R.W TOMLINSON

PROPOSED MINERAL EXTRACTION SITE
432 STORYLAND ROAD, COUNTY OF RENREW
TRAFFIC IMPACT STUDY

Presented to:

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Project No. 7288

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The following Traffic Impact Study (TIS) report has been produced, reviewed and is respectfully submitted for consideration to whom it has been addressed.

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1.0 BACKGROUND

1.1 THE PROPOSED DEVELOPMENT

R.W. Tomlinson Limited has proposed the development of a mineral extraction site located at 432 Storyland Road in Renfrew County, about 9 km north of the Town of Renfrew.

Exhibit 1-1 illustrates (shaded in red) the general area of the primary extraction parcel. The proposed site access is located approximately 2.5 km east of the Highway 17 corridor.

This study analyzed low, average and maximum annual production levels. The actual extraction would, of course, be subject to market demand. The site offers convenient access to the Highway 17 corridor by way of Storyland Road to facilitate the primary haul route to, and from, the greater Ottawa area. The proposed site would be accessed through a new Storyland Road access. The site plan of the proposed site is provided in Appendix "A".

Exhibit 1-1: Study Area Context

2.0 EXISTING CONDITIONS

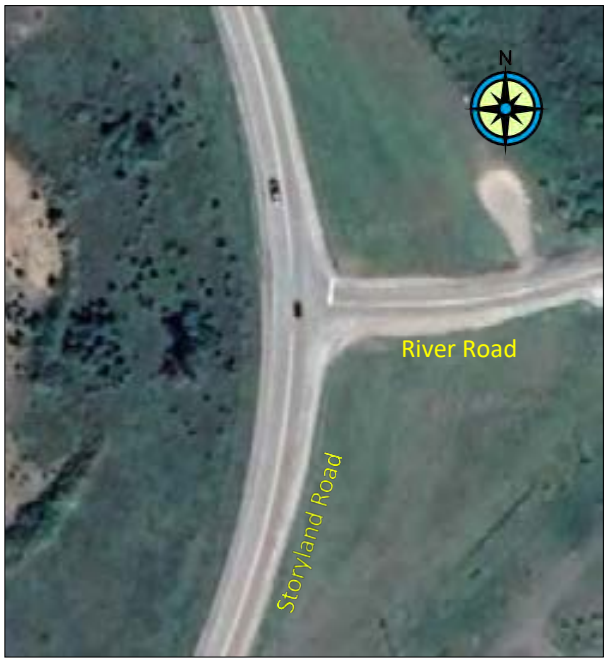
2.1 STUDY AREA ROADWAYS

A review of aerial photography was undertaken to document the existing roadways that would serve the proposed development and surrounding area. The corridors within the study area include:

- **Storyland Road (CR4):** This corridor is an existing 2-lane roadway with an 80 km/hour posted speed limit and a rural cross section. The road runs east-west between Highway 17 and River Road, and north- south between River Road and Chenaux Road. The corridor serves as one of the accesses to the Chenaux Road / Chemin de l'ile bridge connecting to the Province of Quebec. The Storyland Road corridor is characterized by low volumes of traffic with accesses provided to the existing light industrial and residential land uses along the corridor. The proposed mineral extraction site would be accessed from Storyland Road;
- **Highway 17:** This Provincial highway is an existing 2-lane north-south inter-city corridor that has a posted speed limit of 90 km/hour within the study area. The highway runs between Arnprior to the northwest towards the City of North Bay and further west toward the Ontario-Manitoba. It is anticipated that all of the proposed traffic destined to, and departing from, the mineral extraction site would make use of this highway corridor;
- **Pinnacle Road:** This is a 2-lane east-west existing roadway with a posted speed limit of 60 km/hour located north of Renfrew. The road runs east-west and is located on the west side of Highway 17 extending from Highway 17 on the west, to Highway 60 on the east. The western limit of Pinnacle Road transitions onto the eastern limit of Storyland Road; and
- **River Road (CR1):** This is a 2-lane north-south existing rural roadway with a posted speed limit of 80 km/hour. The road runs between Storyland Road and the Town of Arnprior along the Ottawa river. It is characterized primarily by adjacent rural residential development.

2.2 STUDY AREA INTERSECTIONS

- **Highway 17 / Storyland Road-Pinnacle Road:** The Highway 17 / Storyland Road-Pinnacle Road is a four-legged intersection controlled by STOP-signs along the minor roads (Storyland Road-Pinnacle Road). The intersection has auxiliary left turn lanes on both major approaches, an auxiliary right turn lane on the southbound approach and none on the minor approaches. There is a channelized right turn in the northbound direction along the Highway 17 corridor. The Ministry of Transportation of Ontario (MTO) future plans call for twinning Highway 17 to a point south of the Storyland Road intersection, with an anticipated start date of 2024. (See Section 3.2)



- **Storyland Road / River Road:** The Storyland Road/River Road intersection is a "T" intersection with STOP-control on the minor westbound approach. It is located 500m east of the proposed access. There is a right turn auxiliary lane on the northbound approach providing for approximately 2 car lengths of vehicle storage length**.**

2.3 EXISTING (2021) TRAFFIC VOLUMES

The following traffic information was collected to establish baseline traffic conditions:

- A manual peak period traffic count was undertaken on June 30th, 2021 between the hours of 7:00 am-to-9:00 am and 3:30 pm-to- 5:30 pm at the intersection of Storyland Road/River Road (County Road 1); and
- A peak hour traffic count was referenced from MTO information. The count was undertaken on July 17th, 2019 at the Highway 17/Storyland-Pinnacle Road intersection. (See Appendix "B"). The 2019 MTO traffic count at the Highway 17/Storyland Road-Pinnacle Road intersection was surcharged by a 2 percent annual growth rate (See Section 3.1) to update the information to represent current 2021 traffic volumes.

Exhibit 2-1 illustrates the existing (2021) adjusted morning and afternoon peak hour traffic volumes adopted for this study.

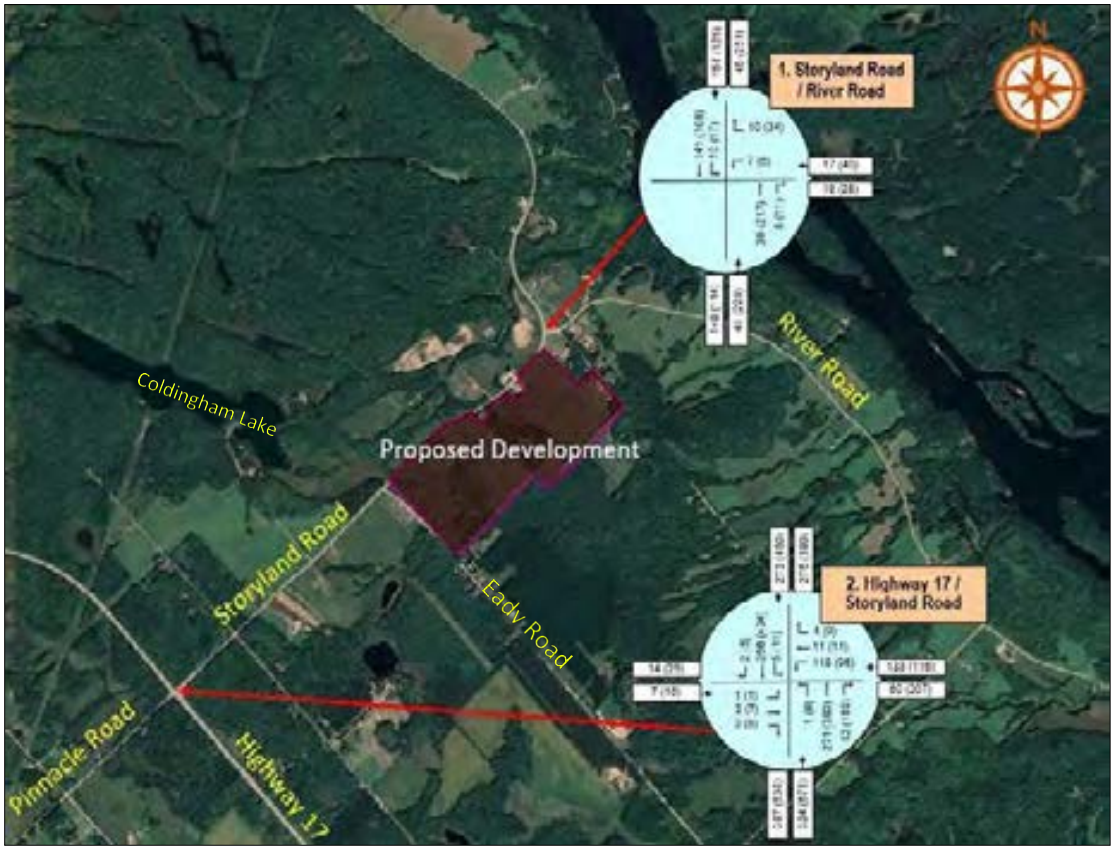


Exhibit 2-1: 2021 Existing Traffic - Peak Hour Traffic Volumes

2.4 EXISTING (2021) INTERSECTION CAPACITY ANALYSIS

Table 2-1 summarizes the intersection capacity analysis that was undertaken for the two study area intersections assuming the existing morning and afternoon peak hours of travel demand (Exhibit 2-1). The analysis was undertaken utilizing Synchro™ 10 analysis software which uses Highway Capacity Manual (6th Edition) methodologies to determine level-of-service (delay-based), volume-to-capacity (v/c) and 95th percentile vehicle queue lengths performance metrics. The analysis assumed a peak hour factor of 0.95 for existing and future conditions.

