Dufferin Road 17	WB	900 vphpl	92	0.10	137	0.15
	EB	900 vphpl	105	0.12	99	0.11
4th Line	NB	400 vphpl	35	0.09	21	0.05
	SB	400 vphpl	35	0.09	15	0.04

As indicated, 4th Line is operating at 4 to 9% of its capacity, whereas Dufferin Road 17 is operating at 10 to 15% of capacity. In considering these operating levels, there is significant reserve capacity along both roads to accommodate increased volumes over a long period of time.

2.4.2 Intersection Operations

The assessment of existing conditions provides the baseline from which the future traffic volumes and operations (both with and without the additional site trips) can be assessed. The capacity, and hence operations, of a road system is effectively dictated by its intersections. As such, the analysis focused on the operations of the noted key intersection of 4th Line with Dufferin Road 17. The analysis is based on the 2021 traffic volumes (including consideration for existing truck traffic and percent heavy trucks), the existing configuration and intersection stop control and procedures outlined in the *2000 Highway Capacity Manual*[3] (using Synchro v.10 software). For unsignalized intersections, the review considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for the critical movements, namely the stop movements on the minor street. Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

A summary of the analyses is provided in Table 2 whereas detailed operations worksheets are included in Appendix B.

Table 2: Intersection Operations – 2021 Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
4th Line & Dufferin Road 17	NB	stop	9	A	0.01	10	B	0.03
	SB	stop	11	B	0.06	10	B	0.02

Based on the existing volumes and intersection configuration and control, the subject intersection provides an excellent level of service (LOS B or better) with minimal delays during both peak hours. As such, no intersection improvements are required to support the existing conditions. It is noted that the analysis reflects the existing heavy truck percentage for each

[3] *Highway Capacity Manual.* Transportation Research Board, Washington DC, 2000.

individual movement, with a minimum of 5% heavy trucks considered (in some cases, as evident in the traffic volumes of Figure 6, heavy trucks constitute 100% of the total movement volume).

3 DHL Shelburne Pit

3.1 EXISTING OPERATIONS

As illustrated in Figure 1 and Figure 2, the DHL Shelburne Pit is located on 4th Line north of Dufferin Road 17. It is located in a Sand and Gravel Resource Area (as per the County's Official Plan) and is served by 4th Line, a designated Mineral Aggregate Haul Route (as per the Township's Official Plan). The site is currently licenced to extract 199,550 tonnes per year.

3.2 PROPOSED EXPANSION

DHL is seeking an amendment to the Township's Official Plan and Zoning By-law as well as a license for a Class A Category 3 sand and gravel pit (which would permit mineral extraction above the water table), to expand its existing operations to the north, the associated area of which is illustrated in both Figure 1 and Figure 2.

The proposed expansion license limit is 500,000 tonnes annually albeit it is expected that actual extraction will range from 150,000 to 250,000 tonnes per year; the increased tonnage allowed under the licence will allow for flexibility should current demands increase significantly and for sustained operations through the future years.

3.3 SITE ACCESS

Access to the existing site is provided via 4th Line which runs north-south along the eastern boundary of the property. The existing site access is located towards the southeast corner of the site and provides separate inbound and outbound lanes (1 lane per direction), with a grassed median separation. Both lanes are paved and readily accommodate the required design vehicles.

While the proposed expansion will extend the site boundaries to the north, the existing site access will be maintained. Given the existing operations of the site and associated truck traffic and turning requirements, the current configuration is considered appropriate.

3.4 HAUL ROUTE

The existing haul route which serves the area (including the DHL and Strada sites) includes 4th Line from the respective site access points to Dufferin Road 17 and Dufferin Road 17 to Dufferin Road 124 (which then continues north and south to provide connectivity to the provincial road system, thus providing access to the intended markets to the north and south).

As per the Township's Official Plan:

> *…all traffic associated with existing or future mineral aggregate operations will be generally directed to Arterial Roads, Provincial highways, and those Township road sections designated as Mineral Aggregate Haul Routes on the schedules to this Plan*.

In context of the existing road system designation and configuration (County roads are arterials which provide access to provincial highways, and 4th Line is a designated haul route), the above OP policy is satisfied.

No changes to the haul route are anticipated with the proposed expansion.

3.5 SITE TRAFFIC

3.5.1 Existing Operations

The trips generated by the existing pit operations (assuming typical operations) have been summarized based on the following:

- 199,550 tonne annual extraction licence amount;
- average truck capacity of 30 tonnes; and
- 250 operating days per year (reflective of year-round operations).

While the site operates year-round, the majority of extraction occurs during the months May to November when building and road construction demands are greatest. During the peak season, the quarry is assumed to operate 12 hours per day (06:00 to 18:00), whereas during the off peak period, reduced hours of operation are assumed at 8 hours per day. While weekend operations may occur, such is not regular and thus has not been considered. To further consider peak hour operations during a typical day, the average hourly volumes have been increased by a factor of 2.0 (ie. site activity will not be uniform over the course of the day as some hours will be busier than others). A summary of the resulting truck volumes is provided in Table 3, including daily and hourly truck volumes.

It is noted that the truck volumes of Table 3 assume an annual extraction of 199,550 tonnes, corresponding to the site's licence. Actual extraction varies and is typically less than the licence limit. While the pit also generates automobile trips at the start and end of each day related to employee use, the volume of such is minor and thus the associated impacts are considered negligible.

As per the traffic volumes of Figure 6, the existing DHL site is assumed to generate 8 inbound and 7 outbound trips during the AM peak hour and 2 inbound and 0 outbound trips during the PM peak hour (reflects actual extraction limits vs theoretical/licence limits).

Table 3: Site Generated Traffic – Existing Operations

PERIOD	PERIOD TONNAGE	OPERATING DAYS	TONNES/ DAY	LOADS/ DAY	LOADS/HOUR	
					Ave	Peak
Average	199,550	250	800	27	2.6	5.2
Peak Season[1]	159,640	145	1100	37	3.1	6.2
Off-Peak Season[2]	39,910	105	380	13	1.6	3.2

[1] peak season = 12 hour operations from May to November (during which it is assumed 80% of the annual tonnage will be extracted)
[2] off-peak season = 8 hour operations from December to April (during which it is assumed that 20% of annual tonnage will be extracted)

3.5.2 Existing Operations - Peak Day

The market for aggregates is typically greater during the spring and summer months than during the winter months. Therefore, it is important to consider peak operating conditions. Assuming a peak day extraction of 3,000 tonnes, the resulting truck volumes are noted in Table 4. As noted, on a peak day, the site is expected to process an average of 8.3 loads per hour which translates to 8.3 truck trips to the site and 8.3 truck trips from the site. During the peak hour of the peak day, the site is expected to process 16.6 loads (assuming peak hour is 2.0x the average hour), or 16.6 trips to the site and 16.6 trips from the site.

Table 4: Site Generated Traffic – Existing Operations Peak Day

PEAK DAY TONNAGE	TONNES/DAY	LOADS/ DAY	LOADS/HOUR	
			Ave	Peak
3,000	100	100	8.3	16.6

3.5.3 Future Operations

Upon approval of the proposed expansion, it is understood that extraction is expected to be in the order of 150,000 to 250,000 tonnes per year depending on market demand. However, to account for increased demands and provide flexibility to service larger construction projects within the immediate area, a 500,000 tonne licence is being pursued.

To ensure a conservative approach to the traffic assessment, the analysis is premised on the annual extraction licence of 500,000 tonnes and the previously noted assumptions with respect to truck capacity and operating days/hours. In considering the annual operations, the following are noted:

- 16,667 total number of loads (500,000 tonnes ÷ 30 tonnes per load); and
- 33,334 truck trips (16,667 empty trucks arriving at the site and 16,667 loaded trucks departing from the site).

A summary of the truck trip estimates is provided in Table 5, including daily and hourly truck volumes. To further consider peak hour operations during the day, the average hourly volumes have been increased by a factor of 2.0, recognizing that site activity will not be uniform over the course of the day as some hours will be busier than others (typically demands during the early morning hours are greatest coinciding with the start of construction projects). Based on a projected annual extraction of 500,000 tonnes and considering typical conditions, the site could generate in the order of 32 to 92 loads per day which translates to 64 to 184 truck trips per day. Based on the noted operating hours per day, the average hourly volume of loaded trucks would be in the order of 4 to 8 per hour, with peak hour operations producing upwards of 15 loads per hour (assuming that the peak hour reflects the average hourly truck load volume increased by a factor of 2.0). This translates to 30 peak hour trips (ie. 15 empty trips in and 15 loaded trips out) during the peak season.

Table 5: Site Generated Traffic – Future Operations

PERIOD	PERIOD TONNAGE	OPERATING DAYS	TONNES/ DAY	LOADS/ DAY	LOADS/HOUR	
					Ave	Peak
Average	500,000	250	2,000	67	6.5	13.0
Peak Season[1]	400,000	145	2,760	92	7.7	15.4
Off-Peak Season[2]	100,000	105	950	32	4.0	8.0

[1] peak season = 12 hour operations from May to November (during which it is assumed 80% of the annual tonnage will be extracted)
[2] off-peak season = 8 hour operations from December to April (during which it is assumed that 20% of annual tonnage will be extracted)

3.5.4 Future Operations - Peak Day

To further consider peak season peak day operations (ie. the busiest day of the year), a peak daily tonnage of 5,000 tonnes has also been considered. Such operations are not expected to be common place but have nonetheless been considered to determine the potential number of trips generated by the site under these conditions. In considering the previous assumptions regarding truck size and operating hours, the resulting truck volumes associated with the peak operations are noted in Table 6.

Table 6: Site Generated Traffic – Future Operations Peak Day

PEAK DAY TONNAGE	TONNES/DAY	LOADS/ DAY	LOADS/HOUR	
			Ave	Peak
5,000	167	13.9	27.8	5,000

On the projected ultimate peak day, the site is expected to generate an average of 14 loads per hour which translates to 14 trips to the site and 14 trips from the site. During the peak hour of the peak day, the site is expected to generate 28 trips to the site (assuming the peak hour is 2.0 times the average hour) and 28 trips from the site.

3.6 EXISTING VS FUTURE OPERATIONS

A brief summary of the existing and future peak season operations and peak daily operations is provided in Table 7. Assuming a future annual extraction of 500,000 tonnes, the site is expected to generate 30 peak hour trips on an average day during the peak season, an increase of 18 peak hour trips when compared to existing conditions. In considering the peak day, the existing level of 33 trips increases to 56 during the peak hour.

Table 7: Site Generated Traffic – Existing vs Future Operations

SCENARIO		DAILY TONNAGE	LOADS/ DAY	LOADS/HOUR		PEAK HOUR TRIPS
				Average	Peak	
Existing Operations	Peak Season Average Day	1,100	37	3.1	6.2	12
	Peak Season Peak Day	3,000	100	8.3	16.6	33
Future Operations	Peak Season Average Day	2,760	92	7.7	15.4	30
	Peak Season Peak Day	5,000	167	13.9	27.8	56

4 Future Conditions

This chapter will describe the road network and traffic volumes expected for the 2026 and 2035 horizon years (taken as 5 and 10 years beyond anticipated operations for the proposed expansion).

4.1 ROAD NETWORK

No operational improvements to the study area road network or haul route are expected to occur throughout the horizon years. As such, the study area, road network and haul route as previously discussed will be maintained.

4.2 TRAFFIC VOLUMES

Traffic volumes expected for the 2026 and 2031 horizon years for the study area have been estimated based on the 2019 traffic volumes, historical growth on Dufferin Road 17 as per traffic data provided by Dufferin County and anticipated growth in the area.

4.2.1 Historic Growth

Historic traffic volumes on Dufferin Road 17 were obtained from Dufferin County for the road sections immediately east of Highway 10 (to the west of 4th Line) and west of Dufferin Road 124 (to the east of 4th Line). A summary of the volumes over the period 2012 to 2020 is provided in Table 8. The resulting annual growth in Dufferin Road 17 volumes was 7.0% from 2012 to 2018 (2020 volumes were not considered as likely impacted by Covid-19) west of Dufferin Road 124 and 7.1% from 2012 to 2019 east of Highway 10.

Table 8: Dufferin Road 17 Traffic Volumes

	2012	2013	2014	2015	2016	2017	2018	2019	2020
West of Dufferin Rd 124	1732	-	-	1522	2249	2594	2594	-	1385
East of Highway 10	1014	1155	1051	2210	1999	1398	1398	1639	-

Historic traffic volumes on 4th Line were not available and thus determination of historic growth was not possible. Suffice to say, given the limited existing volumes on 4th Line, the annual growth will not be significant.

4.2.2 Anticipated Background Growth

In consideration of the available data, an annual growth of 7% has been assumed for Dufferin Road 17 whereas a reduced 2% annual growth has been assumed on 4th Line to consider nominal growth.

4.2.3 Other Development Growth

As indicted in Figure 1 and Figure 2, Strada Aggregates currently operates two pits on the east side of 4th Line and plan to expand operations onto two adjacent land parcels. As per the *Planning Report and ARA Summary Statement*[4], the total area to be licenced is approximately 61 hectares (150 acres) with approximately 48 hectares (120 acres) proposed for extraction. It is understood that the expansion of the current extraction onto the adjacent lands will not result in an increase in traffic generated or the yearly extraction tonnage. It is further understood that there will be no changes to the existing Strada site access or the designated haul route. In this regard, no increase in traffic volumes, over current operating levels, is expected from the Strada operations.

4.2.4 Background Traffic Volumes

The resulting 2026 and 2031 background traffic volumes (ie. future traffic volumes without consideration for the expansion of the DHL pit) are illustrated in Figure 7 and Figure 8 respectively. It is noted that the assumed growth rates have not been applied to traffic to/from the existing gravel pits on 4th Line (no growth has been considered for these volumes).

4.2.5 DHL Traffic Volumes

In determining the future DHL site generated traffic volumes, consideration has been given to the following scenarios:

- peak season - average day (2,760 tonnes per day) - peak hour (15 loads per hour); and
- peak season - peak day (5,000 tonnes per day) - peak hour (28 loads per hour).

The associated assignment of the noted traffic volumes reflects the use of 4th Line (the haul route) and distribution of truck traffic at the 4th Line/Dufferin Road 17 intersection based on the existing traffic counts. The resulting peak hour volumes are illustrated in Figure 9 and Figure 10.

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[4] *Planning Report and ARA Summary Statement, Strada Aggregates Melancthon Pit Extension*. MJBC, May 2017.

4.2.6 Total Traffic Volumes

The DHL site generated traffic volumes have been combined with the background traffic volumes for each of the 2026 and 2031 horizons, yielding the future total traffic volumes. As evident from the 2021 traffic volumes (refer to Figure 6), the AM peak hour volumes are the more critical in terms of both total volumes on Dufferin Road 17 and 4th Line, and truck volumes to/from the existing gravel pit operations. To illustrate this further, 70 vehicles were observed on 4th Line immediately north of Dufferin Road 17 during the AM peak hour, of which 61 were trucks. During the PM peak hour, the 4th Line volume was 36 vehicles, of which only 6 were trucks. This reflects the nature of the gravel pit operations, with peaks occurring typically first thing in the morning, as opposed to later in the day. In this regard, only the AM peak hour has been carried forward for further review (in that it is the peak hour in all regards - volumes on Dufferin Road 17, volumes on 4th Line and truck volumes). The resulting future total traffic volumes are illustrated in:

- Figure 11 - 2026 Total with DHL peak season, average day, peak hour volumes;
- Figure 12- 2031 Total with DHL peak season, average day, peak hour volumes;
- Figure 13 - 2026 Total with DHL peak season, peak day, peak hour volumes; and
- Figure 14 - 2031 Total with DHL peak season, peak day, peak hour volumes.

