

August 11, 2017

Ryan Cressman, P.Eng.
Project Engineer
55 King Street East
Bowmanville Ontario L1C 1N4

RE: Grady Drive Extension from Whitehand Drive to Remi Court (C14-0162)

Dear Mr. Cressman:

1. Introduction

CIMA+ was retained by the Municipality of Clarington (Clarington) to conduct a Class EA for the Grady Drive Extension from Whitehand Drive to Remi Court, in Newcastle, Ontario. As part of this EA, Clarington requested that a traffic assessment be conducted to estimate how much traffic is expected to use the proposed expansion of Grady Drive, and to determine which mitigation measures can be implemented in order to reduce the amount of cut-through traffic to ensure that the existing residential areas do not lose their 'Village Appeal.' Additionally, this traffic assessment also include a review of mitigation measures for potential cut-through traffic attracted to North Street between King Avenue and Grady Drive.

2. Grady Drive Traffic

It is estimated that a two-way total of 454 vehicles during the AM peak and 452 vehicles during the PM peak are expected to use the Grady Drive extension. These volumes include traffic generated by the residential developments in the study area surroundings, including the existing residential neighbourhood south of Grady Drive and East of Rudell Road, and two new developments: Foster Creek North Residential Subdivision and North Village Neighbourhood.

The following sections describe the methodology used to estimate the volumes on the Grady Drive extension.

2.1. Review of Existing and Proposed Residential Developments

As part of the analysis, the following two previously submitted Traffic Impact Study (TIS) reports were reviewed to assist in estimating the volumes along the road network generated by the developments:

- Transportation Study Addendum – North Village Phase 1, submitted on May 20, 2008 by Sernas Transtech; and
- Foster Creek North Residential Subdivision Update to Traffic Impact Study, dated May 22, 2008.

Due to the age of the reports, which had used the 7th edition of the ITE Trip Generation Manual, the rates used for trip generation were compared to the current 9th edition of the manual, and it was concluded that the rates for the land uses used from the 7th edition (Single Detached LUC 210 and Low Rise Residential Condominiums/Townhouses LUC 230) are similar to the 9th edition, therefore no modification to site generated traffic is necessary.

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Trip generation for the existing residential neighborhood immediately west of the proposed Foster Creek development was also calculated and distributed/assigned to the road network, using the same distribution used for the Foster Creek development.

Figure 1 illustrates the study area under review and possible routes. **Table 1** summarizes the trip generation and distribution used in both TIS reports, as well as our assumptions for the existing residential area.

Figure 1: Study Area Origins and Destinations



Table 1: Residential Trip Generation and Distribution

Development	Peak Hour	Total Trips		North %		South %		East %		West %	
		In	Out	In	Out	In	Out	In	Out	In	Out
Foster Creek	AM	177	383	10%	13%	20%	17%	25%	35%	45%	35%
	PM	422	257	10%	13%	20%	17%	25%	35%	45%	35%
North Village	AM	39	129	15%	15%	5%	5%	5%	5%	75%	75%
	PM	140	79	15%	15%	5%	5%	5%	5%	75%	75%
Existing Residential	AM	39	108	10%	13%	20%	17%	25%	35%	45%	35%
	PM	125	69	10%	13%	20%	17%	25%	35%	45%	35%

2.2. Travel Time Assessment

In order to determine the amount of traffic from the existing and proposed residential developments expected to use the Grady Drive extension, a travel time assessment was conducted between the residential areas (the Origins) and the directions outside the study area i.e., north, east, south, west (the Destinations). For the purpose of this analysis only the most logical routes with impact on Grady Drive were considered (for example, it is unlikely that residents from Foster Creek would use Grady Drive to travel West, or that residents from North Village would use Grady Drive to travel North, South, or East). **Table 2** describes the routes considered in the travel time assessment and traffic volume analysis.