Table 2-1: Existing Traffic Analysis (2021) – Morning and Afternoon Peak Hour

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)						
			Critical Movement				
	Control Type	Overall LOS and Delay	Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	Volume-to-Capacity Ratio (v/c)	95th Percentile queue length (Vehicles)
Highway 17 / Storyland Road-Pinnacle Road	Minor Leg STOP-controlled	A, 3.6 (A, 4.1)	WB-LT (WB-LT)	17.6 (31.1)	C (D)	0.33 (0.48)	1.4 (2.4)
Storyland Road / River Road	Minor STOP-Controlled	A, 1.1 (A,1.3)	WB-LT (WB-LT)	9.1 (9.9)	A (A)	0.02 (0.054)	0.1 (0.2)

Table 2-1 indicates that both study area intersections would operate with satisfactory levels of service and acceptable average delays-per-vehicle. The westbound approach was found to be the critical movement at the Highway 17/Storyland-Pinnacle Road intersection as it exhibited a level of service "D" with approximately 31 seconds of average delay during the afternoon peak hour of travel demand. Appendix "C" provides the Synchro™ traffic analysis result sheets indicative of existing 2021 traffic conditions.

2.5 ADJACENT LAND USES

The Storyland Road corridor is characterized by rural residential and commercial properties with infrequent accesses along the corridor. The corridor affords various access opportunities to local County roads and private roads which access Coldingham Lake to the north of the proposed Storyland pit. An existing licensed pit (Sullivan Holdings Ltd.) exists directly to the north of the proposed Storyland pit.

Eady Road is a 2-lane rural roadway that abuts the proposed Storyland pit and provides access to rural residential properties.

3.0 TRAFFIC OPERATIONS: WITHOUT DEVELOPMENT

3.1 BACKGROUND TRAFFIC GROWTH

Table 3-1 summarizes the 10-year (2006-to-2016) historical daily traffic growth along the Highway 17 corridor. The table indicates that the average annual growth rate along the corridor was calculated to be approximately 1.8%. In order to model the background traffic growth in the study area, a 2% background traffic growth rate was applied to each approach at all study area intersections.

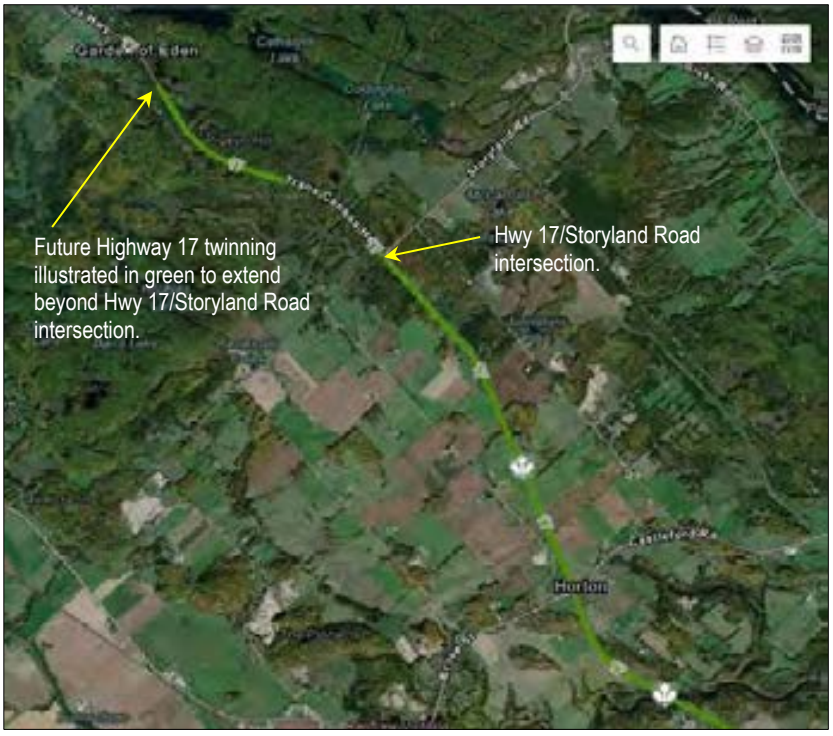
Table 3-1: Historical Average Annual Daily Traffic on Highway 17

Year	South of Storyland	North of Storyland	Year	South of Storyland	North of Storyland
2006	10,400	7,850	2012	10,900	7,900
2007	10,200	8,000	2013	11,100	8,800
2008	10,200	8,150	2014	11,800	8,950
2009	10,200	8,300	2015	12,000	9,100
2010	11,000	8,500	2016	12,300	9,250
2011	11,300	8,650			
		Average Annual Growth Rate		**1.83%**	**1.78%**

Source: MTO iCorridor – Historical Provincial Highway Volumes – Web Site

3.2 HIGHWAY 17 TWINNING

MTO's capital projects[1] indicated that the twinning of Highway 17 from Scheel Drive to 3 km west of Bruce Road is scheduled to start sometime in the 2023-to-2024 time-horizon. As the exact timelines for completion of this initiative remains unknown, the following analyses examined scenarios with, and without, the Highway 17 twinning in place for the 2028 horizon year. It is assumed that the eventual twinning of the Highway 17 corridor in the vicinity of the study area would see the existing at-grade Highway 17/Storyland-Pinnacle Road intersection being re-configured to a new grade-separated interchange which would result in significant traffic operational improvements.



Source: https://www.ontario.ca/page/ontarios-highway-programs

Exhibit 3-1:
Highway 17 Twinning Project in vicinity of Storyland Road

3.3 TRAFFIC FORECASTS: WITHOUT DEVELOPMENT

Exhibit 3-2 and Exhibit 3-3 illustrate the 2023 and 2028 forecast morning and afternoon peak hour traffic volumes without the proposed development in place. These traffic volumes were assessed to determine the traffic operational characteristics and required infrastructure improvements necessary to take place in the absence of the proposed development assuming the 2% background growth at all study area intersections over the 2-year and following 5-year interval.