4.3 TRAFFIC OPERATIONS

4.3.1 Road Section Operations

The operations of the study area roads were revisited in consideration of the future projected traffic volumes on both Dufferin Road 17 and 4th Line. The results are illustrated in Table 9 and Table 10, considering peak hour volumes under average day and peak day operations at the DHL Shelburne Pit.

Table 9: Road Operations – 2026 Conditions

ROAD SECTION & DIRECTION OF TRAVEL		CAPACITY	AVERAGE DAY AM PEAK HOUR		PEAK DAY AM PEAK HOUR	
			Volume	V/C	Volume	V/C
Dufferin Road 17	WB	900 vphpl	123	0.14	131	0.15
	EB	900 vphpl	142	0.16	150	0.17
4th Line	NB	400 vphpl	42	0.11	55	0.14
	SB	400 vphpl	44	0.11	57	0.14

Table 10: Road Operations – 2031 Conditions

ROAD SECTION & DIRECTION OF TRAVEL		CAPACITY	AVERAGE DAY AM PEAK HOUR		PEAK DAY AM PEAK HOUR	
			Volume	V/C	Volume	V/C
Dufferin Road 17	WB	900 vphpl	159	0.18	168	0.19
	EB	900 vphpl	187	0.21	195	0.22
4th Line	NB	400 vphpl	42	0.11	55	0.14
	SB	400 vphpl	45	0.11	58	0.14

As indicated, the subject road sections will continue to operate at less than 22% of their respective capacities and thus no operational issues are foreseen. Furthermore, it can be concluded that the road system can accommodate further significant increases in traffic volumes beyond which has been considered in this assessment (ie. should volumes grow beyond the assumed growth rates, or should there be increased gravel pit volumes).

4.3.2 Intersection Operations

The intersection of Dufferin Road 17 with 4th Line was again analyzed to consider the projected total traffic volumes. The results are summarized in Table 11 and Table 12 for the 2026 and 2031 horizons respectively; detailed operation worksheets are included in Appendix B. The DHL site access operations have also been reviewed and duly summarized.

Table 11: Intersection Operations – 2026 Conditions

INTERSECTION & MOVEMENT		CONTROL	AVERAGE DAY AM PEAK HOUR			PEAK DAY AM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
4th Line & Dufferin Road 17	NB	stop	10	A	0.02	10	B	0.02
	SB	stop	12	B	0.08	12	B	0.12
DHL Site Access	EB	stop	10	A	0.02	10	A	0.04

In all cases, both intersections will provide excellent levels of services (LOS B or better) with minimal delays. The maximum volume to capacity (v/c) ratio is 0.13, which suggests the most critical movement is projected to operate at no more than 13% again. Again, the results indicate

that further increases can be readily accommodated (whether that be in the background volumes, the gravel pit volumes and/or individual movement volumes).

Table 12: Intersection Operations – 2031 Conditions

INTERSECTION & MOVEMENT		CONTROL	AVERAGE DAY AM PEAK HOUR			PEAK DAY AM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
4th Line & Dufferin Road 17	NB	stop	10	B	0.02	11	B	0.02
	SB	stop	13	B	0.10	13	B	0.13
DHL Site Access	EB	stop	10	B	0.01	10	A	0.04

4.4 TURN LANE REQUIREMENTS

4.4.1 Right Turn Lanes

As previously noted, there is an existing westbound right turn lane on Dufferin Road 17 at 4th Line, recognizing that both are designated as haul routes. In considering the future projected volumes for this movement, the volumes range from 27 to 35 vehicles per hour, or approximately 1 right turn movement every 2 minutes. MTO guidelines suggest a right turn lane should be provided with the turning volume exceeds 60 vehicles per hour and/or has the potential to negatively impact the through movement. Under normal operating conditions, a right turn lane would not be required given the traffic volumes. As such, it is assumed that the existing right turn lane was constructed in context of the turning truck volumes and the desire to remove them from the through stream of traffic.

It is noted that the MTO guidelines suggest a right turn lane with a storage length of 85 metres and a taper length of 80 metres on roads with a 100 km/h design speed (80 km/h posted speed). The existing turn lane has a storage length of approximately 40 metres and a taper of 30 metres, and thus does not comply with MTO guidelines. However, given that such has existed for some time, and given that the truck volumes are not expected to increase significantly over existing conditions, the existing turn lane is considered appropriate.

Given the negligible southbound right turn movements expected at the site access, a right turn lane on 4th Line at the site access is not warranted.

4.4.2 Left Turn Lanes

The need for a left turn lane is premised on the design speed, turning volume, advancing volume and opposing volume. Given the relatively low volumes projected, a left turn lane on Dufferin

Road 17 at 4th Line is not warranted (the warranted is provided in Figure 15 for the most critical traffic volume scenario - 2031 Total Traffic Volumes – Peak Season Peak Day Peak Hour).

Similarly, a left turn lane is not warranted on 4th Line at the site access given the limited turning volumes in conjunction with the limited northbound/southbound through volumes.

4.5 SIGHT LINES

Sight lines at the existing DHL site access on 4th Line have been reviewed in context of applicable guidelines.

For a design speed of 100 km/h (80 km/h posted), MTO standards dictate a minimum stopping sight distance of 185 metres. Stopping distance refers to the minimum distance required for a vehicle travelling at the design speed to stop before reaching an object in the road. For example, should a truck slow or stop on 4th Line to turn into the site, approaching vehicles (either northbound or southbound) must have sufficient sight lines to ensure that upon observation of the slowed truck and the determination of the need to react, they are able to come to a complete stop without colliding with the vehicle. Dufferin County requirements, as per the County's Entrance Policy, have also been considered. For roads with a posted speed limit of 80 km/h, the required sight distance is 230 metes (somewhat greater in that it affords additional flexibility to oncoming vehicles with respect to having to slow versus come to a complete stop).

For a vehicle exiting the site, the sight distances to the north and south of the site access, as determined by field measurement (based on a driver eye height of 1.05 metres and an object height of 0.6 metres as per guidelines), exceed 300 metres. Similarly, for a southbound or northbound vehicle approaching the site access on 4th Line, visibility also exceeds 300 metres, and thus there is sufficient distance to react and respond accordingly. In this regard, both MTO and Dufferin standards are satisfied.

It is recognized that MTO standards are based on passenger cars and thus do not necessarily reflect the increased braking distance required for trucks. However, as truck drivers have a greater eye height (in the order of 2.3 metres), they have increased visibility and hence greater sight distances. As per MTO guidelines, this increased sight distance offsets the difference in vehicle performance relating to braking. Furthermore, as trucks will be slowing to complete their turns to/from the pit, they are not expected to be in a situation whereby they need to stop suddenly. This applies more so to approaching vehicles which are noted as having sufficient sight lines.

5 Summary

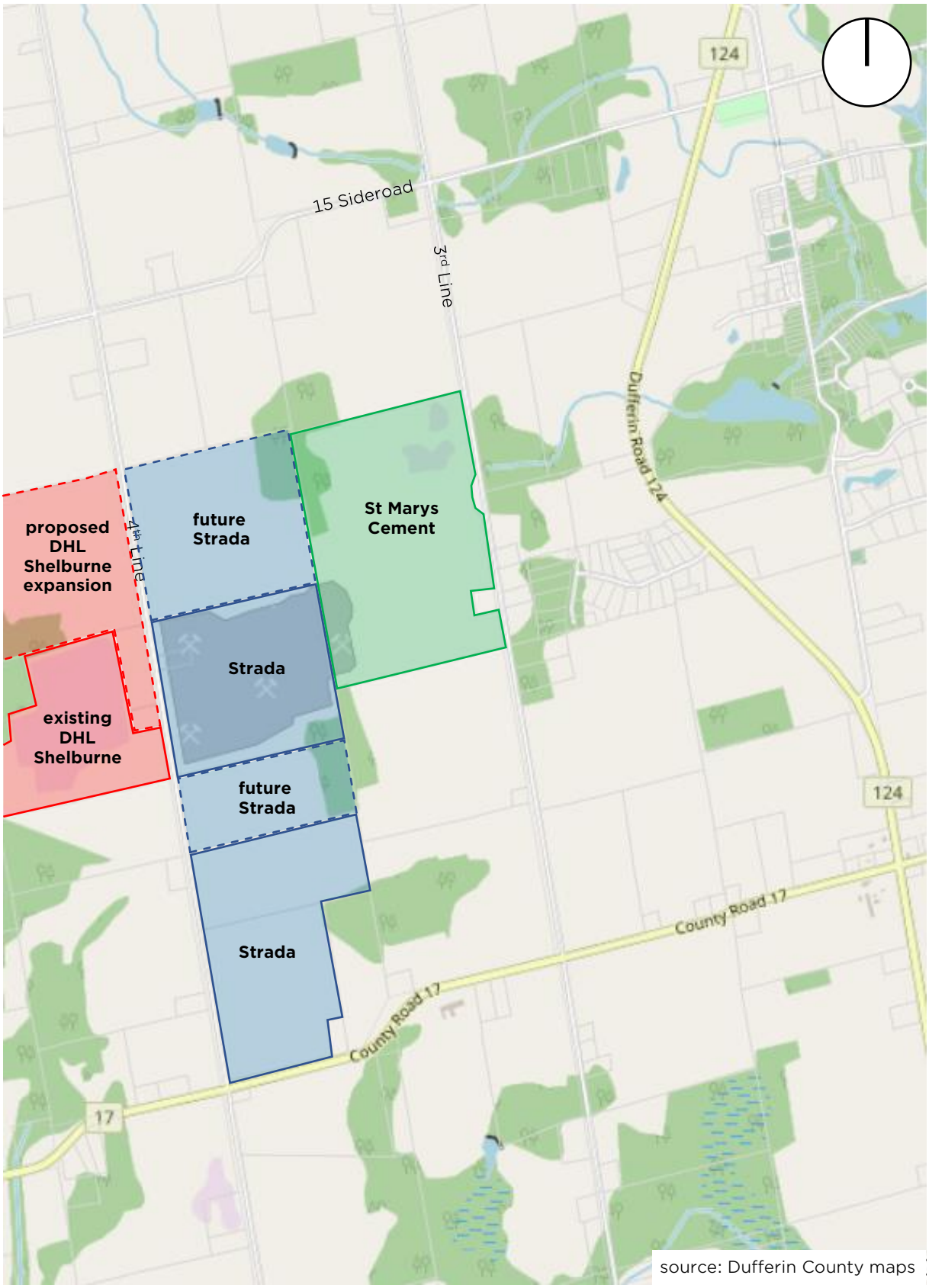
This review has addressed the transportation impacts associated with the proposed expansion of the licensed boundary of the DHL Shelburne Pit. While the primary purpose of the proposed expansion is to extend the life span of the pit rather than increase the current operations, the review has considered the potential impacts associated with an increase in the licence amount (and hence assumed increase in extraction operations) as compared to existing conditions.

Upon review of available traffic data, it was determined that the adjacent road network is operating with excess reserve capacity and can readily accommodate the additional traffic volumes associated with an increase in the operations at the DHL Shelburne Pit. No improvements are required to address the available road capacity. With respect to intersection operations, the intersection of Dufferin Road 17 with 4th Line will provide excellent operations. Likewise, the site access on 4th Line will operate without issue given the low volumes on the road network and limited volumes generated by the site. No intersection/access improvements are considered necessary from an operations perspective.

The need for exclusive left turn lanes on 4th Line at the site access and on Dufferin Road 17 at 4th Line was reviewed based on MTO turn lane warrants and the noted traffic volumes. Given the limited volumes to be generated by the site and the low volumes on Dufferin Road 17, exclusive turn lanes are not warranted at either location. With respect to right turn lanes, a southbound right turn lane is not warranted on 4th Line at the site access whereas a westbound right turn lane already exists on Dufferin Road 17 at 4th Line (albeit its configuration is somewhat less than MTO standards would dictate).

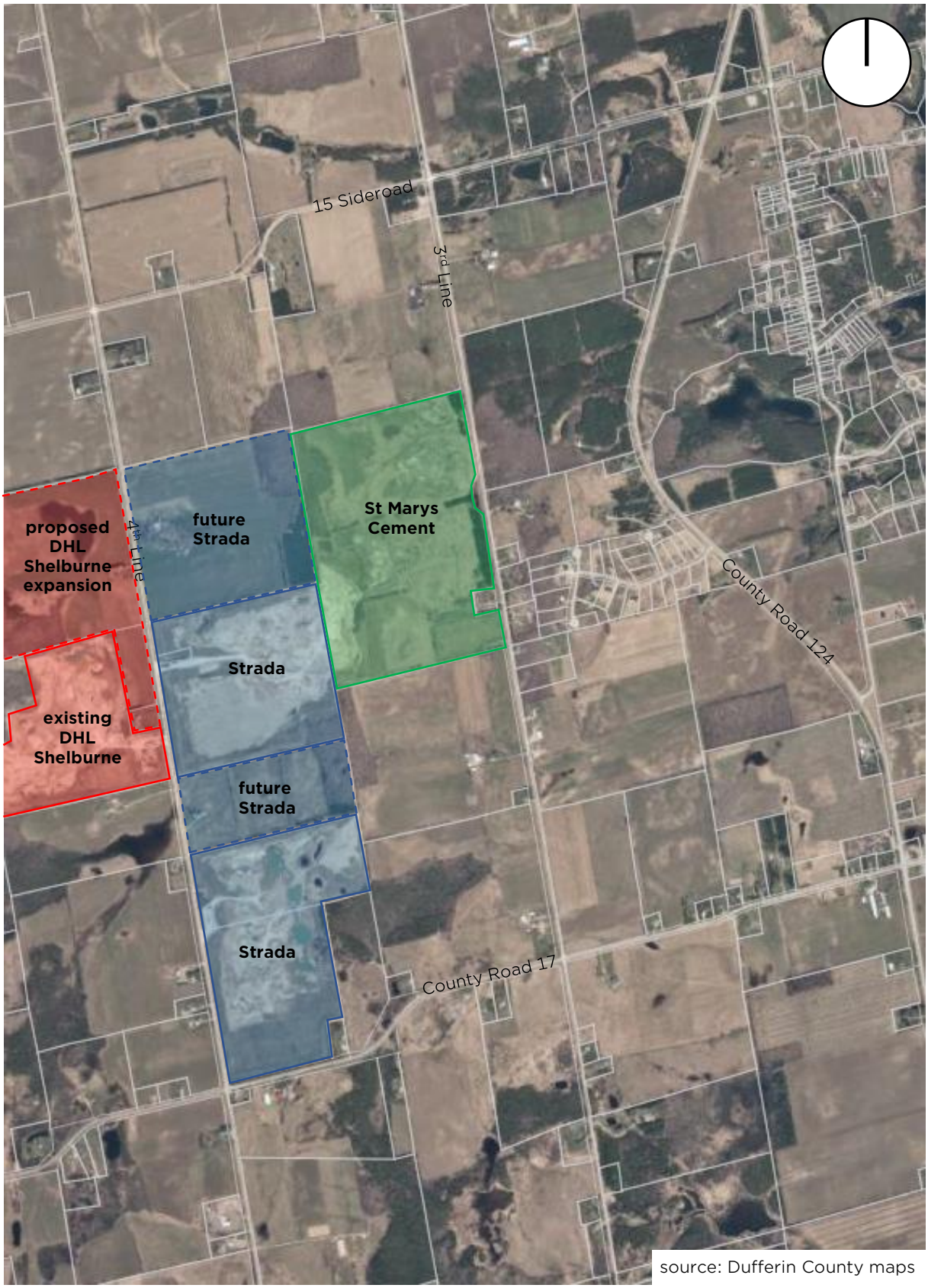
Sight lines were reviewed along 4th Line in both directions at the site access, to ensure vehicles accessing the site can do so in a safe and efficient manner. In all instances, the sight distances exceed the requirement for a 100 km/h design speed (20 km/h over the posted speed) considering both MTO and County standards. As such, no road improvements are required to address sight lines.