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Table 2: Travel Time Analysis Routes

From	To	Route Options
North Village	West	Route 1: South on RR17 – West on King Avenue
		Route 2: South on RR17 – West on Grady Drive – South on Rudell Road – West on King Avenue
Foster Creek	North	Route 1: South on Pedwell Street – East on King Avenue - North on RR 17
		Route 2: East on Grady Drive – North on RR 17
	South	Route 1: South on Pedwell Street – East on King Avenue - South on RR 17
		Route 2: East on Grady Drive – South on RR 17
	East	Route 1: South on Pedwell Street – East on King Avenue
		Route 2: East on Grady Drive – South on RR 17 – East on King Avenue
Existing Residential Neighbourhood	North	Route 1: South on Pedwell Street – East on King Avenue - North on RR 17
		Route 2: East on Grady Drive – North on RR 17
	South	Route 1: South on Rudell Road – East on King Avenue - South on RR 17
		Route 2: East on Grady Drive – South on RR 17
	East	Route 1: South on Rudell Road – East on King Avenue
		Route 2: East on Grady Drive – South on RR 17 – East on King Avenue

The travel time for each route was estimated using the following assumptions;

- An average travel speed of 40 km/h was used along Grady Drive, and 50km/h along RR 17 and King Avenue, and the “base travel time” was calculated based on these travel speeds and the road segment lengths; and
- Intersection delays were taken from the Synchro results for turning/through movements contained within the Foster Creek TIS for the Future Total 2017 (with Pedwell connection) scenario, and added to the base travel times for each respective route.

It was found that, for the majority of the Origin/Destination (O/D) pairs, the Route which utilizes the Grady Drive extension is typically the fastest route available, although there were some instances where the other route option to the Grady Drive extension presented similar travel times. The detailed calculations can be found in **Appendix A**.

2.3. Grady Drive Residential Volumes

To determine the volumes expected to use the Grady Drive Extension, the fastest route for each Origin/Destination pair was selected and the trip generation volumes associated with the respective O/D pair were assigned to the Grady Drive Extension. When travel times were similar for the two route options, the associated volumes were split 50/50 between both routes. The resulting two-way volumes associated with the residential neighbourhoods were 363 in the AM peak hour, and 391 in the PM peak hour.

2.4. Grady Drive School Traffic

The Kawartha Pine Ridge District School Board has plans to replace Clarke High School and The Pines Senior Public School with a new school within the Newcastle urban area. The most

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likely location for the new school is northwest of the intersection of Grady Drive with Rudell Road, as illustrated in Figure 1 (section 2.1) and **Figure 1**. Although the new school plans are still in very early stages, the School Board estimates that it could be a combined elementary/secondary school with 500 elementary and up to 900 secondary students. Based on this information and on the Clarington Secondary Schools Boundaries/Catchment Map, the following assumptions were made to estimate school-related traffic

- 30% of students were assumed to take school buses from the northern areas of Clarington;
- ITE trip generation rates (LUC 520 – Elementary School and LUC 530 – High School) were used to estimate trip generation, resulting in 307 trips (194 in, 113 out) in the AM peak hour and 201 trips (77 in, 124 out) in the PM peak hour
- Trip distribution was assumed as summarized in **Figure 1**; and
- Trip assignment was assumed as summarized in **Table 3**.

Figure 2: School Trip Distribution Assumptions



Table 3: School Trip Assignment Assumptions

Destination	Trip Distribution	Routes using Grady Drive
Immediate Vicinity	20%	Assumed pass-by traffic only
South	40%	12.5% via North St or Manvers Rd
East	20%	10% via Monroe St
Far South	15%	7.5% via Manvers Rd
West	5%	2.5% of outbound trips via North St or Manvers Rd

Based on the assumptions above, the estimated two-way school related volumes on Grady Drive are 91 in the AM peak hour and 61 in the PM peak hour.