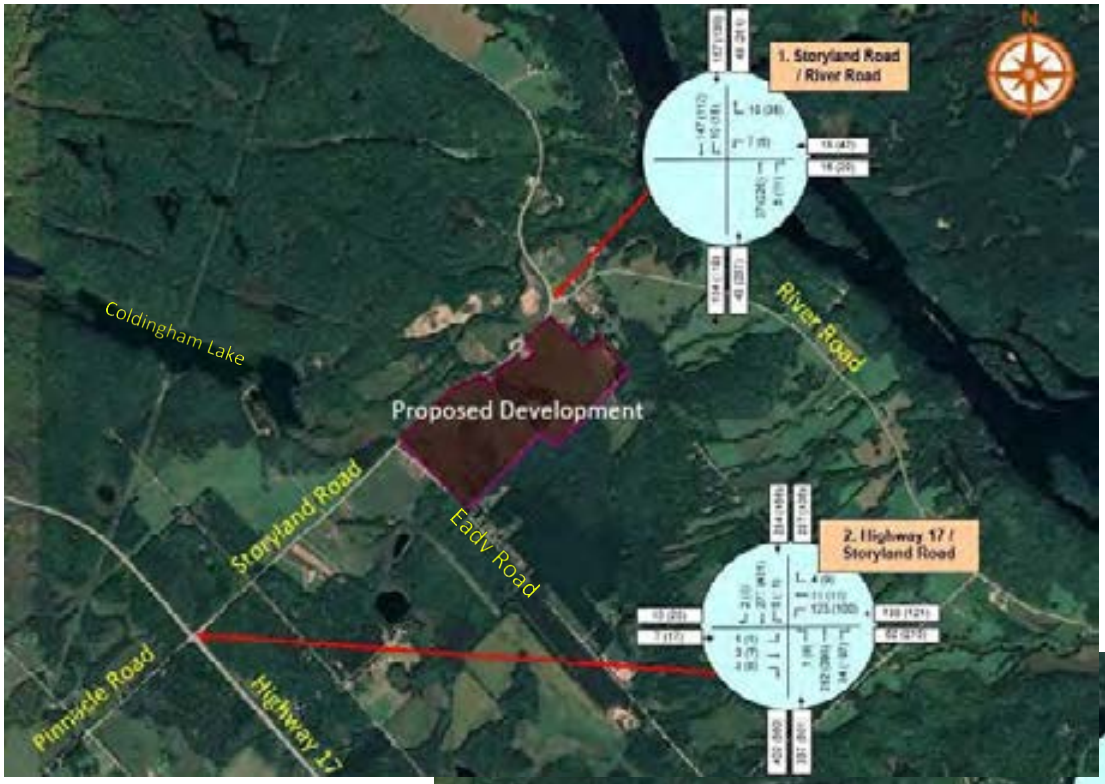


Exhibit 3-2: 2023 Traffic Forecast: Peak Hour of Travel Demand – No Development

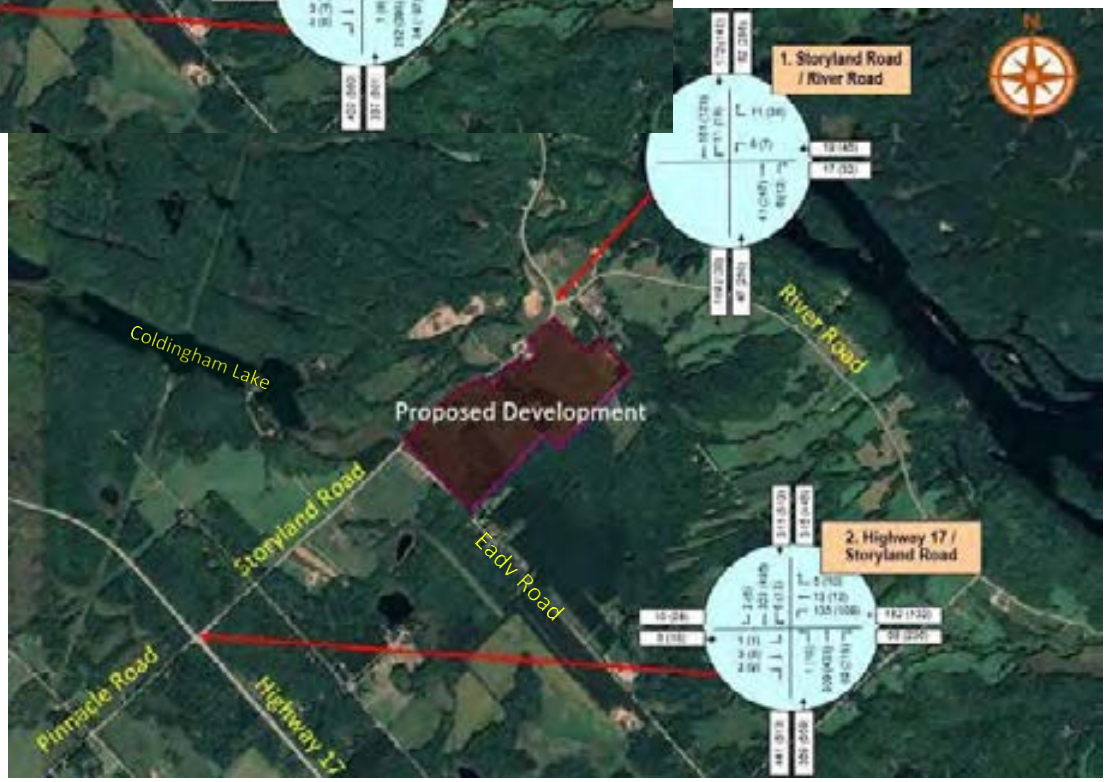


Exhibit 3-3: 2028 Traffic Forecast: Peak Hour of Travel Demand - No Development

Table 3-2 summarizes the intersection capacity analysis results for the two study area intersections assuming the forecast 2023 background morning and afternoon peak hours of travel demand.

- Overall, both study area intersections, in the absence of the proposed development are forecast to continue to operate with satisfactory levels of service and delays.
- The critical movement of the Highway 17/Storyland-Pinnacle Road intersection remains the westbound approach which is forecast to operate as a level-of-service of "D" with just under 35 seconds of delay during the afternoon peak hour of travel demand.

Table 3-2: 2023 Forecast Traffic Analysis: Without Development

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)						
	Control Type	Overall LOS and Delay	Critical Movement				
			Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	v/c Ratio	Queue Length* (vehicles)
Highway 17 / Storyland Road-Pinnacle Road	Minor Leg STOP-Controlled	A, 4.4 (A, 4.5)	WB-LT (WB-LT)	21.6 (34.6)	C (D)	0.43 (0.52)	2.1 (2.7)
Storyland Road / River Road	Minor Leg STOP-Controlled	A, 1.1 (A, 1.4)	WB-LT (WB-LT)	9.1 (10)	A (B)	0.02 (0.06)	0.1 (0.2)

1. volume-to-capacity ratio (Values in excess of point 0.9 indicate congested conditions.)
2. 95th Percentile Queue Length

Table 3-3 summarizes the intersection capacity analysis assuming the 2028 horizon year forecast for the morning and afternoon peak hours of travel demand without the development in place.

Table 3-3: 2028 Forecast Traffic Analysis: Without Development

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)						
	Control Type	Overall LOS and Delay	Critical Movement				
			Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	v/c Ratio[1]	Queue Length[2] (vehicles)
Highway 17 / Storyland Road-Pinnacle Road **Hwy 17 2-Lane**	Minor Leg STOP-Controlled	A, 4.4 (A, 6.6)	WB-LT (WB-LT)	21.6 **(51.4)**	C **(F)**	0.43 (0.67)	2.1 (4.1)
Storyland Road / River Road	Minor Leg STOP-Controlled	A, 1.1 (A, 1.4)	WB-LT (WB-LT)	9.2 (10.2)	A (B)	0.03 (0.07)	0.1 (0.2)

1. volume-to-capacity ratio (Values in excess of point 0.9 indicate congested conditions.)
2. 95th Percentile Queue Length

Table 3-2 and Table 3-3 assume the existing Highway 17/Storyland-Pinnacle Road intersection configuration would remain in place and indicates that:

- the minor leg STOP controlled at-grade intersection would provide unsatisfactory levels-of-service (LOS "F") for the westbound left turn vehicles with an average delay of 51.4 seconds. However, this is attributed to the heavy through traffic volumes along the Highway 17 corridor which constrain left turn vehicles from entering the intersection.

Table 3-4 presents the 2028 horizon year results assuming that the existing at-grade Highway 17/Storyland-Pinnacle Road intersection would be replaced by a grade-separated Highway 17 interchange which would coincide with the twinning of the Highway 17 corridor. Table 3-4 assumes the proposed mineral extraction site is not operational and indicates that:

- with the advent of a grade separated interchange both east and west ramp terminal intersections on either side of the Highway 17 corridor would provide high levels of service (LOS "A") during the 2028-time horizon with delays reduced to less than 10 seconds; and
- interim operational improvements can be achieved by way of signalizing the intersection prior to interchange / highway widening if deemed appropriate/warranted by the Ministry.

Table 3-4: 2028 Traffic Operations: Highway 17 Interchange Ramp Terminals: Without Development

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)						
	Control Type	Overall LOS and Delay	Critical Movement				
			Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	v/c Ratio[1]	Queue Length[2] (vehicles)
Highway 17 / Storyland Road-Pinnacle Road **Hwy 17 Interchange**	Minor Leg STOP-Controlled Ramps	A, 0.6 (A, 1.4)	SB off ramp – LT (SB off ramp – LT)	9.3 (9)	A (A)	0.01 (0.02)	0 (0.1)
		A, 2.5 (A, 5.8)	NB off ramp – LT (NB off ramp – LT)	8.7 (9.5)	A (A)	0.06 (0.23)	0.2 (0.9)

1. volume-to-capacity ratio (Values in excess of point 0.9 indicate congested conditions.)
2. 95th Percentile Queue Length

4.0 TRAFFIC OPERATIONS: WITH DEVELOPMENT

The proposed mineral extraction site would be serviced by 40-tonne capacity trailer trucks which are typically used to haul excavation materials. The trucks are most likely to be used in hauling the aggregate to ready-mix concrete plants.

4.1 TRAFFIC GENERATION

The following general assumptions were reviewed by the proponent of the development and used to determine the forecast traffic that would be generated by the mineral extraction site:

- Employee traffic associated with the mineral extraction site would arrive to the site, and depart from the site, outside of the peak hour of travel demand;
- All heavy-vehicle trips involve an inbound trip followed by an outbound trip during the same peak hour. This assumes that vehicles arrive empty, and then depart fully loaded;
- The mineral extraction site would operate between the months of March and December, Monday through Friday, for a total of 196 days-per-year;
- The pit would typically operate between 8-to-12 hours-per-day depending on demand. Hauling operations could potentially operate for 24-hour if required;
- Trips to the mineral extraction site would be staggered throughout the day to minimize the waiting times between loads.
- Operations of the extraction site do not follow a typical commuter traffic pattern with the peak number of trucks arriving/departing during the peak hours of travel demand.

Table 4-1 describes three thresholds of activity of the proposed mineral extraction site. For the purposes of this traffic impact study a "conservative" approach was adopted that assumed an average 625,000 tonne annual rate of extraction (roughly 2.5 times the "planned") rate. This was found to result in an average activity rate of 80 trucks-per-day, or 8 trucks-per-hour assuming an average 10-hour day. A "worst-case" absolute maximum scenario, which would result in 16 truck movements-per-hour was also evaluated. It is important to note that it is extremely unlikely that peak trip generation of the development will coincide with the peak hour of travel demand.

Table 4-1: Heavy Vehicle Traffic Estimate

	Scenario		
	Planned	**Conservative**	**Worst-Case Maximum**
Tonnes/Year	250,000	**625,000**	**1,000,000**
Hours/day	12	**10**	**8**
Trucks/day	32	**80**	**128**
Trucks/hour	< 3	**8**	**16**

Both "conservative" and "worst-case" scenarios were tested for traffic analysis purposes. As illustrated in Table 4-1, in a more realistic "planned" scenario, truck volumes on a typical day could be one-third of that estimated within this TIA document.