With respect to improvements necessary to address road conditions, it is noted that Strada Aggregates has agreed to undertake improvements to 4th Line as part of their expansion application. These improvements recognize the use of 4th Line as a haul route and the increased truck traffic that it serves (and will continue to serve). Implementation of the improvements is expected to occur once all approvals for the Strada application have been obtained. It is expected that DHL will be asked to contribute to the road improvement costs, recognizing that they will directly benefit.



DHL SHELBURNE PIT

Figure 1: Site Location Map



source: Dufferin County maps

DHL SHELBURNE PIT

Figure 2: Site Location Aerial

4th Line at the DHL Site Access

Looking S on 4th Line from the site access

Looking N on the 4th Line from the site access

DHL SHELBURNE PIT

Figure 3A: Area Road Network

4th Line at the DHL Site Access

Dufferin Road 17 at 4th Line intersection

Looking W on Dufferin Road 17 at 4th Line

Looking N on 4th Line from Dufferin Road 17

DHL SHELBURNE PIT

Figure 3B: Area Road Network

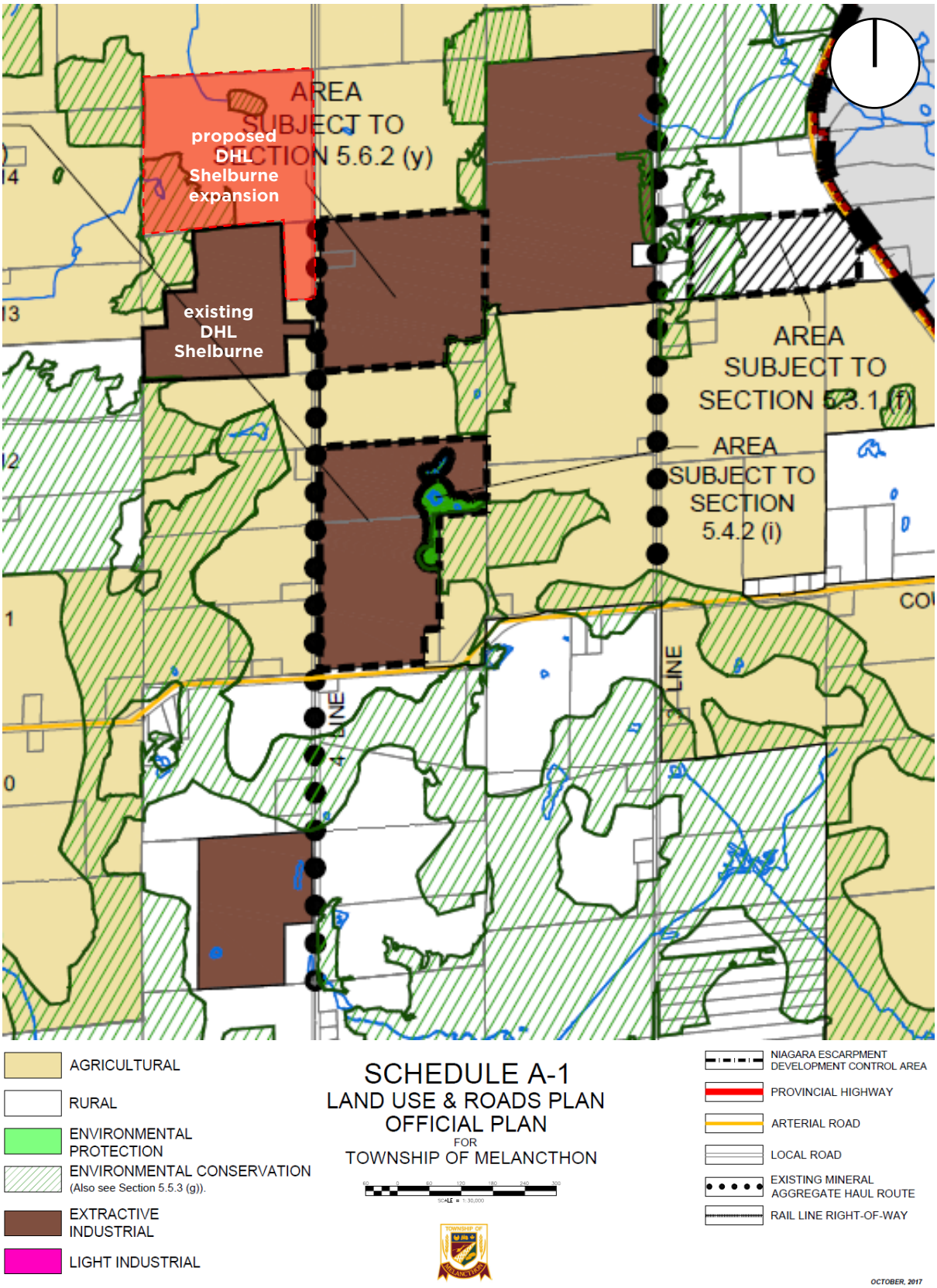
Looking S on 4th Line from DHL Site Access