3. North Street Traffic

With the Grady Drive extension, it is expected that North Street will experience increased traffic volumes, including cut-through traffic at the northern section of the road. In order to estimate these potential volumes, the following assumptions were used:

- Volumes from the “Five-year Total Traffic Volumes” figures in the TIS entitled “PROPOSED SUPERMARKET DEVELOPMENT”, prepared by Paradigm Transportation Solutions Ltd. in 2011, were used. The two-way volumes correspond to 46 in the AM peak hour and 66 in the PM peak hour;
- All supermarket generated traffic using the north section of North Street to get to/from the residential development to the west via Grady Drive extension were assumed to be pass-by traffic;
- 50% of Grady Drive volumes estimated based on travel time assessment and school traffic, and with origins/destinations to the south and to the east, were assumed to potentially use North Street. The remaining 50% were assumed to use Manvers Road.

Based on the assumptions above, the estimated two-way volumes on North Street are as follows:

- AM peak hour: 203 (46 supermarket, 44 school, 113 residential); and
- PM peak hour: 207 (66 supermarket, 29 school, 112 residential).

4. Potential Traffic Calming Measures

The opening of the Grady Drive extension has the potential to attract ‘cut-through’ traffic, i.e. traffic that does not have origins or destinations within the area limited by Grady Drive, Rudell Road, King Avenue, and Manvers Road. If intersections along King Avenue present high delays, drivers may prefer to use Grady Drive or North Street to bypass congested intersections or difficult movements (for example, unsignalized left-turns such as Manvers Road @ Grady Drive).

In order to reduce potential cut-through traffic, the following measures can be considered and reviewed in more detail:

- Attempt to reduce delays at the intersections with arterial roadways in the study area (King Avenue and CR17) in order to make routes other than Grady Drive more attractive. This would require signal timing optimization; and

- Consider the implementation of traffic calming measures along Grady Drive and North Street. Details on potential measures are discussed in the following subsections.

4.1. Traffic Calming on Grady Drive

Traffic calming measures such as speed cushions or two-way chicanes along Grady Drive can help reduce cut-through traffic. According to the Transportation Association of Canada (TAC) Canadian Guide to Neighbourhood Traffic Calming (update to be published in the near future), speed cushions can reduce traffic volumes by approximately 30%, and two-way chicanes by up to 22% (one-way chicanes can reduce traffic by up to 47%, however may introduce a head-on collision hazard and have a greater impact on emergency vehicle response times. These measures can be incorporated into the design of the Grady Drive extension, or reviewed after construction, following a study evaluating actual traffic volumes and speeds.

In order to increase their effectiveness (including speed control), a series of traffic calming measures should be implemented along Grady Drive. The suggested spacing between consecutive measures is 150 to 200 metres. Additionally, it is preferable that traffic calming measures not be installed within 150 metres from a stop control sign or traffic signal (refer to Section 5). The presence of driveways should also be considered when preparing detailed design drawings for the traffic calming measures, in order to avoid interference between them. To this effect, speed cushions tend to be easier to accommodate than chicanes.

4.2. Traffic Calming on North Street

North Street is a local road and most of the development along its length consists of single-family detached homes, with the exception of the south end, where an entrance to the No Frills Supermarket is provided. Based on the traffic volume estimation (Section 3), cut-through traffic can be expected at the north end. In order to mitigate this, the same traffic calming measures considered for Grady Drive (i.e. speed cushions or two-lane chicanes) can be considered for North Street. However, the existing cross section on North Street does not present barrier curb, typical of residential neighbourhoods and more common where traffic calming measures are provided. If these measures are considered, consideration should be given to providing barrier curb along North Street to ensure driver expectations are met.

As an alternative, consideration could also be given to implementing a full closure at the north end of North Street (i.e. close its intersection with Grady Drive). This would completely eliminate the possibility of cut-through traffic on North Street and, although residents would no longer have the option of entering/exiting their neighbourhood via Grady Drive, alternative routes via George Street West and Wilmot Street would be available. A right-in/right-out island can also be considered with similar results, however it would not restrict cut-through traffic exiting from the school or residential neighbourhoods.