4.2 HAUL ROUTES: TRAFFIC DISTRIBUTION & ASSIGNMENT

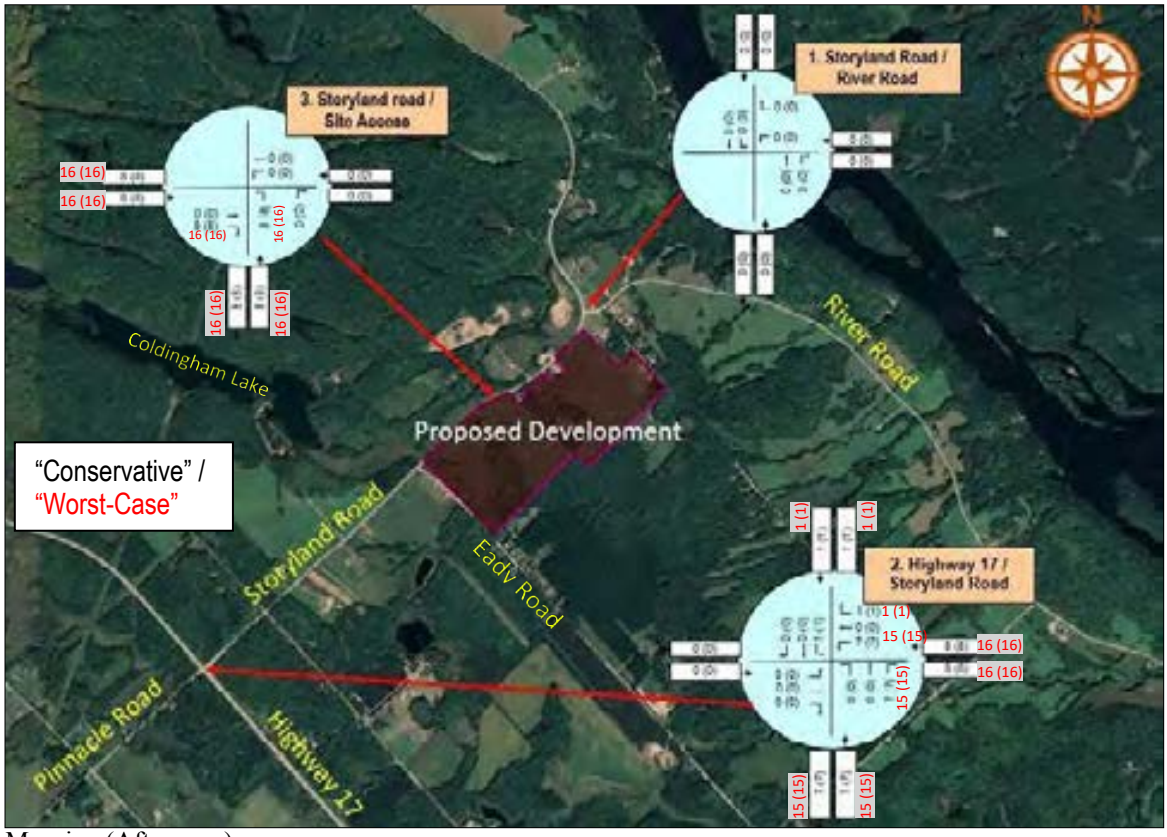
Based on the information provided by the mineral extraction site proponent, the following traffic distribution was assumed for the proposed mineral extraction site:

- 95% using Highway 17 southbound to / from Ottawa;
- 5% using Highway 17 northbound to / from Pembroke; and
- All of the trucks would use the Storyland Road corridor to access Highway 17.

Based on the findings from above, the following distribution and traffic assignment were determined:

- 7 of 8 (conservative) or 15 of 16 (worst-case) trucks in the peak hour (~88%) would utilize the Storyland Road corridor and Highway 17 south of Storyland Road; and
- 1 of 8 (or 16 in the worst-case) trucks in the peak hour (~12%) of site traffic would utilize the Storyland Road corridor and Highway 17 north of Storyland Road.

Exhibit 4-1 illustrates the site generated heavy-vehicle travel demand assigned to the local arterial network assuming a "conservative" case site peak hour.



Morning (Afternoon)

Exhibit 4-1: Site Generated Peak Hour Traffic Volumes

4.3 TRAFFIC FORECASTS: WITH DEVELOPMENT

Exhibit 4-2 illustrates the forecast traffic volumes for the 2023 horizon year when the proposed mineral extraction site is anticipated to be fully operational. Exhibit 4-3 presents the 2028 horizon year which represents a period 5 years beyond the time the site has become operational. The exhibits assume background traffic growth of 2% per year at all study area intersections, and:

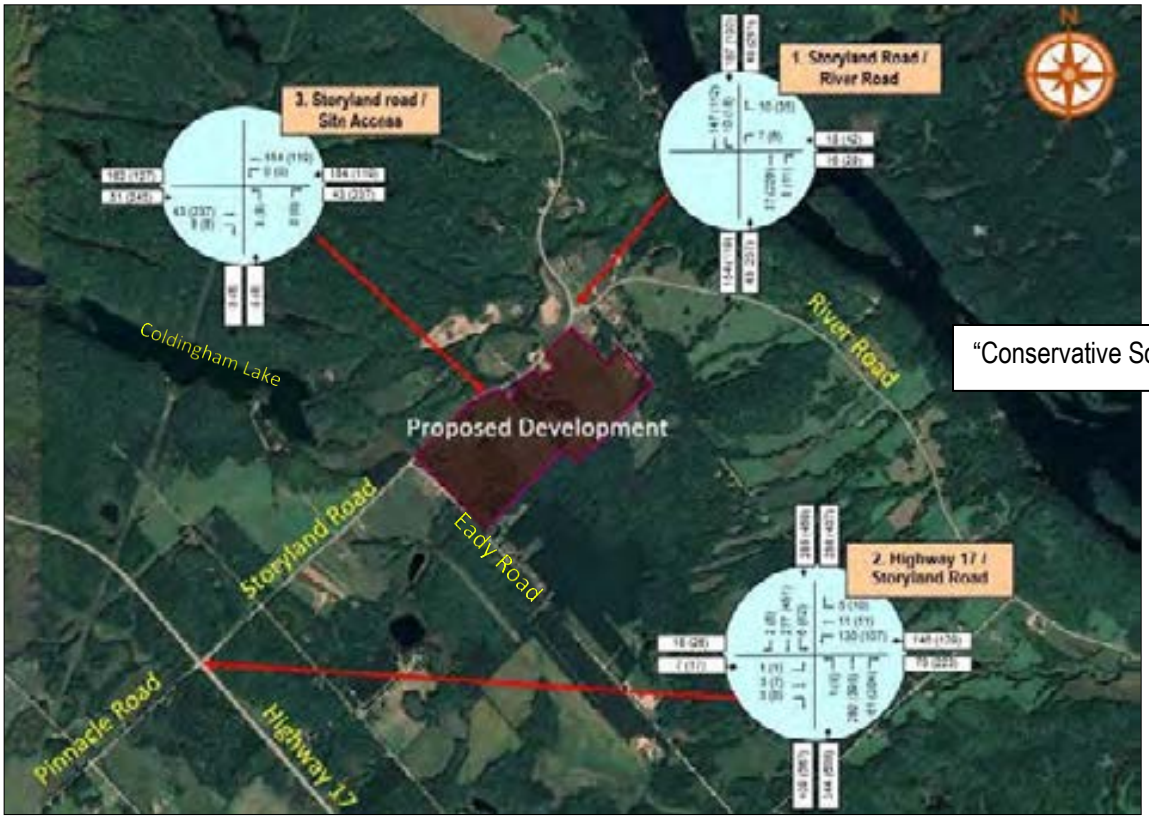
- a full build-out of the proposed Tomlinson Storyland Mineral Extraction site development;
- a 625,000-tonne annual extraction rate; and.

Table 4-2 summarizes the intersection capacity analysis assuming the mineral extraction site is operational in 2023: The table indicates that:

- During the morning peak hour of travel demand the Highway 17/Storyland-Pinnacle Road intersection is forecast to provide satisfactory operations assuming the worst-case scenario. (20.9 second average delay, LOS "C");
- During the morning and afternoon peak hours of travel demand the proposed site access intersection to the mineral extraction site was forecast to operate at a level of service "B" with less than a 13 second delay;
- During the afternoon peak hour of travel demand:
  - Assuming **conservative** operations of the mineral extraction site, the Highway 17 and Storyland Road intersection operates at a level of service of (LOS "E") and delays of 39.1 seconds during the afternoon peak hour of travel demand. These results represent an increase of 4.5 seconds over the background conditions assuming the extraction site is not operational;
  - Assuming **worst-case** operations of mineral extraction site, the Highway 17 and Storyland Road intersection operates at a level of service of (LOS "E") and delays of 43 seconds during the afternoon peak hour of travel demand;

Table 4-2: 2023 Forecast Traffic Operations: With Development

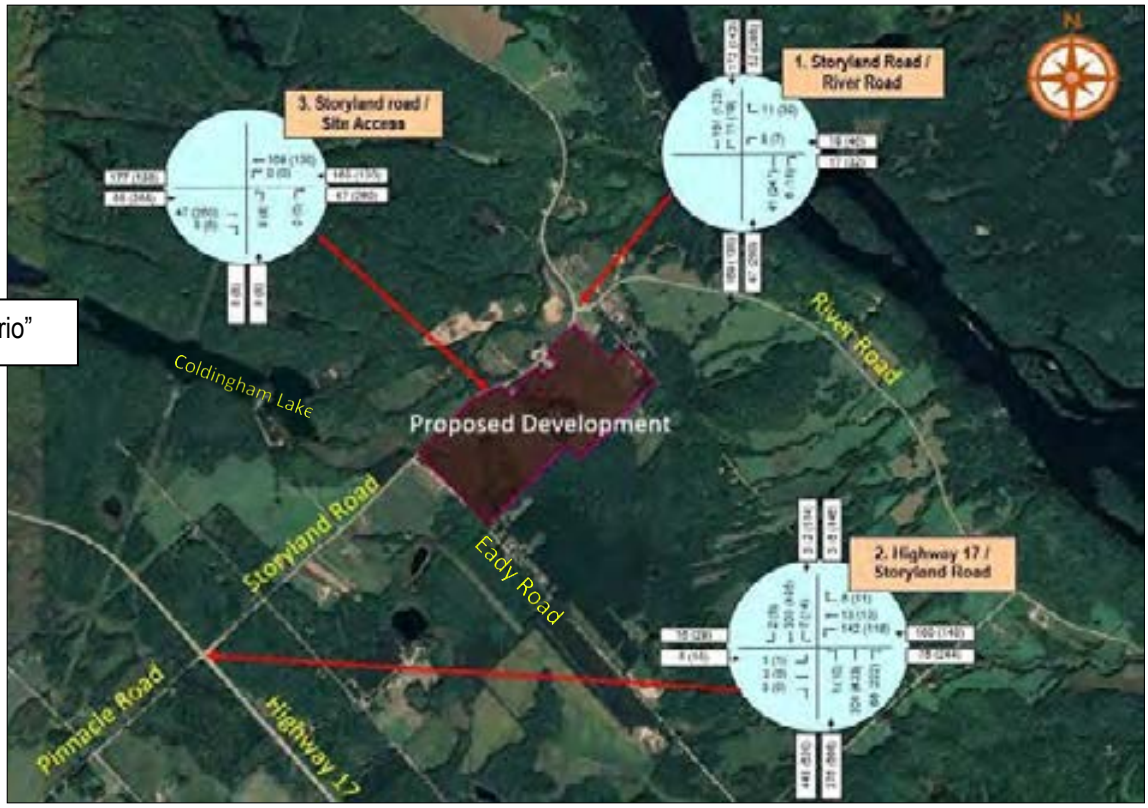
Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)							
	Control Type	Scenario	Overall LOS and Delay	Critical Movement				
				Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	Volume- to-Capacity Ratio (v/c)	95th Percentile Queue Length (vehicles)
Highway 17 / Storyland Road-Pinnacle Road **[Hwy 17 2-Lane]**	Minor Leg STOP-Controlled	Conservative	A, 3.6 (A, 3.0)	WB-LT **(WB-LT)**	19.9 **(39.1)**	C **(E)**	0.39 (0.57)	1.8 (1.6)
		Worst-case	A, 4.6 (A, 6.1)	WB-LT **(WB-LT)**	20.9 **(43)**	C **(E)**	0.42 (0.62)	2 (3.7)
Storyland Road / River Road	Minor Leg STOP-Controlled	N/A	A, 1.1 (A, 1.4)	WB-LT (WB-LT)	9.1 (10)	A (B)	0.02 (0.06)	0.1 (0.2)
Storyland Road / Site Access	Minor Leg STOP-Controlled	Conservative	A, 0.4 (A, 0.3)	NB-LT (NB-LT)	11.1 (12.8)	B (B)	0.02 (0.02)	0 (0.1)
		Worst-case	A, 0.8 (A, 0.5)	NB-LT (NB-LT)	11.2 (13)	B (B)	0.03 (0.04)	0.1 (0.1)