Looking N to DHL Site Access from 600m south of access

source: Google Streetview

DHL SHELBURNE PIT

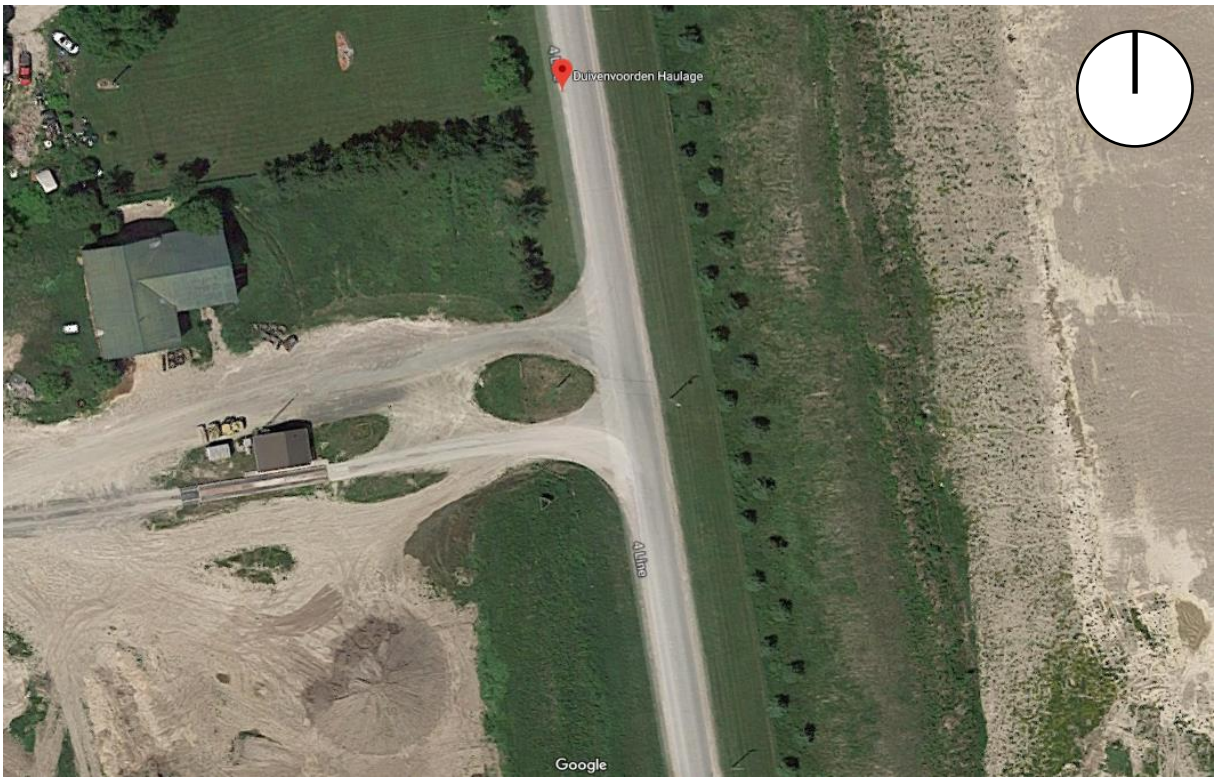
Figure 3C: Area Road Network



DHL SHELBURNE PIT

Figure 4: Official Plan Schedule A-1

4th Line & Dufferin Road 17 intersection

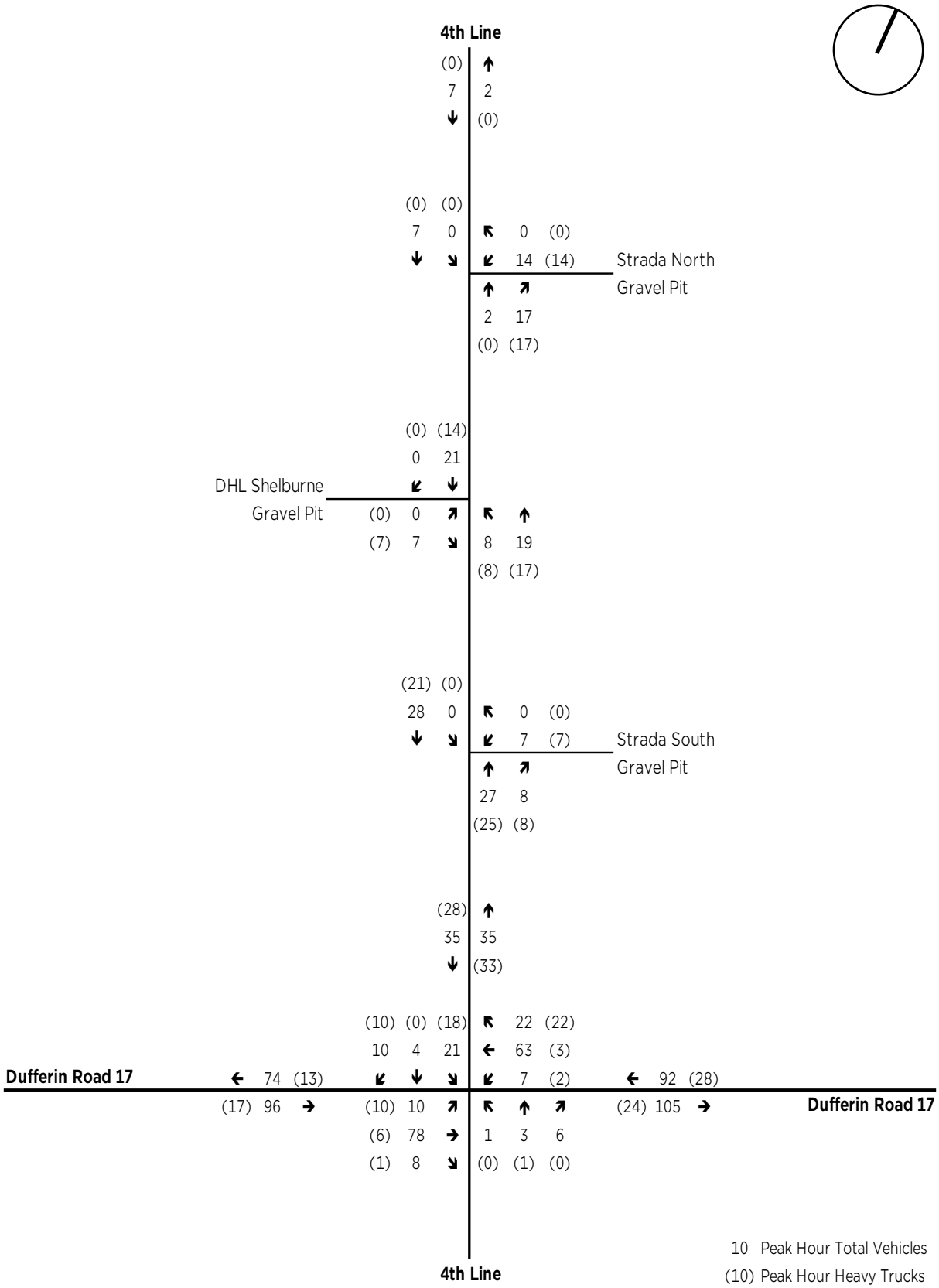


DHL Site Access at 4th Line

source: Google maps

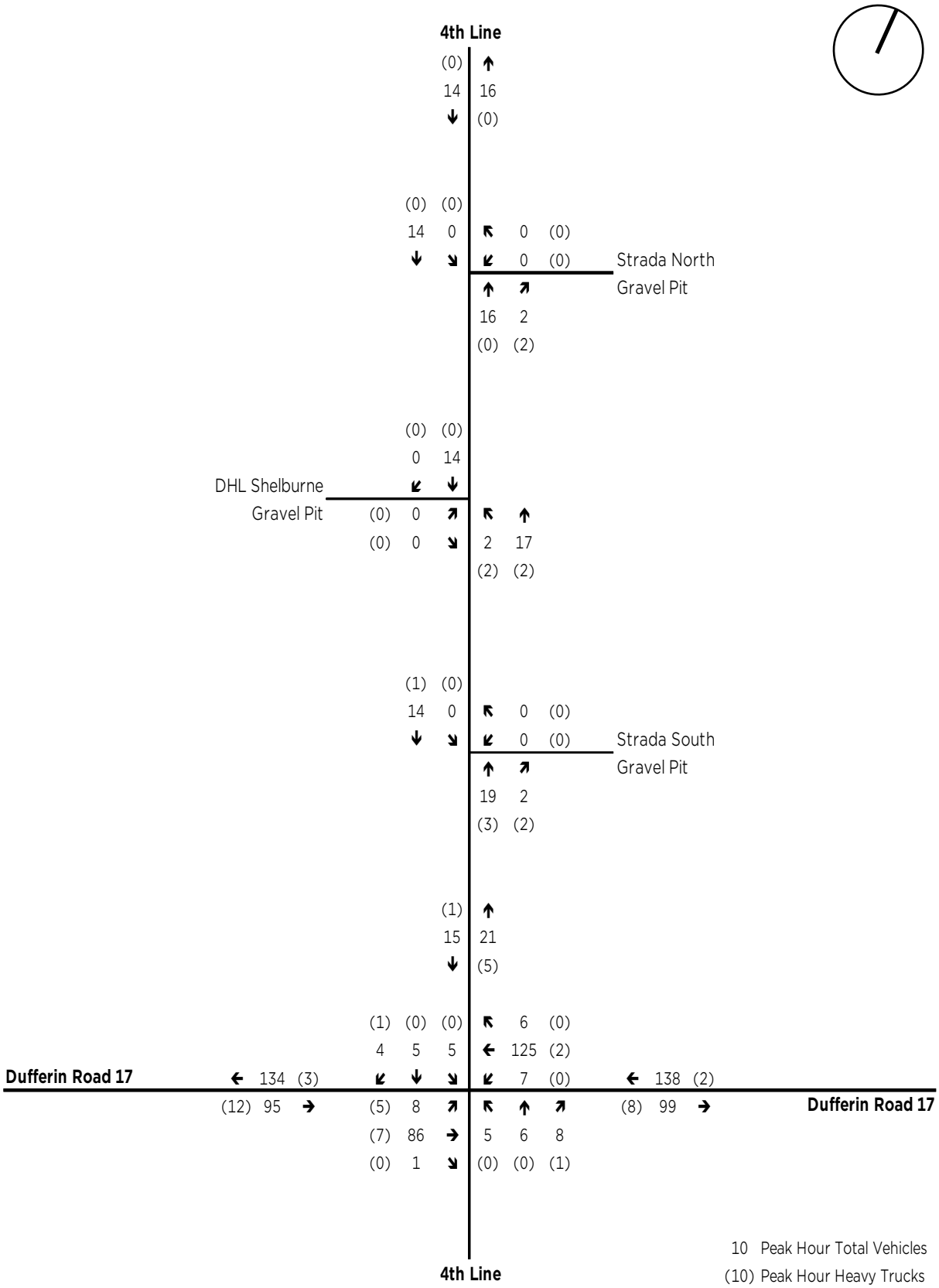
DHL SHELBURNE PIT

Figure 5: Key Intersections



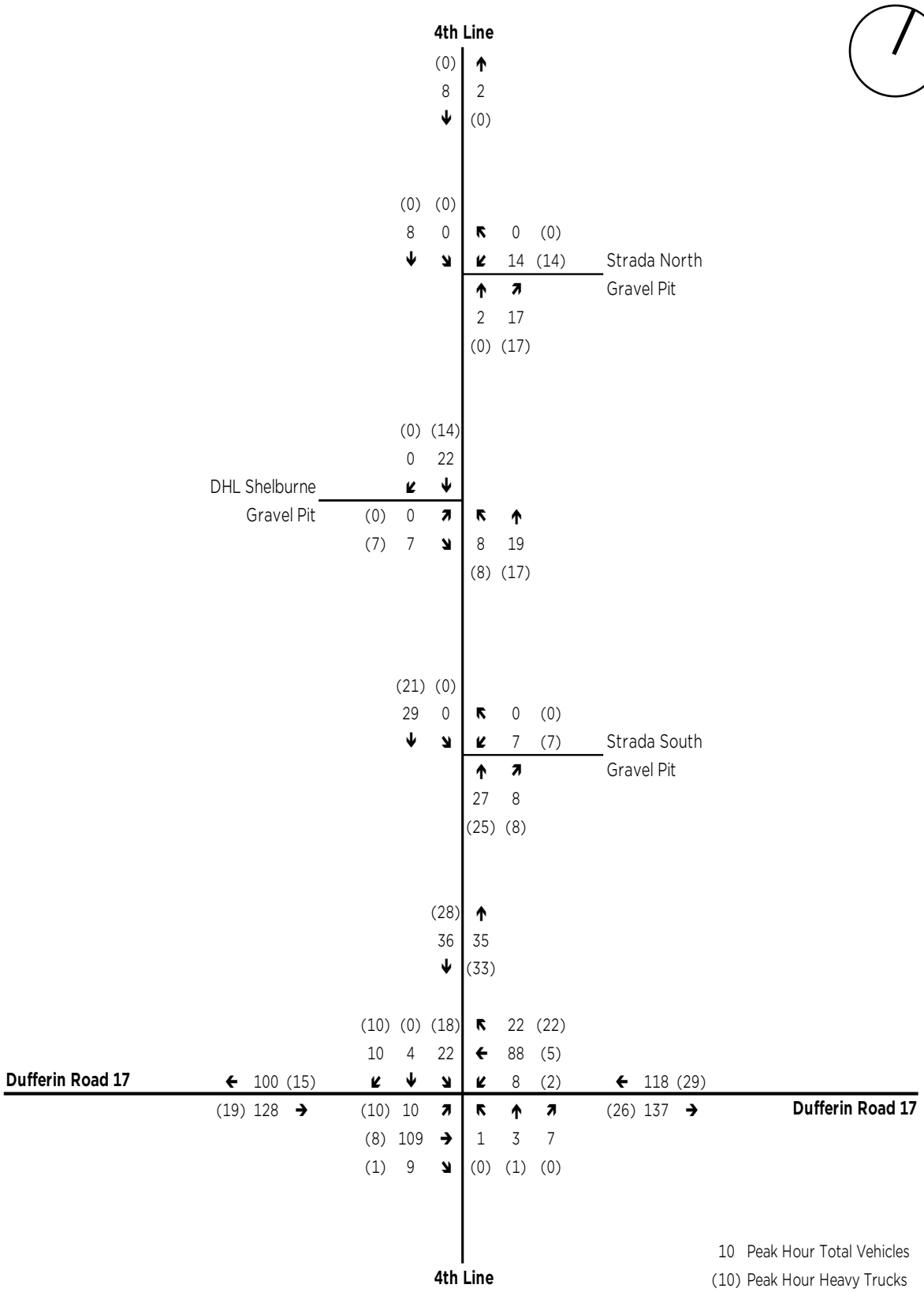
DHL SHELBURNE PIT

Figure 6A: 2021 Traffic Volumes – AM Peak Hour



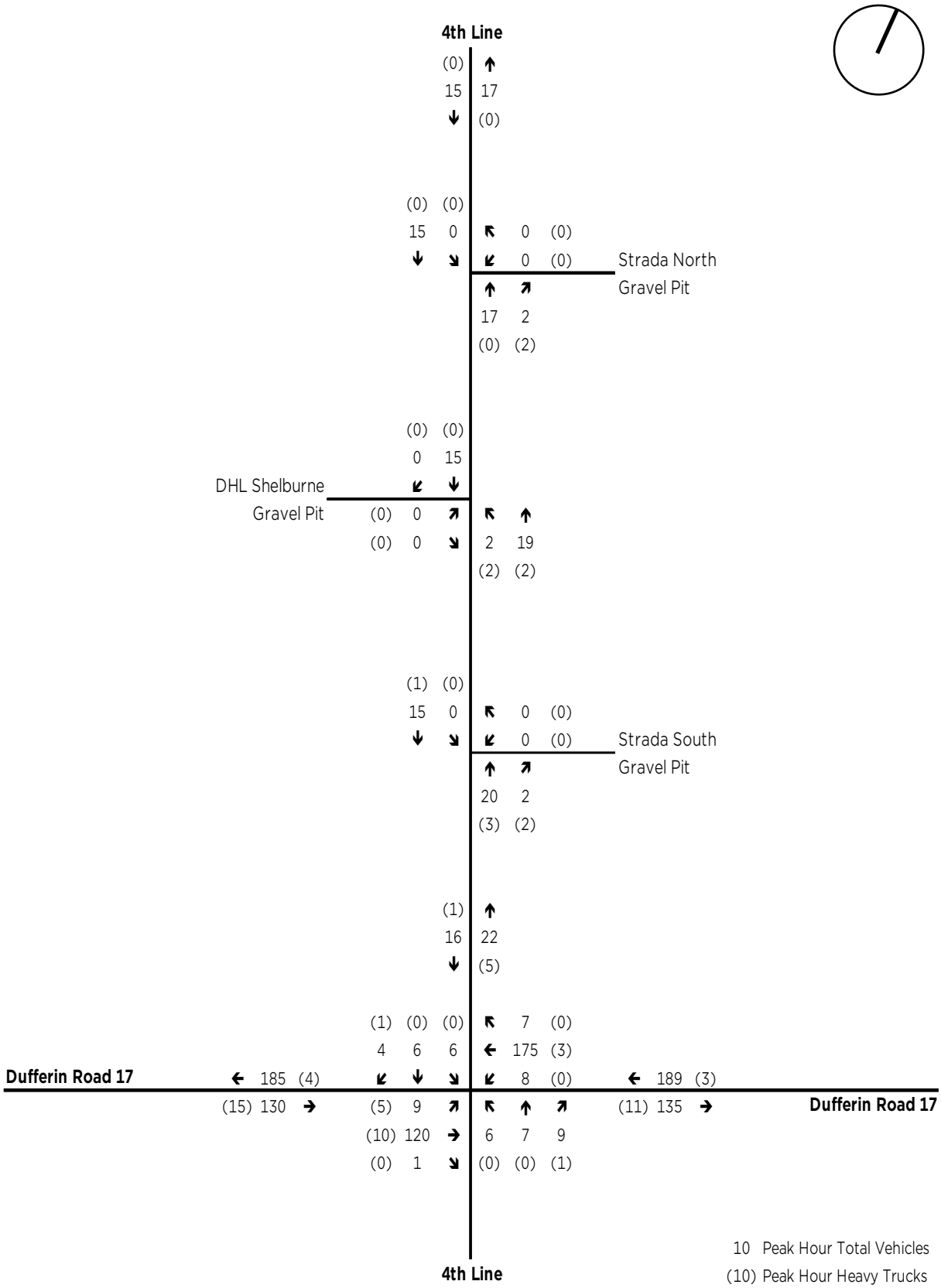
DHL SHELBURNE PIT

Figure 6B: 2021 Traffic Volumes – PM Peak Hour