One potential side-effect of a full-closure or right-in/right-out island on North Street, however, would be potential traffic migration from the north end of North Street to George Street West and Wilmot Street, also residential streets. This could include Supermarket traffic as well as well as drivers attempting to bypass the traffic signal at the intersection of Regional Road 17 and King Avenue. This could be mitigated by prohibiting right-turns from Regional Road 17 to these streets during peak hours.

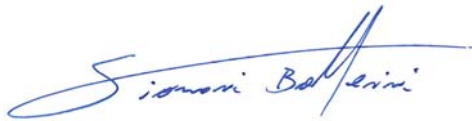
5. Additional Suggestions

In addition to traffic calming measures, the following additional items should be considered:

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- Monitor traffic volumes at the intersection of Grady Drive and Pedwell Street to determine if an all-way stop becomes warranted. This would increase travel time along Grady Drive and make the route less convenient for trips to/from the North Village development. However, it should be noted that OTM Book 5 – Regulatory Signs indicates that the use of all-way stop control for the sole purpose of traffic volume reduction is inappropriate. This measure should only be implemented if the volume at the intersection meets the warrant criteria; and
- Consider reviewing the need to install a traffic signal (undertake signal warrants, intersection capacity review) at the intersection of Manvers Road and Grady Drive.

Yours sincerely

A handwritten signature in blue ink that reads "Giovanni Bottesini". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Giovanni Bottesini, P.Eng., M.Eng.

Transportation Engineer

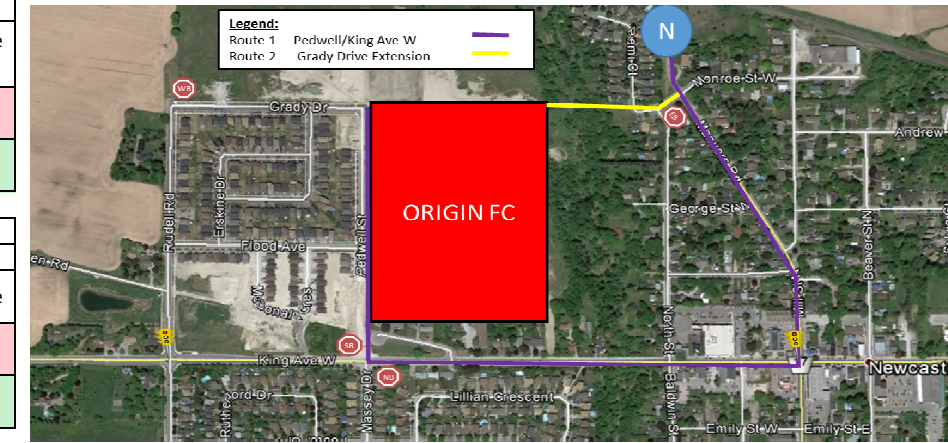
APPENDIX A – TRAVEL TIME CALCULATIONS

Foster Creek to North										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South Via Pedwell St - East Via King Ave - North ViaRR17	0	0	1.9	50	2.3	5.5	0	0	7.8
2	East Via Grady Dr - North ViaRR17	72	50	0.5	40	0.8	1.8	0	0	2.6

North to Foster Creek										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays	Stop Control Delay	Signal Delay	Total Travel Time
1	South ViaRR17 - West Via King Ave - North Via Pedwell St	0	0	1.9	50	2.3	0	0	0.5	2.3
2	South ViaRR17 - West Via Grady Dr	24	65	0.5	40	0.8	0	0	0	0.8

Foster Creek to East										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South Via Pedwell St - East Via King Ave	0	0	1.2	50	1.4	1.75	0	3.8	7.0
2	East Via Grady Dr - South ViaRR17	80	54	1	40	1.5	0.5	1.8	0	3.8