"Conservative Scenario"

Morning (Afternoon)

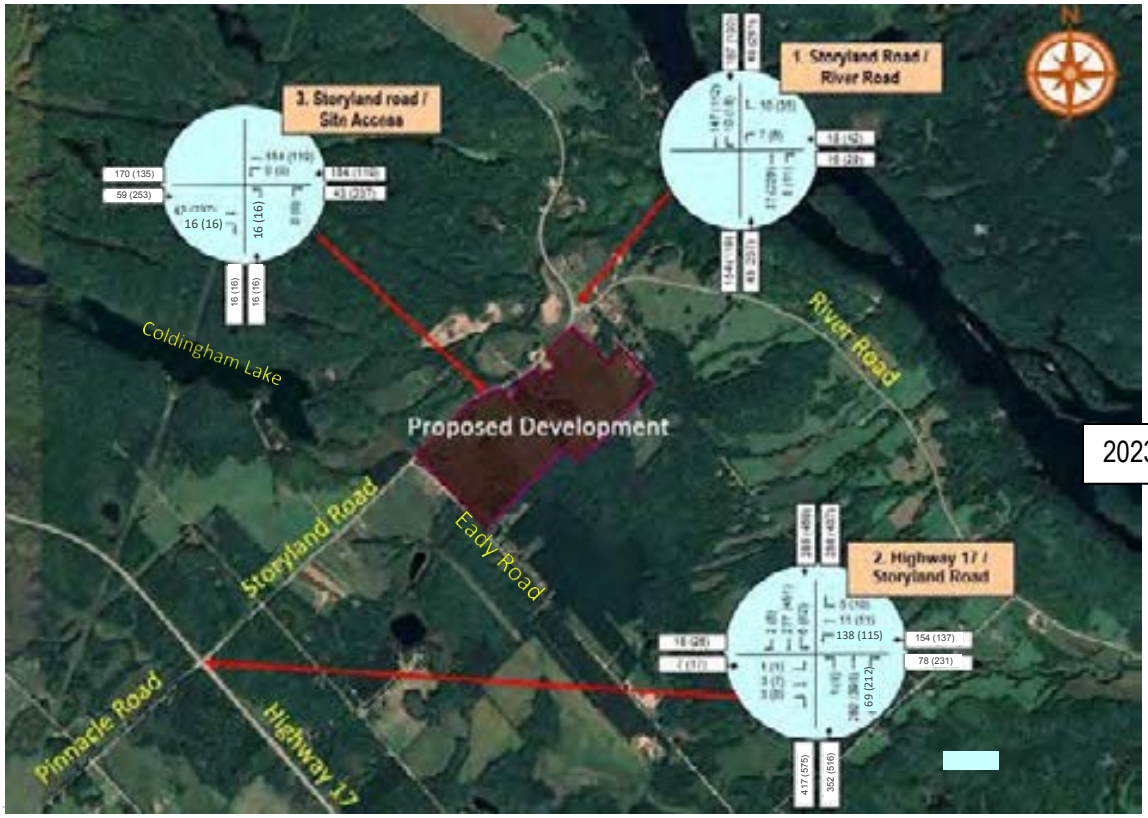
Exhibit 4-2: 2023 Conservative Forecast: Peak Hour of Travel Demand - With Development



"Conservative Scenario"

Morning (Afternoon)

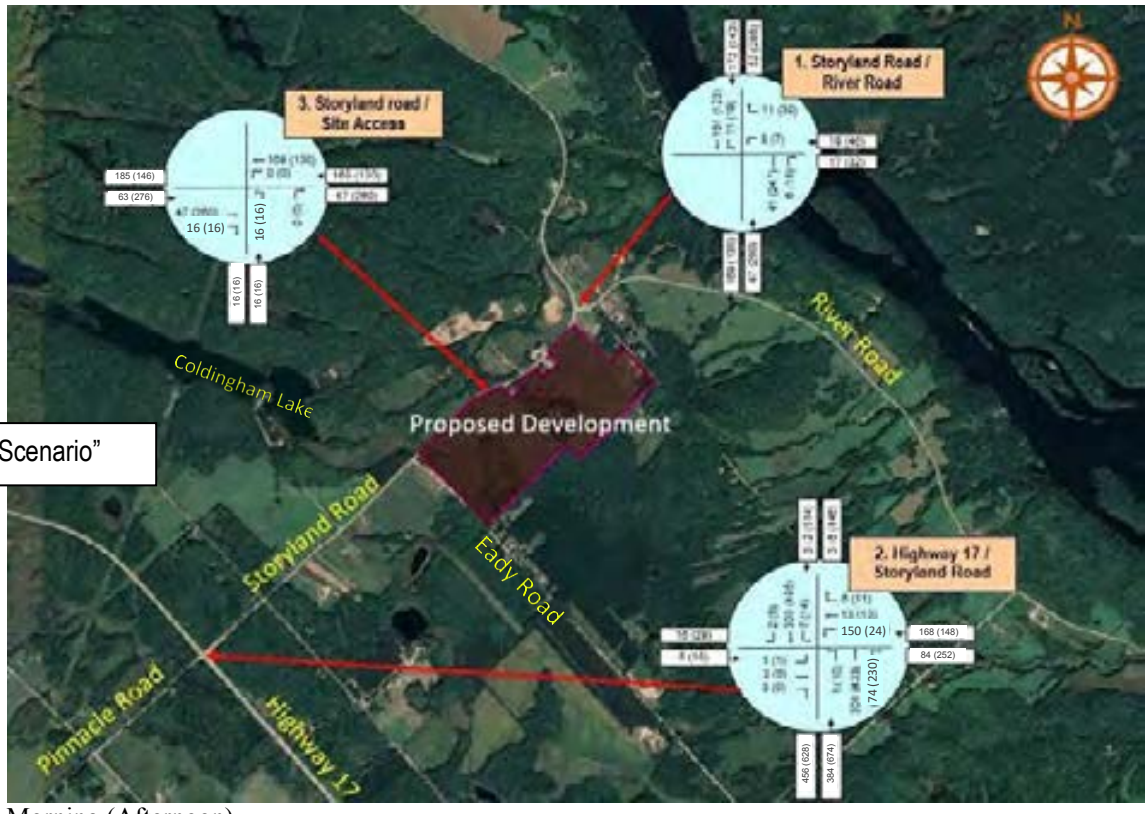
Exhibit 4-3: 2028 Conservative Forecast: Peak Hour of Travel Demand - With Development



2023"Worst-Case Scenario"

Morning (Afternoon)

Exhibit 4-4: <u>2023</u> Worst-Case Forecast: Peak Hour of Travel Demand - With Development



2028"Worst-Case Scenario"

Morning (Afternoon)

Exhibit 4-5: <u>2028</u> Worst-Case Forecast: Peak Hour of Travel Demand - With Development

Table 4-3 summarizes the intersection capacity analysis that was undertaken for the study area intersections assuming the forecast 2028 horizon year morning and afternoon peak hours of travel demand in conservative and worst-case scenarios.

The evaluation of the **conservative scenario** indicates:

- the westbound left turn movement at the Highway 17/Storyland-Pinnacle Road intersection is forecast to operate at a level of service "F" during the afternoon peak hour of travel demand with a delay of approximately 60.4 seconds. A comparison of the results of Table 4-4 (with the site) against Table 3-3 (without the site) indicates that the average delay for this turning movement increased by 9 seconds and the level-of-service remained at a LOS "F".
- the proposed access is forecast to operate at a level-of-service of LOS "B" during both peak hours of travel demand with delays of less than 14 seconds.

The evaluation of the **worst-case scenario** indicates:

- the westbound left turn movement at the Highway 17/Storyland-Pinnacle Road intersection is forecast to operate at a level of service "F" during the afternoon peak hour of travel demand with a delay of approximately **69 seconds**. A comparison of the results of Table 4-3 (with the site) against Table 3-3 (without the site) indicates that the average delay for this turning movement increased by 15 seconds due to site traffic and the level-of-service remained at a LOS "F";
- The Highway 17/Storyland Road-Pinnacle Road intersection continues to operate at an acceptable LOS "C" and a 24.3 second average delay in the morning peak hour of travel demand even with the "worst-case" peak hour of site generated traffic. This represents an increase in average delay of under 3 seconds (compared to 21.6 seconds in background 2028 conditions); and
- the proposed access is forecast to operate at a level-of-service of LOS "B" during both peak hours of travel demand with delays of less than 14 seconds.