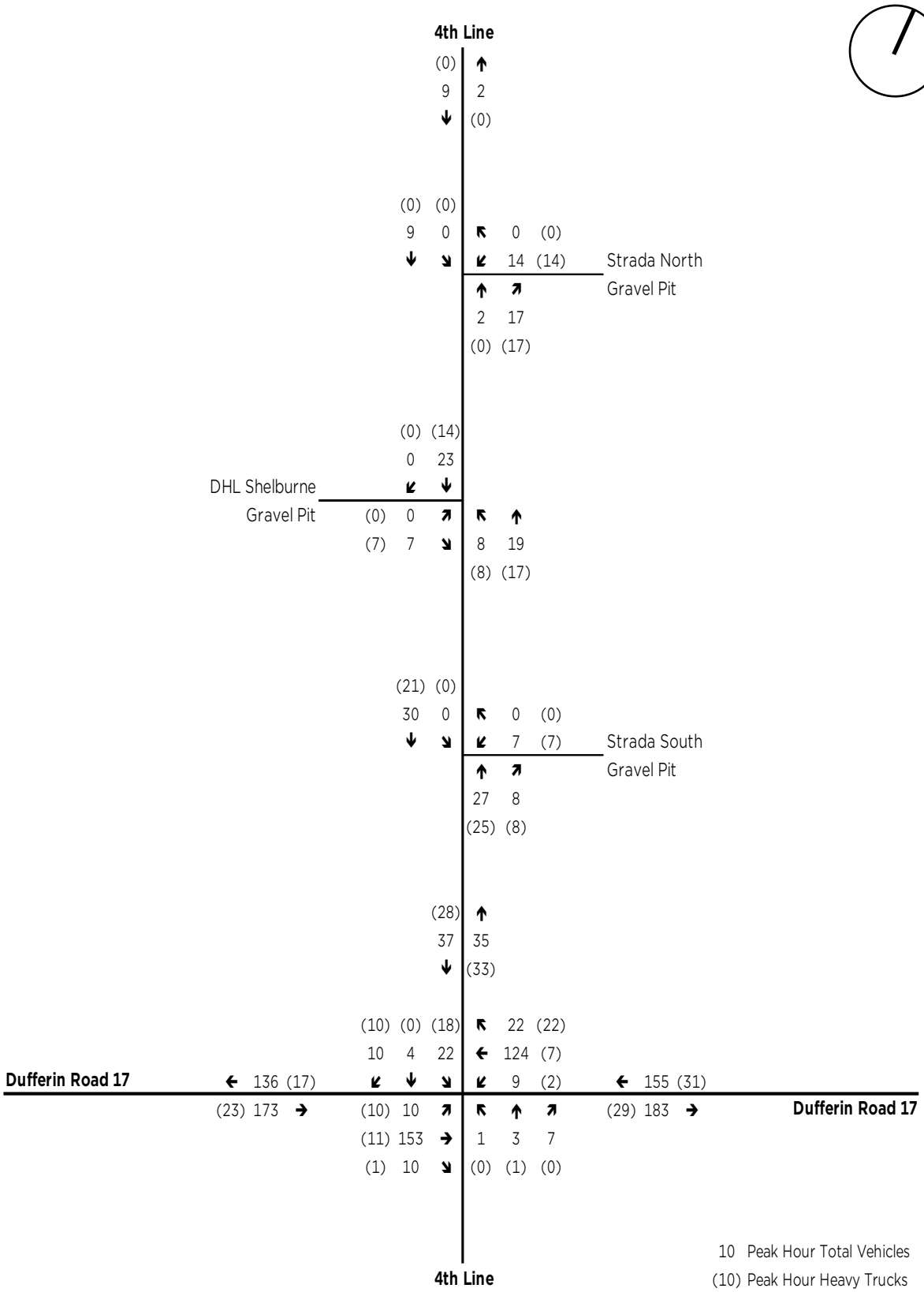
DHL SHELBURNE PIT

Figure 7A: 2026 Background Traffic Volumes – AM Peak Hour



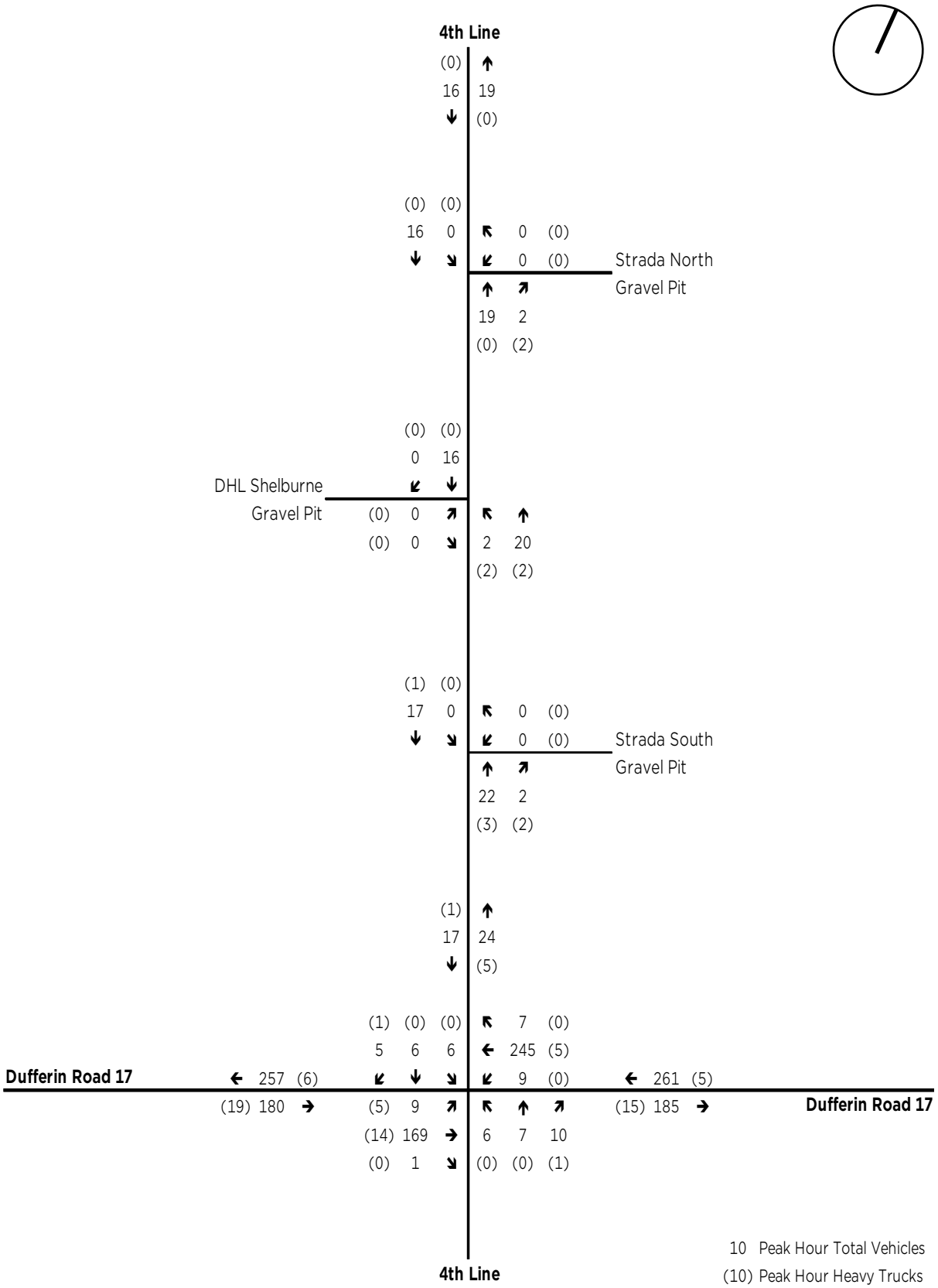
DHL SHELBURNE PIT

Figure 7B: 2026 Background Traffic Volumes – PM Peak Hour



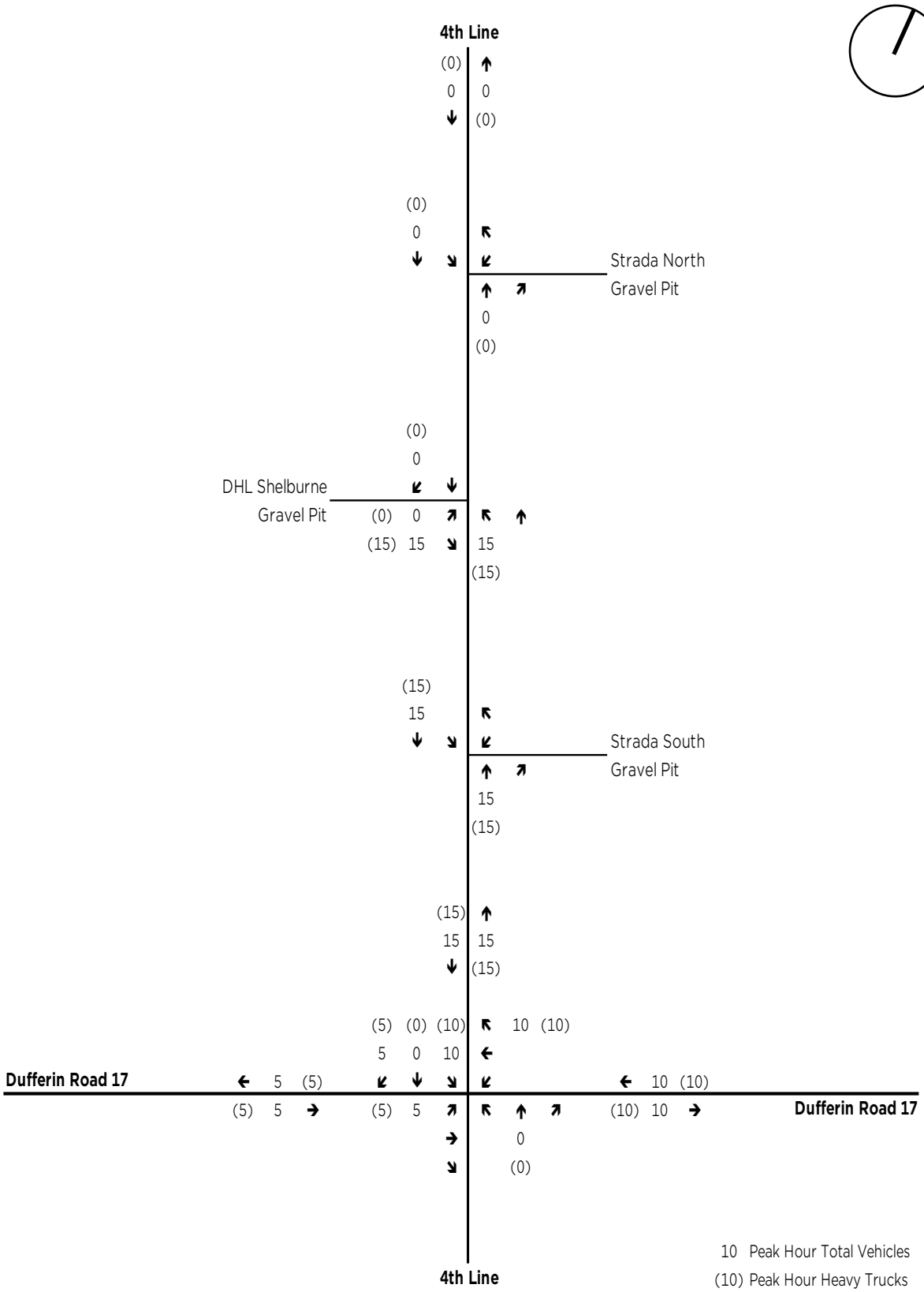
DHL SHELBURNE PIT

Figure 8A: 2031 Background Traffic Volumes – AM Peak Hour



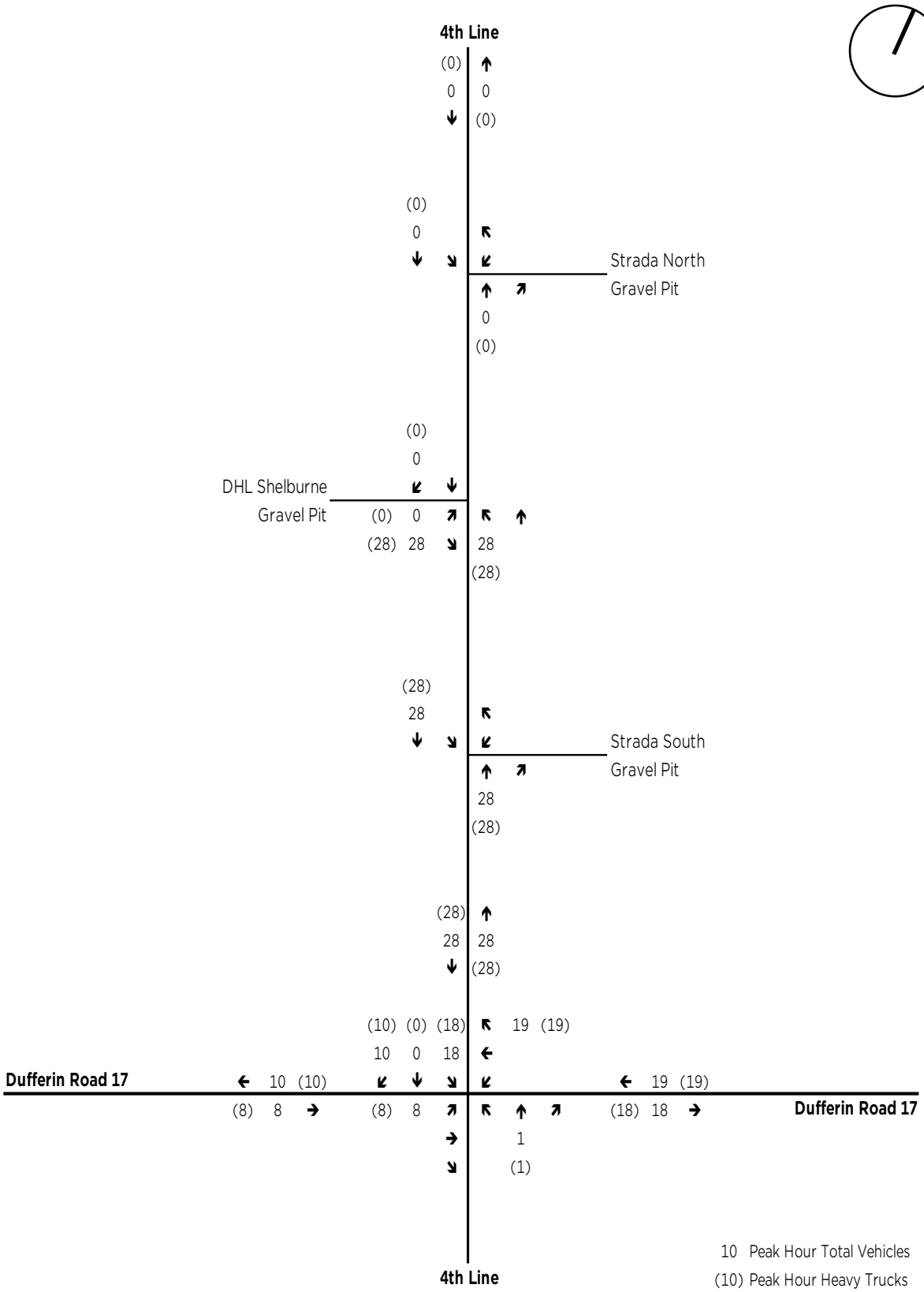
DHL SHELBURNE PIT

Figure 8B: 2031 Background Traffic Volumes – PM Peak Hour



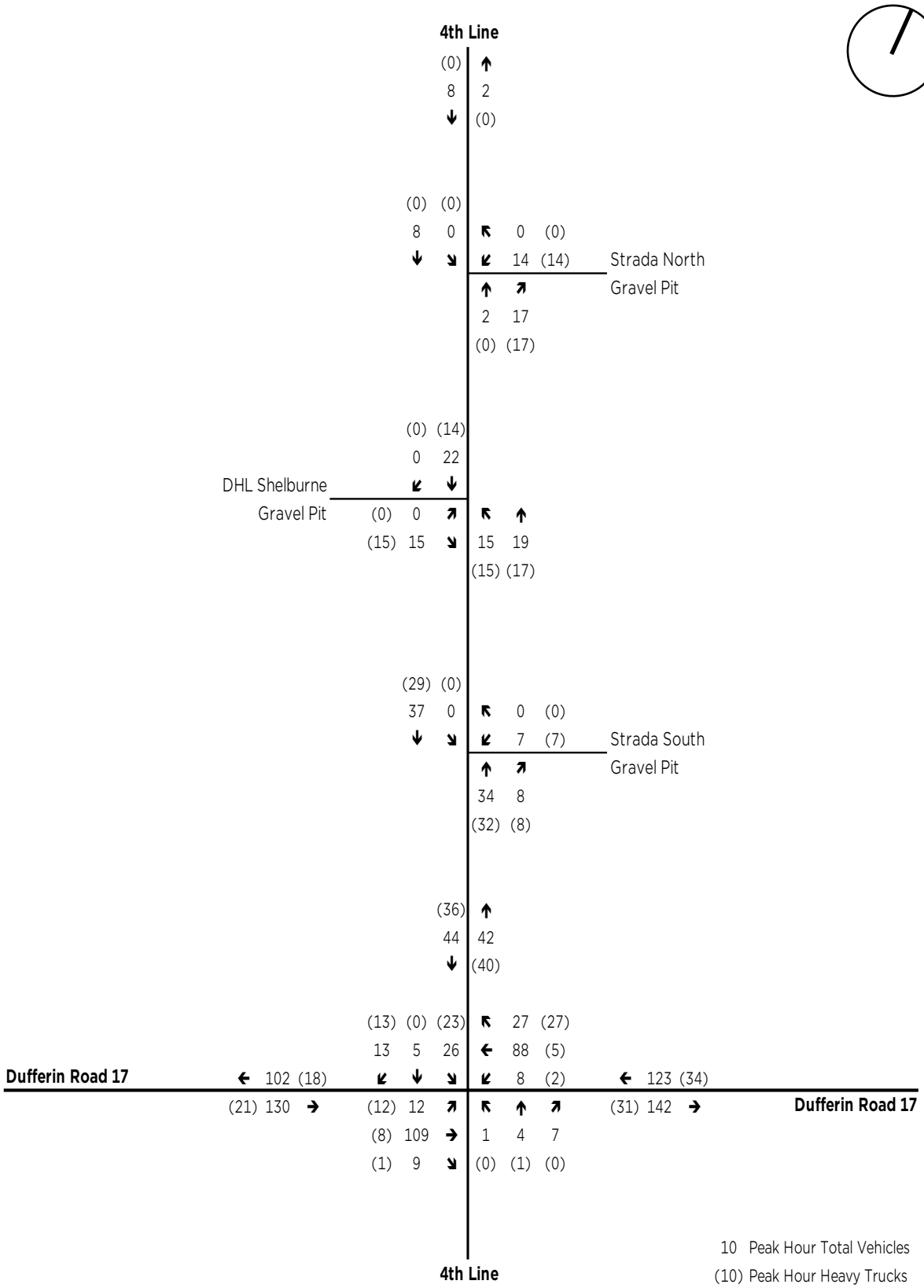
DHL SHELBURNE PIT

Figure 9: DHL Site Volumes – Peak Season Average Day Peak Hour



DHL SHELBURNE PIT