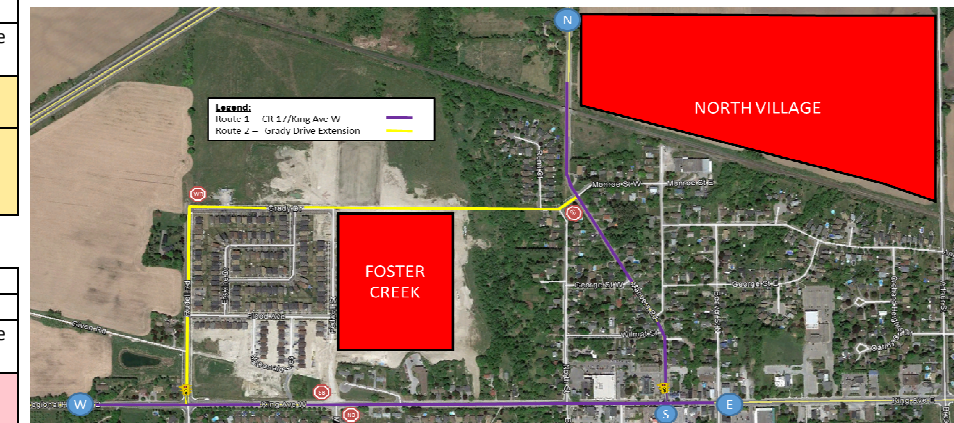
East to Foster Creek										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays	Stop Control Delay	Signal Delay	Total Travel Time
1	East Via King Ave - North Via Pedwell St	0	0	1.2	50	1.4	0	0	0.2	1.6
2	North ViaRR17 - West Via Grady Dr	19	45	1	40	1.5	0.1	0	0.1	1.7



Foster Creek to South										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South Via Pedwell St - West Via King Ave	0	0	1.2	50	1.4	1.75	0	1.5	4.7
2	West Via Grady Dr - South ViaRR17	68	45	1	40	1.5	0.5	1.8	0	3.8



South to Foster Creek										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	East Via King Ave - North Via Pedwell St	0	0	1.2	50	1.4	0	0	0.2	1.6
2	North ViaRR17 - East Via Grady Dr	18	44	1	40	1.5	0.1	0	0.1	1.7



North Village to West										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South ViaRR17 - West Via King Ave	0	0	1.9	50	2.3	0.5	0	0.3	3.1
2	South ViaRR17 - West Via Grady Dr - South Via Rudell - West Via King	60	40	1.6	40	2.4	0.5	0	0.2	3.1

West to north Village										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	East Via King - North ViaRR17	0	0	1.9	50	2.3	3.8	0	0.1	6.2
2	North ViaRR17 - East Via Grady Dr - North Via Rudell - East Via King Ave	20	65	1.6	40	2.4	1.9	0	0	4.3



Existing Residential to East										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South Via Rudell St - East Via King Ave	0	0	1.8	50	2.2	0.5	0	3.8	6.5
2	East Via Grady Dr - South Via RR 17	44	29	1.5	40	2.3	1	1.8	0	5.1

East to Existing Residential										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	East Via King Ave - North Via Pedwell St	0	0	1.8	50	2.2	0	0	0.5	2.7
2	North ViaRR17 - West Via Grady Dr	8	26	1.5	40	2.3	0.1	0	0.1	2.5

Existing Residential to South										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays (Min)	Stop Control Delay (Min)	Signal Delay (Min)	Total Travel Time (Min)
1	South Via Rudell St - West Via King Ave	0	0	1.8	50	2.2	0.5	0	1.5	4.2
2	West Via Grady Dr - South ViaRR17	16	12	1.5	40	2.3	0.5	1.8	0	4.6

South to Existing Residential										
Route #	Route Description	Volumes on Grady		Travel Time						
		Am Volume	PM Volume	Distance (km)	Average Travel Speed (Km/h)	Base Travel Time (Min)	Left Turn Delays	Stop Control Delay	Signal Delay	Total Travel Time
1	East Via King Ave - North Via Pedwell St	0	0	1.8	50	2.2	0	0	0.2	2.4
2	North ViaRR17 - East Via Grady Dr	8	25	1.5	40	2.3	0.1	0	0.1	2.5

Total Volume on Grady	
Am Volume	PM Volume
363	391