Table 4-3: 2028 Forecast Traffic Operations: With Development

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)							
	Control Type	Scenario	Overall LOS and Delay	Critical Movement				
				Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	Volume- to-Capacity Ratio (v/c)	95th Percentile Queue Length (vehicles)
Highway 17 / Storyland Road-Pinnacle Road **Hwy 17 2-Lane**	Minor Leg STOP-Controlled	Conservative	A, 4.9 (A, 4.3)	WB-LT **(WB-LT)**	23.2 **(60.4)**	C **(F)**	0.47 **(0.73)**	2.4 (4.8)
		Worst-case	A, 5.3 **(A, 9.5)**	WB-LT **(WB-LT)**	24.3 **(68.7)**	C **(F)**	0.49 **(0.79)**	2.6 **(5.4)**
Storyland Road / River Road	Minor Leg STOP-Controlled	N/A	A, 1.1 (A, 1.4)	WB-LT (WB-LT)	9.2 (10.2)	A (B)	0.023 (0.0)	0.1 (0.2)
Storyland Road / Site Access	Minor Leg STOP-Controlled	Conservative	A, 0.4 (A, 0.3)	NB-LT (NB-LT)	11.3 (13.3)	B (B)	0.02 (0.02)	0.0 (0.1)
		Worst-case	A, 0.7 (A, 0.5)	NB-LT (NB-LT)	11.4 (13.5)	B (B)	0.03 (0.04)	0.1 (0.1)

The intersection capacity constraints noted in this section are largely a result of background traffic growth along both Highway 17 and Storyland Road.

The next phase of Highway 17 twinning is envisioned to bring the corridor to a 4-lane twinned controlled access freeway in the vicinity of the Storyland intersection. The planned MTO improvements to Highway 17 corridor will alleviate capacity constraints along Storyland Road approach to the Highway 17/Storyland Road intersection.

Table 4-5 summarizes the intersection capacity analysis results assuming that the Highway 17/Storyland Road intersection is replaced by a new grade-separated interchange by the 2028-time horizon and indicates satisfactory peak hour traffic operations. The Conservative traffic generation scenario was assumed within this analysis.

Table 4-4: 2028 Traffic Operations: Highway 17 Interchange Ramp Terminals: With Development

Intersection	Weekday Morning Peak Hour (Afternoon Peak Hour)						
	Control Type	Overall LOS and Delay	Critical Movement				
			Approach / Movement	Average Delay per Vehicle (seconds)	Level of Service	v/c Ratio[1]	Queue Length[2] (vehicles)
Highway 17 / Storyland Road-Pinnacle Road **Hwy 17 Interchange**	Minor Leg STOP-Controlled Ramps	A, 0.6 (A, 1.2)	SB off ramp – LT (SB off ramp – LT)	9.4 (9.2)	A (A)	0.01 (0.03)	0.0 (0.1)
		A, 2.7 (A, 5.5)	NB off ramp - LT (NB off ramp - LT)	8.9 (9.6)	A (A)	0.07 (0.24)	0.2 (0.9)

1. volume-to-capacity ratio (Values in excess of point 0.9 indicate congested conditions.)
2. 95th Percentile Queue Length

5.0 SUPPLEMENTARY ANALYSIS

5.1 SITE ACCESS LOCATION REVIEW

CastleGlenn conducted an evaluation of several possible access locations along the Storyland Road corridor and determined three viable alternative access options. Appendix "E" illustrates the options that were considered. Each option was reviewed from a sight line perspective taking into account the roadway horizontal curvature, the presence/proximity of adjacent dwellings and the presence of existing accesses.

The minimum required sight distance between the proposed access in either direction was determined using TAC methodology2 and was found to be 290 metres.

Access Option 1 would be located directly opposite Chapeski Lane and was found to achieve a sight line distance of over 300 metres in both east and west directions along Storyland Road. The proposed access is located approximately 2.3 kilometers from the Highway 17 / Storyland Road intersection and represents a minimal disruption to local residents.

Exhibit 5-1: Proposed Access Location

5.2 CLIMBING LANE REVIEW

An assessment was undertaken to determine the requirement for a climbing lane along the Storyland Road corridor.

Since climbing uphill is difficult for heavy vehicles, climbing lanes permit heavy vehicles to ascend steep grades in a separate lane without slowing other traffic.

The Storyland Road corridor is a two-lane rural road with an 80 km/hr posted speed limit and characterized by the following grades:

- The road is characterized by a nominal grade between Highway 17 and Eady Lane (Approximately 530 m west of the preferred access option); and
- Between Eady Lane and the Access Option 1, Storyland Road runs on a slight eastbound upgrade with an average slope of approximately 1 percent.

The upgrade in the vicinity of the preferred access location was not considered significant enough to impact the levels of service along the corridor and/or trigger the need for a climbing lane.

5.3 LEFT TURN LANE WARRANT ANALYSIS

A turning lane warrant analysis was undertaken following geometric design standards[1] for Ontario highways. The warrants for left turn lanes are based on left turn volume, the volume of opposing vehicles and the volume of advancing vehicles. The purpose of left turn auxiliary lanes is:

- to minimize that conflict between the advancing vehicles and the left turn vehicles during the left turn maneuver; and
- mitigate the delay for vehicles queued behind left turning vehicles.

The proposed mineral extraction site was estimated to generate an additional 80 heavy vehicles-per-day or 8 vehicles-per-hour assuming a 10-hour work day (See Table 4-1). However, (as indicated in Section 4.2 and illustrated within Exhibit 4-1), none of the anticipated traffic would be approaching the site from the north. Exhibit 4-3 and Exhibit 4-2 indicate zero southbound left turns into the proposed Access site.

Independent of the assumption that no heavy vehicle traffic would enter the mineral extraction site from the north, the TIA wished to test a situation where heavy vehicles, during the forecast peak hours of travel demand in the 2028 horizon year, would attempt to enter the site during the peak hours of travel demand making the southbound left turn into the mineral extraction site. Hence,

- the traffic volumes depicted within Exhibit 4-2 were surcharged by an additional 5 heavy vehicles entering the site from the north; and
- A truck-to-passenger vehicle equivalency factor of 2.0 was applied to the left turn vehicles into the site.

1. Transportation Association of Canada, 2017, Chapter 9, Equation 9.9.1

Table 5-1 indicates the advancing and opposing volumes forecast to occur in the 2028 horizon year at the proposed access to the mineral extraction site. The table indicates that:

- During the peak hours of travel demand the percentage of trucks in the advancing volume was found to be in the range of 5-to-7 percent due to the low east-west traffic volumes.

Exhibit 5-2 and Exhibit 5-3 illustrate the left turn warrant analysis[2] for the morning and afternoon peak hours for the 2028 horizon year, respectively. The exhibits illustrate that:

- During the peak hours of travel demand a southbound left turn slip lane arrangement into the proposed mineral extraction site was found not to be warranted.

The design of the access in terms of throat length, tapers, curve radii and drainage remain to be determined subsequent to a geometric review.

Table 5-1: Left Turn Lane Warrant Analysis (625,000 Tonnes-Per-Year)

Parameter		*Morning Peak Hour*		*Afternoon Peak Hour*	
A. SB-Left-Turn Volume		5 trucks/hour	10 PCU/hour	5 trucks/hour	10 PCU/hour
B. V_a, Number of vehicles approaching	WB-Th	169 vph/hr	2.3% Heavy's 177 PCU/hr	130 vph	2.7% Heavy's 138 PCU/hr
	WB-LT	5 trucks/hr	10 PCU/hr	5 vph	10 PCU/hr
	Va Total	**174 vph**	**187 PCU/hr**	**135 vph**	**148 PCU/hr**
C. V_o, Number of opposing vehicles	EB-Th	47 vph	13.8% Heavy's 61 PCU/hr	260 vph	2.0% Heavy's 272 PCU/hr
	NB-LT	8 trucks/hr	16 PCU/hr	8 vph	16 PCU/hr
	Vo Total	**55 vph**	**77 PCU/hr**	**258 vph**	**288 PCU/hr**
(A divided by C) Left Turn Pct, Pct of left-turning vehicles in approaching direction		--	5.3%	--	6.8%

vph - Vehicles-per-hour
PCU - Passenger Car Unit
Note: The percentages of heavy vehicles were referenced from the existing MTO traffic counts at the Highway 17/Storyland- Pinnacle Road intersection.