Figure 10: DHL Site Volumes – Peak Season Peak Day Peak Hour



DHL SHELBURNE PIT

Figure 11: 2026 Total Traffic Volumes – Peak Season Average Day Peak Hour

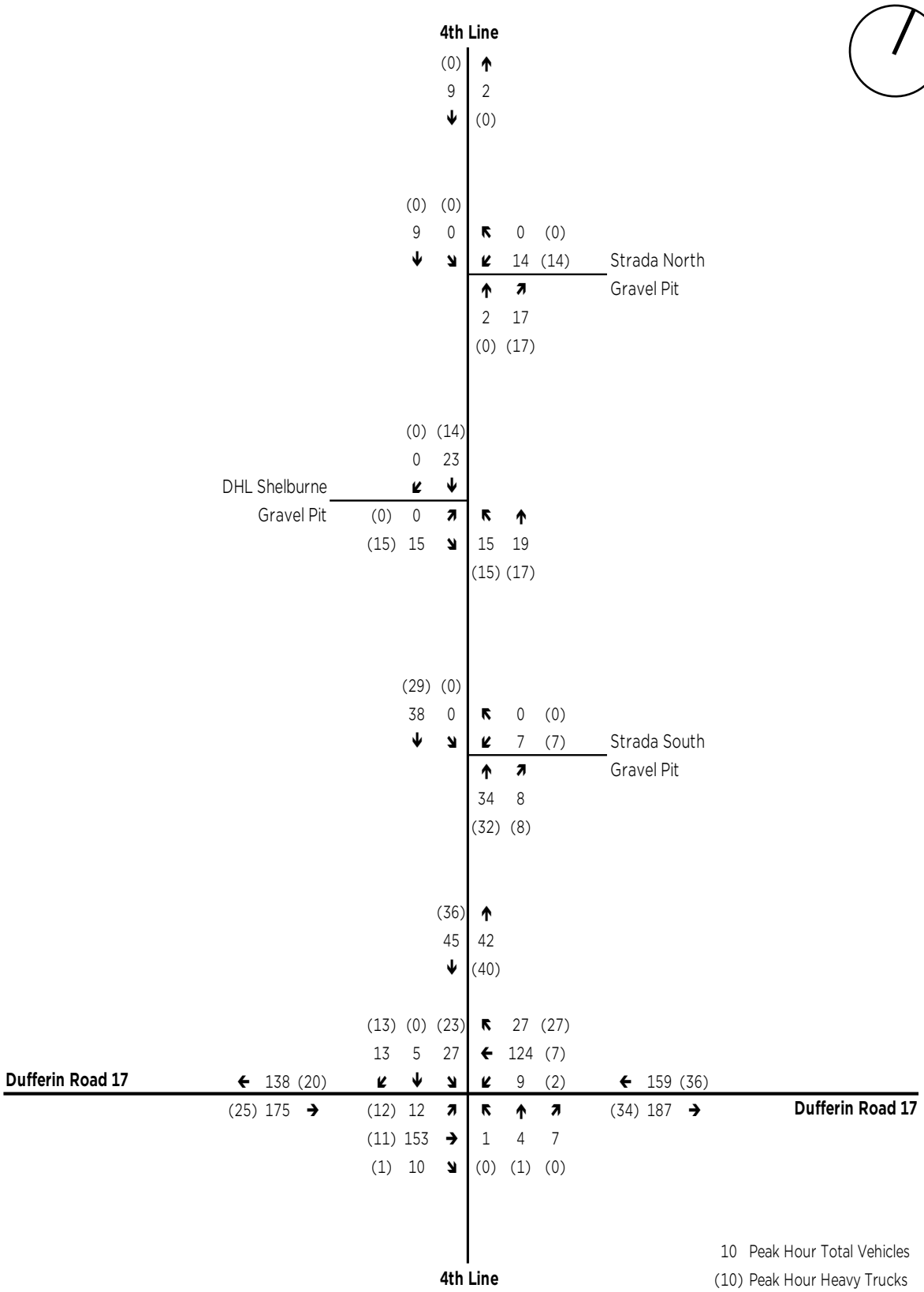


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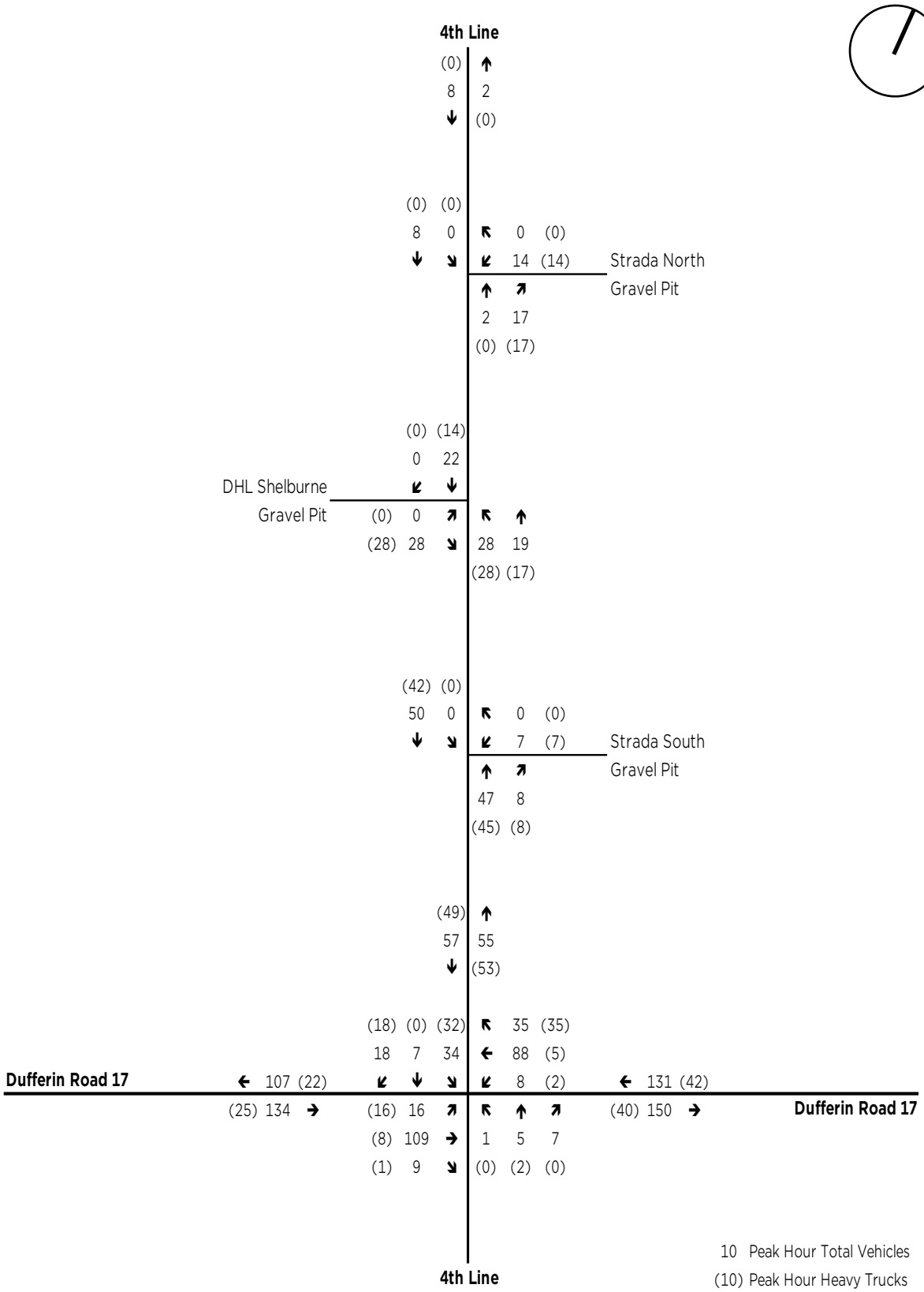
Figure 12: 2031 Total Traffic Volumes – Peak Season Average Day Peak Hour



DHL SHELBURNE PIT

Figure 13: 2026 Total Traffic Volumes – Peak Season Peak Day Peak Hour

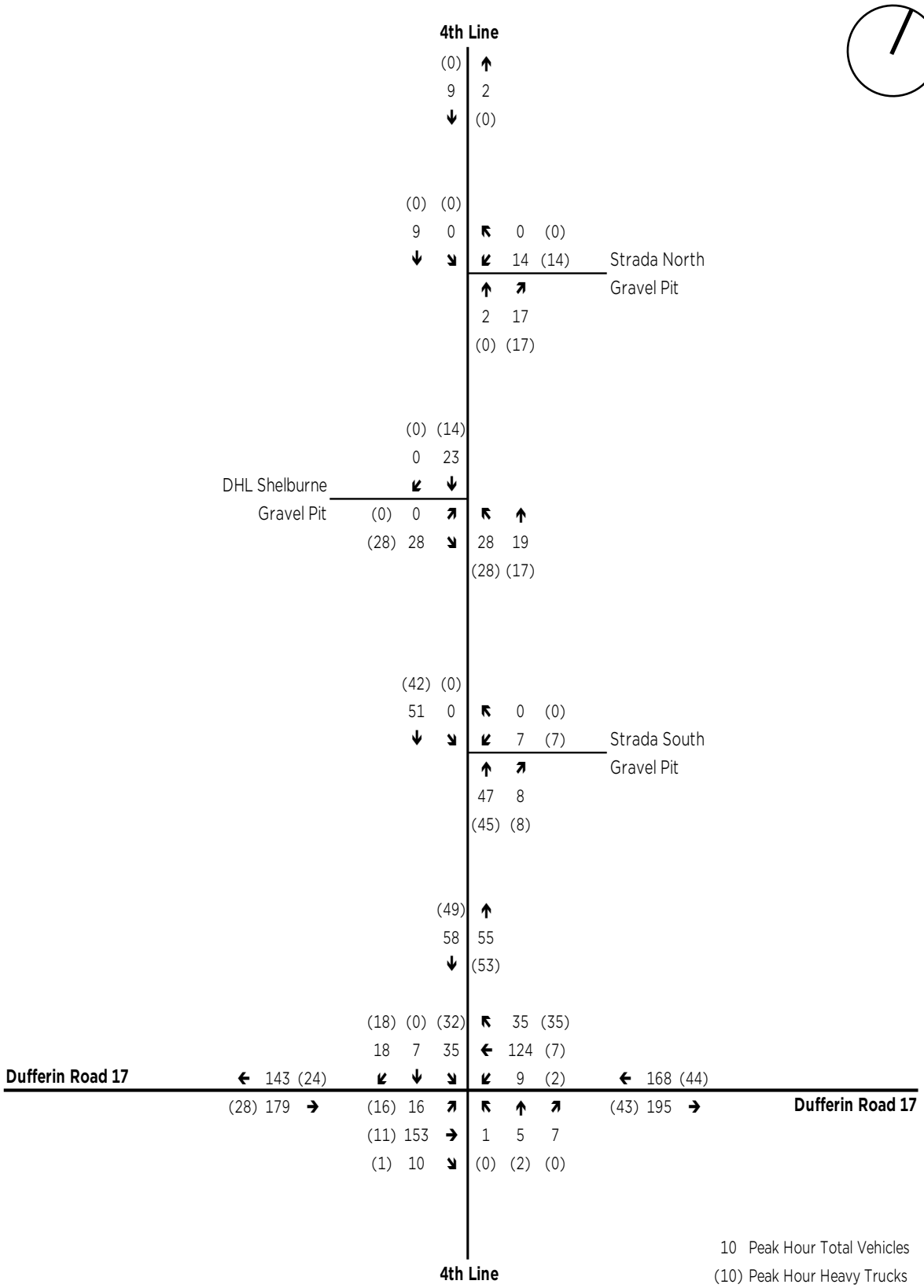


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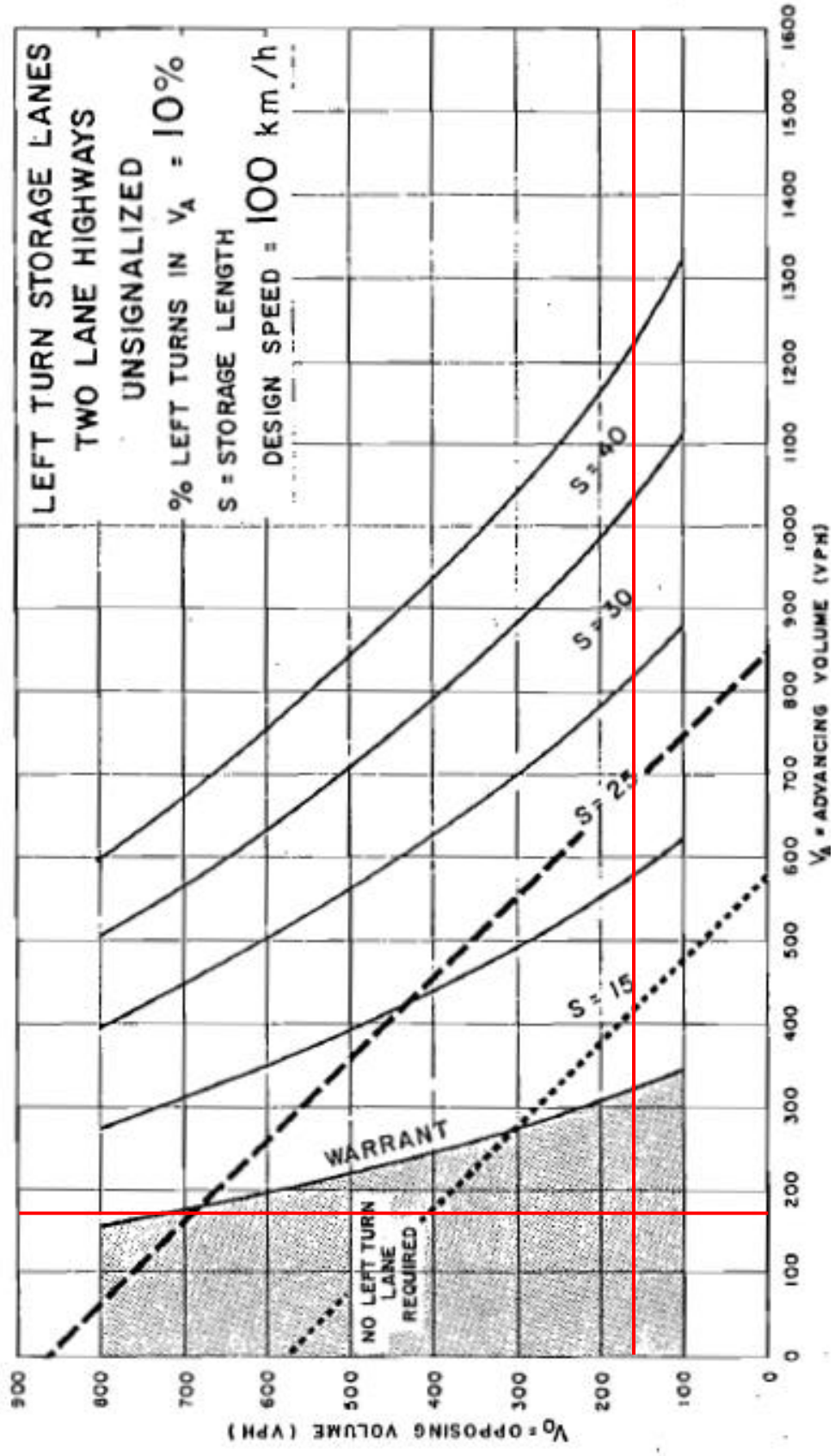
Figure 14: 2031 Total Traffic Volumes – Peak Season Peak Day Peak Hour