2 *Appendix 9 for Chapter 9: Intersections,* MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017

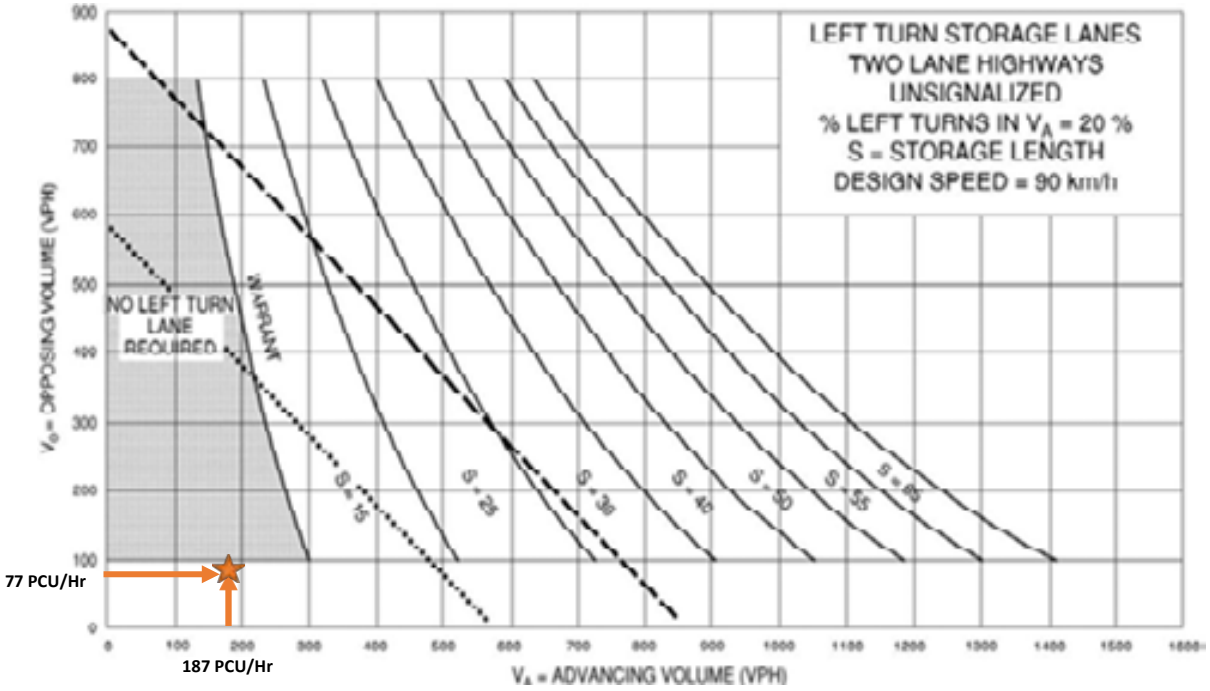


Exhibit 5-2: Left-Turn Warrant Analysis: 2028 Morning Peak Hour

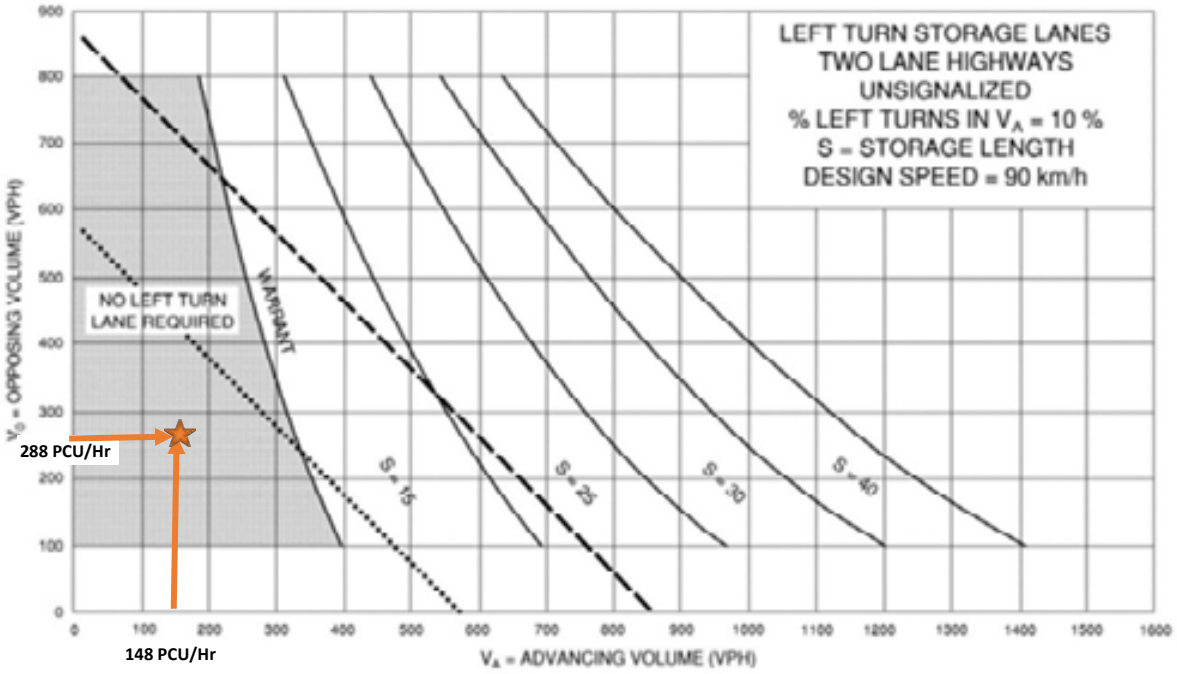


Exhibit 5-3: Left-Turn Warrant Analysis: 2028 Afternoon Peak Hour

5.4 RIGHT TURN LANE WARRANT ANALYSIS

A "rule-of-thumb" warrant[3] for a right turn auxiliary lane involves the following three criteria:

1. The main (or through road) must exhibit an average annual daily traffic (AADT) level greater-than-or-equal-to 1,800 vehicles-per-day; [The forecast 2028 2-way AADT on Storyland Road in front of the proposed mineral extraction access has been estimated at 1,515 AADT which does not satisfy this criterion.]
2. The intersecting road must exhibit an AADT greater-than-or-equal-to 900 vehicles-per-day; [The forecast 2028 2-way AADT on the laneway serving the proposed mineral extraction access has been estimated to be no higher than 200 AADT assuming the maximum permitted extraction.]
3. The right turn daily traffic volume for the movement in question must exhibit an AADT greater-than-or-equal-to 360 vehicles-per-day. [The forecast 2028 right turn AADT traffic volume turning into the site would be no greater than 160 vehicles-per-day assuming the maximum permitted extraction.]

It was concluded that a right turn auxiliary lane would not be necessary to accommodate vehicles entering the site. As stated above, the design of the access in terms of throat length, tapers, curve radii and drainage remain to be determined subsequent to a geometric review.

3. Alberta Highway Geometric Design Guide, Chapter D. Pg D-181, Section D.7.7 Warrant for Right Turn Lane

6.0 FINDINGS AND RECOMMENDATIONS

6.1 SUMMARY OF FINDINGS

- For the purposes of this traffic analysis a "conservative" and "worst-case" estimates of annual tonnage to be extracted from the proposed site were assumed to be 625,000 and 1,000,000 tonnes, respectively. This is almost 2.5 and 4 times the anticipated market demand. Based on the "conservative" estimate the proposed mineral extraction site would generate 80 heavy vehicle trips-per-day or 128 trips in the worst-case scenario.
- It is anticipated that the proposed pit would be operational between the months of March and December for 196 hauling days-per-year, operating on an 8-to-12-hour schedule depending on market conditions.
- Assuming the "worst" annual 1,000,000 tonnes of excavation, the 8-hour operating schedule and that all heavy vehicles entering and leaving the site are 40-tonne capacity triaxle trucks the proposed mineral extraction site is forecast to generate approximately 16 trucks of export material per-peak-hour, which translates to 32 two-way truck trips during the peak hour of travel demand (16 in and 16 out). However, extraction from the site do not typically follow commuter traffic patterns with the peak number of trucks arriving/departing during the peak hours of travel demand.
- Assuming a background growth rate of 2 percent along all study area roadways, the Highway 17/Storyland Road intersection was found to operate at a level of service "F" with a 51.4 second delay for the WB-LT movement in the absence of the proposed development. This delay is a pre-existing condition.
- The impact of the proposed mineral extraction site upon the traffic operations of the existing Highway 17/Storyland-Pinnacle Road intersection configuration was evaluated at a 2028-time horizon (five years after operations would commence) comparing traffic volumes both with, and without, the site. The net impact was determined to affect the westbound left turn from Storyland Drive onto the Highway 17 corridor such that the average delay for this turning movement increased by 9 seconds (conservative scenario) or 17 seconds (worst-case scenario) and the level-of-service was forecast to remain at a LOS "F".
- The Highway 17/Storyland Road-Pinnacle Road intersection continues to operate at an acceptable LOS "C" and a 24.3 second average delay in the morning peak hour of travel demand (future 2028 conditions) even with the "worst-case" peak hour of site generated traffic.
- The proposed twinning of Highway 17 corridor from Scheel Drive to 3 km west of Bruce Road is scheduled to start sometime in the 2023-to-2024. The advent of a grade-separated interchange at the Storyland-Pinnacle Road crossing at the five-year time horizon was evaluated both with, and without, the mineral extraction site in place. It was determined that the intersections at the ramp terminals, would operate at a LOS "A" with an average delay just under 10 seconds, with the extraction site operational.
- Of the several sites evaluated for access to the proposed site, the preferred location, from a traffic operational perspective, was determined to be directly opposite Chapeski Lane. Sight lines, the roadway horizontal curvature, the presence/proximity of adjacent dwellings and the presence of existing accesses were considered. The design of the access remains to be defined

at the time of site plan control.

- The proposed site access was found to operate with a northbound left-turn at an acceptable level of service "B" with a delay of under 15 seconds to enter the Storyland Road westbound traffic stream of traffic during the morning and afternoon peak hours of travel demand assuming minor leg STOP control at the new access.
- Analysis indicated that upgrades to the Storyland Road corridor in terms of a truck climbing lane or auxiliary turn lanes into the site were unwarranted.