Note: volumes based on 2031 projections for Peak Season Peak Day Peak Hour

DHL SHELBURNE PIT

Figure X: Left Turn Warrant – Dufferin Road 17 at 4th Line

Appendix A:
Traffic Counts

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Project #19291 - TATHAM Engineering Ltd

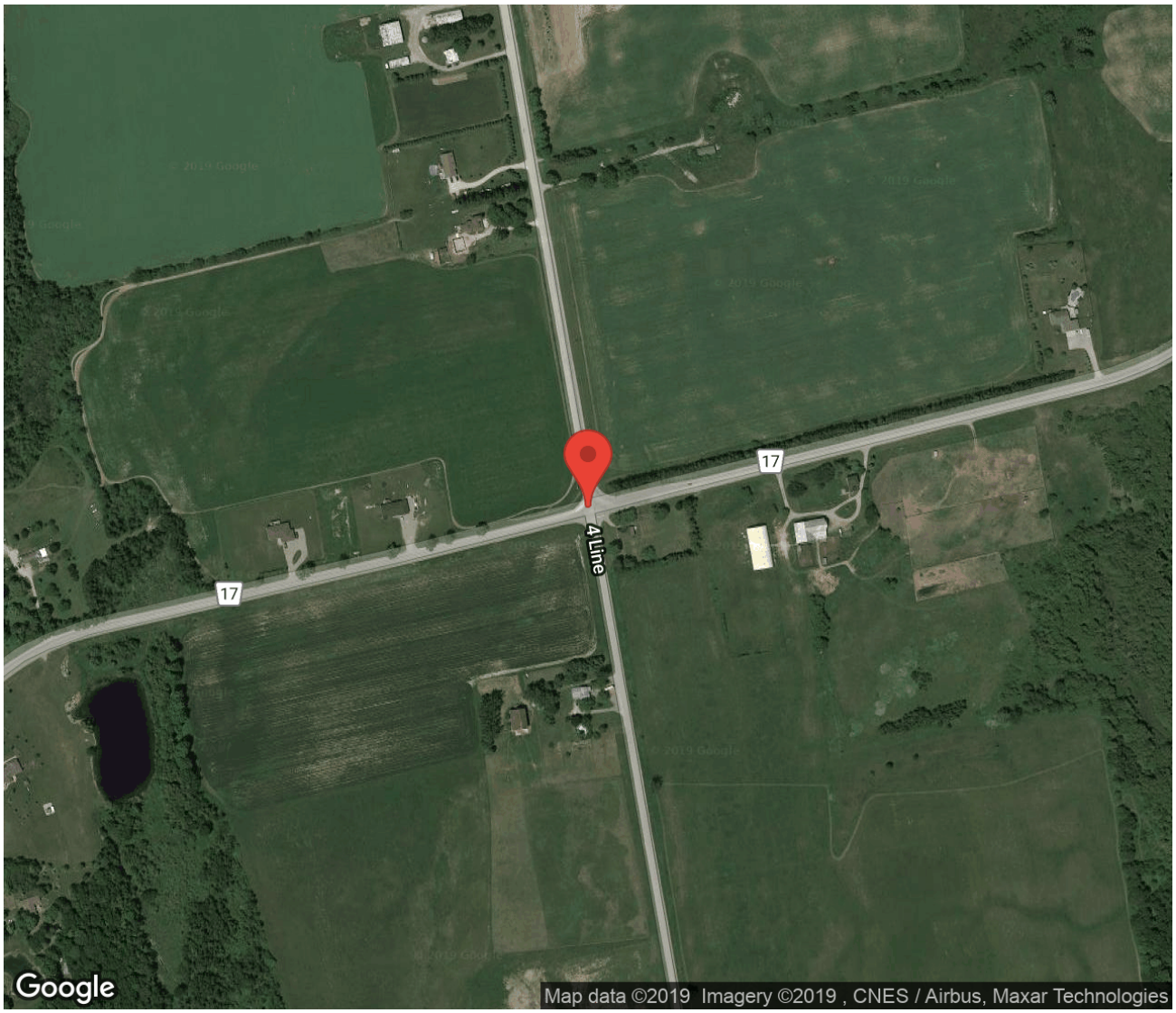
Intersection Count Report

Intersection:	4th Line & Dufferin County Rd 17
Municipality:	Shelburne
Count Date:	Sep 05, 2019
Site Code:	1929100001
Count Categories:	Cars, Medium Trucks, Heavy Trucks, Pedestrians
Count Period:	07:00-09:00, 16:00-18:00
Weather:	Clear

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Map

Intersection:	4th Line & Dufferin County Rd 17
Municipality:	Shelburne
Count Date:	Sep 05, 2019



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Summary

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

4th Line - Traffic Summary

Hour	North Approach Totals						South Approach Totals					
	Includes Cars, Medium Trucks, Heavy Trucks						Includes Cars, Medium Trucks, Heavy Trucks					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	20	8	2	0	30	0	0	1	2	0	3	0
08:00 - 09:00	21	4	10	0	35	0	1	3	6	0	10	0
BREAK												
16:00 - 17:00	9	3	5	0	17	0	4	6	4	0	14	0
17:00 - 18:00	2	6	3	0	11	0	10	3	8	0	21	0
GRAND TOTAL	**52**	**21**	**20**	**0**	**93**	**0**	**15**	**13**	**20**	**0**	**48**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Summary

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

Dufferin County Rd 17 - Traffic Summary

	East Approach Totals						West Approach Totals					
	Includes Cars, Medium Trucks, Heavy Trucks						Includes Cars, Medium Trucks, Heavy Trucks					
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	3	42	15	0	60	0	4	74	8	0	86	0
08:00 - 09:00	7	55	22	0	84	0	10	68	8	0	86	0
BREAK												
16:00 - 17:00	4	102	3	0	109	0	2	82	3	0	87	0
17:00 - 18:00	9	100	5	0	114	0	7	67	2	0	76	0
GRAND TOTAL	**23**	**299**	**45**	**0**	**367**	**0**	**23**	**291**	**21**	**0**	**335**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

North Approach - 4th Line

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	0	0	0	0	0	0	0	0	0	3	1	0	0	4	0
07:15	0	2	0	0	2	0	0	0	0	0	5	0	2	0	7	0
07:30	1	2	0	0	3	0	0	0	0	0	2	0	0	0	2	0
07:45	2	3	0	0	5	0	0	0	0	0	7	0	0	0	7	0
08:00	2	0	0	0	2	0	0	0	0	0	3	0	0	0	3	0
08:15	0	2	0	0	2	0	0	0	0	0	4	0	5	0	9	0
08:30	0	2	0	0	2	0	0	0	0	0	8	0	3	0	11	0
08:45	1	0	0	0	1	0	0	0	0	0	3	0	2	0	5	0
SUBTOTAL	6	11	0	0	17	0	0	0	0	0	35	1	12	0	48	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

North Approach - 4th Line

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
16:00	0	0	1	0	1	0	0	0	0	0	5	0	1	0	6	0
16:15	0	1	0	0	1	0	0	0	0	0	1	0	1	0	2	0
16:30	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
16:45	3	2	1	0	6	0	0	0	0	0	0	0	0	0	0	0
17:00	0	3	0	0	3	1	0	0	0	1	0	0	0	0	0	0
17:15	1	0	1	0	2	0	0	0	0	0	0	0	1	0	1	0
17:30	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0
17:45	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	4	9	5	0	18	1	0	0	0	1	6	0	3	0	9	0
GRAND TOTAL	**10**	**20**	**5**	**0**	**35**	**1**	**0**	**0**	**0**	**1**	**41**	**1**	**15**	**0**	**57**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

South Approach - 4th Line

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
07:30	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0
08:15	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	2	0	2	0	0	1	0	1	0	0	0	0	0	0
08:45	0	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	1	3	7	0	11	0	0	1	0	1	0	1	0	0	1	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

South Approach - 4th Line

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
16:00	1	1	0	0	2	0	0	1	0	1	0	0	0	0	0	0
16:15	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
16:30	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0
16:45	0	4	2	0	6	0	0	0	0	0	0	0	0	0	0	0
17:00	2	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0
17:15	2	1	2	0	5	0	0	0	0	0	0	0	1	0	1	0
17:30	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0	0
17:45	2	1	3	0	6	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	14	9	10	0	33	0	0	1	0	1	0	0	1	0	1	0
GRAND TOTAL	**15**	**12**	**17**	**0**	**44**	**0**	**0**	**2**	**0**	**2**	**0**	**1**	**1**	**0**	**2**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

East Approach - Dufferin County Rd 17

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	7	0	0	7	0	1	0	0	1	0	0	3	0	3	0
07:15	0	11	0	0	11	1	0	0	0	1	0	3	3	0	6	0
07:30	1	7	0	0	8	0	2	0	0	2	0	0	6	0	6	0
07:45	1	10	0	0	11	0	0	0	0	0	0	1	3	0	4	0
08:00	0	11	0	0	11	0	2	0	0	2	0	1	5	0	6	0
08:15	1	10	0	0	11	0	0	0	0	0	0	1	9	0	10	0
08:30	2	13	0	0	15	0	0	0	0	0	1	0	3	0	4	0
08:45	2	16	0	0	18	0	0	0	0	0	1	1	5	0	7	0
SUBTOTAL	7	85	0	0	92	1	5	0	0	6	2	7	37	0	46	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

East Approach - Dufferin County Rd 17

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
16:00	0	13	0	0	13	0	1	0	0	1	0	1	1	0	2	0
16:15	3	22	0	0	25	0	2	0	0	2	0	3	0	0	3	0
16:30	0	31	1	0	32	0	1	0	0	1	0	0	0	0	0	0
16:45	1	25	1	0	27	0	3	0	0	3	0	0	0	0	0	0
17:00	3	24	3	0	30	0	1	0	0	1	0	1	0	0	1	0
17:15	3	21	1	0	25	0	1	0	0	1	0	1	0	0	1	0
17:30	2	32	0	0	34	0	0	0	0	0	0	0	0	0	0	0
17:45	0	19	1	0	20	1	0	0	0	1	0	0	0	0	0	0
SUBTOTAL	12	187	7	0	206	1	9	0	0	10	0	6	1	0	7	0
GRAND TOTAL	**19**	**272**	**7**	**0**	**298**	**2**	**14**	**0**	**0**	**16**	**2**	**13**	**38**	**0**	**53**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

West Approach - Dufferin County Rd 17

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	20	3	0	23	0	0	0	0	0	2	1	0	0	3	0
07:15	1	15	1	0	17	0	3	0	0	3	1	0	0	0	1	0
07:30	0	9	1	0	10	0	2	0	0	2	0	1	0	0	1	0
07:45	0	22	3	0	25	0	0	0	0	0	0	1	0	0	1	0
08:00	0	12	0	0	12	0	1	0	0	1	5	1	0	0	6	0
08:15	0	15	1	0	16	0	2	0	0	2	3	0	1	0	4	0
08:30	0	16	4	0	20	0	1	0	0	1	2	2	0	0	4	0
08:45	0	14	2	0	16	0	2	0	0	2	0	2	0	0	2	0
SUBTOTAL	1	123	15	0	139	0	11	0	0	11	13	8	1	0	22	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: 4th Line & Dufferin County Rd 17
Municipality: Shelburne
Count Date: Sep 05, 2019

West Approach - Dufferin County Rd 17

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
16:00	0	25	2	0	27	0	1	0	0	1	1	2	0	0	3	0
16:15	0	11	0	0	11	0	0	1	0	1	0	5	0	0	5	0
16:30	0	19	0	0	19	0	1	0	0	1	0	0	0	0	0	0
16:45	1	13	0	0	14	0	1	0	0	1	0	4	0	0	4	0
17:00	0	19	1	0	20	0	0	0	0	0	3	0	0	0	3	0
17:15	1	14	0	0	15	1	2	0	0	3	2	2	0	0	4	0
17:30	0	13	0	0	13	0	0	0	0	0	0	1	0	0	1	0
17:45	0	16	1	0	17	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	2	130	4	0	136	1	5	1	0	7	6	14	0	0	20	0
GRAND TOTAL	**3**	**253**	**19**	**0**	**275**	**1**	**16**	**1**	**0**	**18**	**19**	**22**	**1**	**0**	**42**	**0**

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	07:00:00	From:	08:00:00
To:	09:00:00	To:	09:00:00

Intersection: 4th Line & Dufferin County Rd 17
Site ID: 1929100001
Count Date: Sep 05, 2019

Weather conditions:

**** Unsignalized Intersection ****

Major Road: Dufferin County Rd 17 runs E/W

North Approach

	Out	In	Total
Cars	7	2	9
MT	0	0	0
HT	28	33	61
	35	**35**	**70**

4th Line

HT	10	0	18	0
MT	0	0	0	0
Cars	0	4	3	0
Totals	**10**	**4**	**21**	**0**

Peds: 0

East Approach

	Out	In	Total
Cars	55	65	120
MT	2	7	9
HT	27	23	50
	84	**95**	**179**

Dufferin County Rd 17

HT	MT	Cars	Totals
0	0	0	**0**
10	0	0	**10**
5	6	57	**68**
1	0	7	**8**

Peds: 0

Peds: 0

Peds: 0

Dufferin County Rd 17

	Totals	Cars	MT	HT
	0	0	0	0
	22	0	0	22
	55	50	2	3
	7	5	0	2

West Approach

	Out	In	Total
Cars	64	51	115
MT	6	2	8
HT	16	13	29
	86	**66**	**152**

Totals	**1**	**3**	**6**	**0**
Cars	1	2	5	0
MT	0	0	1	0
HT	0	1	0	0

4th Line

South Approach

	Out	In	Total
Cars	8	16	24
MT	1	0	1
HT	1	3	4
	10	**19**	**29**

Cars - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: 4th Line & Dufferin County Rd 17
Count Date: Sep 05, 2019
Period: 07:00 - 09:00

Peak Hour Data (08:00 - 09:00)

Start Time	North Approach 4th Line						South Approach 4th Line						East Approach Dufferin County Rd 17						West Approach Dufferin County Rd 17						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
08:00	5	0	0	0	0	5	1	1	0	0	0	2	0	14	5	0	0	19	5	14	0	0	0	19	45
08:15	4	2	5	0	0	11	0	1	1	0	0	2	1	11	9	0	0	21	3	17	2	0	0	22	56
08:30	8	2	3	0	0	13	0	0	3	0	0	3	3	13	3	0	0	19	2	19	4	0	0	25	60
08:45	4	0	2	0	0	6	0	1	2	0	0	3	3	17	5	0	0	25	0	18	2	0	0	20	54
Grand Total	**21**	**4**	**10**	**0**	**0**	**35**	**1**	**3**	**6**	**0**	**0**	**10**	**7**	**55**	**22**	**0**	**0**	**84**	**10**	**68**	**8**	**0**	**0**	**86**	**215**
Approach %	60	11.4	28.6	0		-	10	30	60	0		-	8.3	65.5	26.2	0		-	11.6	79.1	9.3	0		-	
Totals %	9.8	1.9	4.7	0		16.3	0.5	1.4	2.8	0		4.7	3.3	25.6	10.2	0		39.1	4.7	31.6	3.7	0		40	
PHF	**0.66**	**0.5**	**0.5**	**0**		**0.67**	**0.25**	**0.75**	**0.5**	**0**		**0.83**	**0.58**	**0.81**	**0.61**	**0**		**0.84**	**0.5**	**0.89**	**0.5**	**0**		**0.86**	**0.9**
Cars	3	4	0	0		7	1	2	5	0		8	5	50	0	0		55	0	57	7	0		64	134
% Cars	14.3	100	0	0		20	100	66.7	83.3	0		80	71.4	90.9	0	0		65.5	0	83.8	87.5	0		74.4	62.3
Medium Trucks	0	0	0	0		0	0	0	1	0		1	0	2	0	0		2	0	6	0	0		6	9
% Medium Trucks	0	0	0	0		0	0	0	16.7	0		10	0	3.6	0	0		2.4	0	8.8	0	0		7	4.2
Heavy Trucks	18	0	10	0		28	0	1	0	0		1	2	3	22	0		27	10	5	1	0		16	72
% Heavy Trucks	85.7	0	100	0		80	0	33.3	0	0		10	28.6	5.5	100	0		32.1	100	7.4	12.5	0		18.6	33.5
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	16:00:00	From:	16:30:00
To:	18:00:00	To:	17:30:00

Intersection: 4th Line & Dufferin County Rd 17
Site ID: 1929100001
Count Date: Sep 05, 2019

Weather conditions:

**** Unsignalized Intersection ****

Major Road: Dufferin County Rd 17 runs E/W

North Approach

	Out	In	Total
Cars	12	14	26
MT	1	1	2
HT	1	5	6
	14	**20**	**34**

4th Line

HT	1	0	0	0
MT	0	0	1	0
Cars	3	5	4	0
Totals	**4**	**5**	**5**	**0**

East Approach

	Out	In	Total
Cars	114	76	190
MT	6	5	11
HT	2	7	9
	122	**88**	**210**

Peds: 0

Dufferin County Rd 17

HT	MT	Cars	Totals
0	0	0	**0**
5	1	2	**8**
6	4	65	**75**
0	0	1	**1**

Peds: 0

Peds: 0

Dufferin County Rd 17

Totals	Cars	MT	HT
0	0	0	0
6	6	0	0
109	101	6	2
7	7	0	0

Peds: 0

West Approach

	Out	In	Total
Cars	68	109	177
MT	5	6	11
HT	11	3	14
	84	**118**	**202**

Totals	5	6	8	0
Cars	5	6	7	0
MT	0	0	0	0
HT	0	0	1	0

4th Line

South Approach

	Out	In	Total
Cars	18	13	31
MT	0	0	0
HT	1	0	1
	19	**13**	**32**

Cars - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

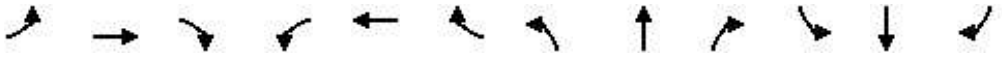
Peak Hour Summary

Intersection: 4th Line & Dufferin County Rd 17
Count Date: Sep 05, 2019
Period: 16:00 - 18:00

Peak Hour Data (16:30 - 17:30)

Start Time	North Approach 4th Line						South Approach 4th Line						East Approach Dufferin County Rd 17						West Approach Dufferin County Rd 17						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
16:30	0	0	1	0	0	1	1	1	1	0	0	3	0	32	1	0	0	33	0	20	0	0	0	20	57
16:45	3	2	1	0	0	6	0	4	2	0	0	6	1	28	1	0	0	30	1	18	0	0	0	19	61
17:00	1	3	0	0	0	4	2	0	2	0	0	4	3	26	3	0	0	32	3	19	1	0	0	23	63
17:15	1	0	2	0	0	3	2	1	3	0	0	6	3	23	1	0	0	27	4	18	0	0	0	22	58
Grand Total	**5**	**5**	**4**	**0**	**0**	**14**	**5**	**6**	**8**	**0**	**0**	**19**	**7**	**109**	**6**	**0**	**0**	**122**	**8**	**75**	**1**	**0**	**0**	**84**	**239**
Approach %	35.7	35.7	28.6	0		-	26.3	31.6	42.1	0		-	5.7	89.3	4.9	0		-	9.5	89.3	1.2	0		-	
Totals %	2.1	2.1	1.7	0		5.9	2.1	2.5	3.3	0		7.9	2.9	45.6	2.5	0		51	3.3	31.4	0.4	0		35.1	
PHF	**0.42**	**0.42**	**0.5**	**0**		**0.58**	**0.63**	**0.38**	**0.67**	**0**		**0.79**	**0.58**	**0.85**	**0.5**	**0**		**0.92**	**0.5**	**0.94**	**0.25**	**0**		**0.91**	**0.95**
Cars	4	5	3	0		12	5	6	7	0		18	7	101	6	0		114	2	65	1	0		68	212
% Cars	80	100	75	0		85.7	100	100	87.5	0		94.7	100	92.7	100	0		93.4	25	86.7	100	0		81	88.7
Medium Trucks	1	0	0	0		1	0	0	0	0		0	0	6	0	0		6	1	4	0	0		5	12
% Medium Trucks	20	0	0	0		7.1	0	0	0	0		0	0	5.5	0	0		4.9	12.5	5.3	0	0		6	5
Heavy Trucks	0	0	1	0		1	0	0	1	0		1	0	2	0	0		2	5	6	0	0		11	15
% Heavy Trucks	0	0	25	0		7.1	0	0	12.5	0		5.3	0	1.8	0	0		1.6	62.5	8	0	0		13.1	6.3
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Appendix B:
Intersection Operations



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	78	8	7	63	22	1	3	6	21	4	10
Future Volume (Veh/h)	10	78	8	7	63	22	1	3	6	21	4	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	87	9	8	70	24	1	3	7	23	4	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	94			96			212	224	92	208	204	70
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	94			96			212	224	92	208	204	70
tC, single (s)	5.1			4.4			7.1	6.8	6.2	8.0	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.5			3.5	4.3	3.3	4.3	4.0	4.2
p0 queue free %	99			99			100	100	99	96	99	99
cM capacity (veh/h)	1058			1344			715	614	958	586	676	776

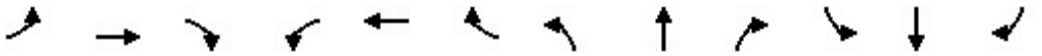
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	107	78	24	11	38
Volume Left	11	8	0	1	23
Volume Right	9	0	24	7	11
cSH	1058	1344	1700	809	640
Volume to Capacity	0.01	0.01	0.01	0.01	0.06
Queue Length 95th (m)	0.2	0.1	0.0	0.3	1.4
Control Delay (s)	1.0	0.8	0.0	9.5	11.0
Lane LOS	A	A		A	B
Approach Delay (s)	1.0	0.6		9.5	11.0
Approach LOS				A	B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	26.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	86	1	7	125	6	5	6	8	5	5	4
Future Volume (Veh/h)	8	86	1	7	125	6	5	6	8	5	5	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	9	96	1	8	139	7	6	7	9	6	6	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	146			97			276	276	96	282	270	139
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	146			97			276	276	96	282	270	139
tC, single (s)	4.7			4.1			7.1	6.5	6.3	7.1	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.8			2.2			3.5	4.0	3.4	3.5	4.0	3.5
p0 queue free %	99			99			99	99	99	99	99	100
cM capacity (veh/h)	1135			1478			655	618	930	646	623	852

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	106	147	7	22	16
Volume Left	9	8	0	6	6
Volume Right	1	0	7	9	4
cSH	1135	1478	1700	729	677
Volume to Capacity	0.01	0.01	0.00	0.03	0.02
Queue Length 95th (m)	0.2	0.1	0.0	0.7	0.6
Control Delay (s)	0.8	0.4	0.0	10.1	10.4
Lane LOS	A	A		B	B
Approach Delay (s)	0.8	0.4		10.1	10.4
Approach LOS				B	B

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	21.7%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	109	9	8	88	27	1	4	7	26	5	13
Future Volume (Veh/h)	12	109	9	8	88	27	1	4	7	26	5	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	13	121	10	9	98	30	1	4	8	29	6	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	128			131			285	298	126	278	273	98
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	128			131			285	298	126	278	273	98
tC, single (s)	5.1			4.4			7.1	6.8	6.2	8.0	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.5			3.5	4.3	3.3	4.3	4.0	4.2
p0 queue free %	99			99			100	99	99	94	99	98
cM capacity (veh/h)	1023			1304			634	555	916	517	617	746

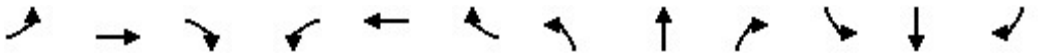
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	144	107	30	13	49
Volume Left	13	9	0	1	29
Volume Right	10	0	30	8	14
cSH	1023	1304	1700	742	579
Volume to Capacity	0.01	0.01	0.02	0.02	0.08
Queue Length 95th (m)	0.3	0.2	0.0	0.4	2.1
Control Delay (s)	0.9	0.7	0.0	9.9	11.8
Lane LOS	A	A		A	B
Approach Delay (s)	0.9	0.6		9.9	11.8
Approach LOS				A	B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	29.4%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	15	15	19	22	0
Future Volume (Veh/h)	0	15	15	19	22	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	17	17	21	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	79	24	24			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	79	24	24			
tC, single (s)	7.4	7.2	5.1			
tC, 2 stage (s)						
tF (s)	4.4	4.2	3.1			
p0 queue free %	100	98	99			
cM capacity (veh/h)	719	828	1134			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	38	24
Volume Left	0	17	0
Volume Right	17	0	0
cSH	828	1134	1700
Volume to Capacity	0.02	0.01	0.01
Queue Length 95th (m)	0.5	0.3	0.0
Control Delay (s)	9.4	3.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.4	3.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	153	10	9	124	27	1	4	7	27	5	13
Future Volume (Veh/h)	12	153	10	9	124	27	1	4	7	27	5	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	13	170	11	10	138	30	1	4	8	30	6	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	168			181			376	390	176	370	365	138
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	168			181			376	390	176	370	365	138
tC, single (s)	5.1			4.4			7.1	6.8	6.2	8.0	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.5			3.5	4.3	3.3	4.3	4.0	4.2
p0 queue free %	99			99			100	99	99	93	99	98
cM capacity (veh/h)	983			1247			550	490	860	445	547	704

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	194	148	30	13	50
Volume Left	13	10	0	1	30
Volume Right	11	0	30	8	14
cSH	983	1247	1700	674	509
Volume to Capacity	0.01	0.01	0.02	0.02	0.10
Queue Length 95th (m)	0.3	0.2	0.0	0.4	2.5
Control Delay (s)	0.7	0.6	0.0	10.4	12.8
Lane LOS	A	A		B	B
Approach Delay (s)	0.7	0.5		10.4	12.8
Approach LOS				B	B

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	34.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	0	15	19	23	0
Future Volume (Veh/h)	5	0	15	19	23	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	0	17	21	26	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	81	26	26			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	81	26	26			
tC, single (s)	7.4	7.2	5.1			
tC, 2 stage (s)						
tF (s)	4.4	4.2	3.1			
p0 queue free %	99	100	98			
cM capacity (veh/h)	717	826	1132			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	38	26
Volume Left	6	17	0
Volume Right	0	0	0
cSH	717	1132	1700
Volume to Capacity	0.01	0.02	0.02
Queue Length 95th (m)	0.2	0.3	0.0
Control Delay (s)	10.1	3.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.1	3.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	109	9	8	88	35	1	5	7	34	7	18
Future Volume (Veh/h)	16	109	9	8	88	35	1	5	7	34	7	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	18	121	10	9	98	39	1	6	8	38	8	20
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	137			131			302	317	126	289	283	98
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	137			131			302	317	126	289	283	98
tC, single (s)	5.1			4.4			7.1	6.8	6.2	8.0	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.5			3.5	4.3	3.3	4.3	4.0	4.2
p0 queue free %	98			99			100	99	99	92	99	97
cM capacity (veh/h)	1014			1304			609	537	916	499	606	746

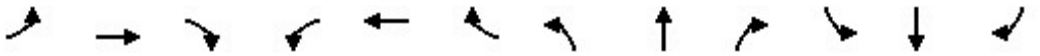
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	149	107	39	15	66
Volume Left	18	9	0	1	38
Volume Right	10	0	39	8	20
cSH	1014	1304	1700	696	568
Volume to Capacity	0.02	0.01	0.02	0.02	0.12
Queue Length 95th (m)	0.4	0.2	0.0	0.5	3.0
Control Delay (s)	1.2	0.7	0.0	10.3	12.2
Lane LOS	A	A		B	B
Approach Delay (s)	1.2	0.5		10.3	12.2
Approach LOS				B	B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	30.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	28	28	19	22	0
Future Volume (Veh/h)	0	28	28	19	22	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	31	31	21	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	107	24	24			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	107	24	24			
tC, single (s)	7.4	7.2	5.1			
tC, 2 stage (s)						
tF (s)	4.4	4.2	3.1			
p0 queue free %	100	96	97			
cM capacity (veh/h)	681	828	1134			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	31	52	24
Volume Left	0	31	0
Volume Right	31	0	0
cSH	828	1134	1700
Volume to Capacity	0.04	0.03	0.01
Queue Length 95th (m)	0.9	0.6	0.0
Control Delay (s)	9.5	5.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	5.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	153	10	9	124	35	1	5	7	35	7	18
Future Volume (Veh/h)	16	153	10	9	124	35	1	5	7	35	7	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	18	170	11	10	138	39	1	6	8	39	8	20
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	177			181			394	408	176	380	375	138
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	177			181			394	408	176	380	375	138
tC, single (s)	5.1			4.4			7.1	6.8	6.2	8.0	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.5			3.5	4.3	3.3	4.3	4.0	4.2
p0 queue free %	98			99			100	99	99	91	99	97
cM capacity (veh/h)	974			1247			528	474	860	428	537	704

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	199	148	39	15	67
Volume Left	18	10	0	1	39
Volume Right	11	0	39	8	20
cSH	974	1247	1700	628	498
Volume to Capacity	0.02	0.01	0.02	0.02	0.13
Queue Length 95th (m)	0.4	0.2	0.0	0.6	3.5
Control Delay (s)	1.0	0.6	0.0	10.9	13.3
Lane LOS	A	A		B	B
Approach Delay (s)	1.0	0.5		10.9	13.3
Approach LOS				B	B

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	36.6%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	28	28	19	23	0
Future Volume (Veh/h)	0	28	28	19	23	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	31	31	21	26	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	109	26	26			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	109	26	26			
tC, single (s)	7.4	7.2	5.1			
tC, 2 stage (s)						
tF (s)	4.4	4.2	3.1			
p0 queue free %	100	96	97			
cM capacity (veh/h)	679	826	1132			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	31	52	26
Volume Left	0	31	0
Volume Right	31	0	0
cSH	826	1132	1700
Volume to Capacity	0.04	0.03	0.02
Queue Length 95th (m)	0.9	0.6	0.0
Control Delay (s)	9.5	5.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	5.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		