6.2 SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS

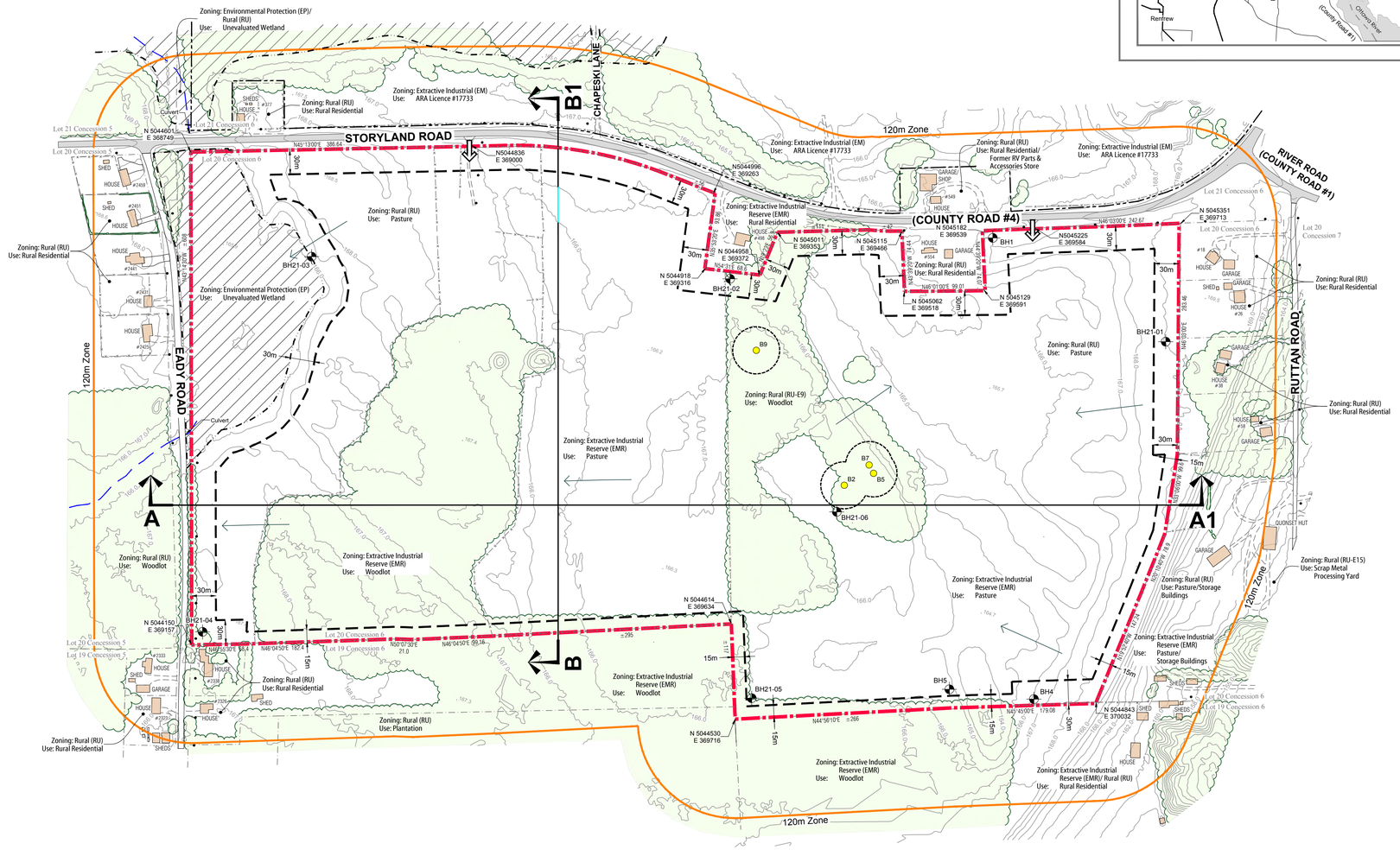
A review of this traffic impact assessment findings yielded the following conclusions:

- The development of the proposed Storyland mineral extraction facility would not require any roadway modifications to the existing roadway network aside from the future access to the site on Storyland Road;
- The Highway 17 / Storyland Road – Pinnacle Road intersection is envisioned to reach its capacity for the westbound left turn movement from Storyland Road onto Highway 17 by year 2028. This is a result of background growth along the Highway 17 corridor and is independent of the proposed development which is anticipated to conservatively generate 8 vehicles during the peak hours of travel demand;
- It was concluded that the MTO's planned Highway 17 corridor improvements will address Storyland Road congestion concerns well beyond the 2028-time horizon; and
- The preferred access location from a traffic operational perspective was found to offer the least disruption to surrounding lands and residents. The access location is directly opposite the Storyland Road/Chapeski Lane intersection.

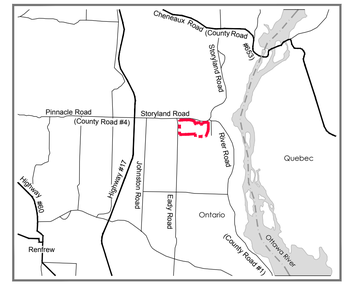
APPENDICIES

APPENDIX "A"

SITE PLAN



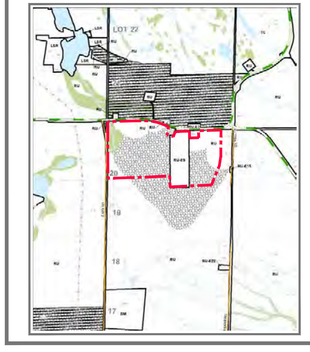
Key Plan



Subject Lands

SCALE
0 1.0 2.0 3.0
KILOMETRES

Zoning Inset



Subject Lands
Environmental Protection
Extractive Industrial Reserve (EMR)
Extractive Industrial (EM)
LGR Limited Service Residential
TC Tourism Commercial
DM Disposal Industrial
RU Rural

Source: Township of Horton Zoning By-law 2010-14

north

SCALE: NTS

Notes:

A. General
1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class A licence for a pit below the ground water table and follows the Aggregate Resources of Ontario: Site Plan Standards August 2020.
2. Area Calculations:
   Licence Area: 69.5 hectares (172 acres)
   Limit of Extraction: 55.9 hectares (138 acres)
3. All measurements shown are in metres unless specified otherwise.

B. References
1. Topographic information compiled by GeoOptic (a division of Aeon Egmond Ltd.) produced from aerial photography flown March 23, 2021. Mapping is produced in real world scale and coordinates (NAD83 UTM Zone 18N). Contour interval is 1m. All elevations are geodetic (CGVD2013 HT2).
2. Property boundary from parcel fabric on vuMap (First Base Solutions) online mapping subscription; Plan 49R-6656 prepared by Gibson, Sury & Rowe (Oct.1983); Plan 49R-15517 prepared by Adam Kasprzak Surveying Ltd. (July 2004); Plan 49R-8151 prepared by Sury, Rowe & Kasprzak Limited (Nov. 1986) and Plan 49R-19545 prepared by Adam Kasprzak Surveying Ltd. (Apr. 2020).
3. The subject site is zoned Extractive Industrial Reserve (EMR) and Rural (RU) and Environmental Protection (EP) in the Township of Horton Zoning By-law 2010-14.
4. Land use information compiled from 2021 imagery and client input.

C. Drainage
1. Surface drainage on and within 120 metres of the licence boundary is by overland flow in the directions shown by arrows on the plan view or by infiltration.

D. Groundwater
1. The groundwater table elevation on site ranges between 165 masl in the western portion of the site to 160 masl in the eastern portion of the site. The existing water table elevations are shown on each cross section on page 5 of 5. Groundwater table elevations provided by WSP Golder (November 2022).

E. Site Access and Fencing
1. There are several existing field accesses to the site. in the locations shown on the plan view.
2. Post and wire fencing (unless noted otherwise) exists in the locations shown on the plan view.

F. Aggregate Related Site Features
1. There are no existing aggregate operations or features on-site such as processing areas with stationary or portable equipment, stockpiles, recyclable materials, scrap, haul roads, fuel storage, berms or excavation faces.

G. Significant Natural Features
1. On-site: Significant wildlife habitat, fish habitat, endangered species (butternut trees) and unevaluated wetland;
   Within 120m: significant woodland, fish habitat and unevaluated wetland.

H. Cross Sections
1. As shown on this page. Detailed sections are shown on page 5 of 5.
2. Cross section locations are identified on the plan view for each drawing.

I. Report References
1. Noise: "Acoustic Assessment for the Proposed Storyland Pit Township of Horton, County of Renfrew, Ontario" November 2022 (Source: Freefield Ltd.)
2. Natural Environment: "Storyland Road Aggregate Development Natural Environment Report & Environmental Impact Statement" November 2022 (Source: McKinley Environmental Solutions)
3. Archaeology: "Stage 1 Archaeological Assessment: Storyland Road, Part Lot 20, Concession 6, Geographic Township of Horton, County of Renfrew, Ontario" March 2021 (Source: Paterson Group) and "Stage 2 Archaeological Assessment: 432 Storyland Road, Part Lot 20, Concession 6, PIN 57271-0024 Geographic Township of Horton, County of Renfrew, Ontario" June 2021 (Source: Matrix Heritage Inc.)
4. Hydrogeology: "Level 1 and Level 2 Water Report Proposed Storyland Pit, Horton Township Ontario" November 2022 (Source: WSP Golder)
5. Maximum Predicted Water Table Report: "Proposed Storyland Pit Horton Township, Ontario" November 2022 (Source: WSP Golder)
6. Traffic: "Proposed Mineral Extraction Site, 432 Storyland Road, County of Renfrew" November 3, 2022 (Source: Castleglenn Consultants Ltd.)

Legal Description

PART OF LOT 20 CONCESSION 6
(geographic township of Horton)
TOWNSHIP OF HORTON
COUNTY OF RENFREW

Legend

- Boundary of Area to be Licensed
- Limit of Excavation — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Fence — PAGE WIRE FENCE UNLESS OTHERWISE NOTED
- Existing Licensed Boundary — ARA LICENCE #17733
- Public Road (Paved) / Public Road (Gravel)
- Existing Spot Elevation — METRES ABOVE SEA LEVEL
- Private Laneway
- Contour with Elevation — METRES ABOVE SEA LEVEL
- Farm/Field Access
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE.
- Existing Vegetation
- Direction of Surface Drainage (IF ANY)
- Hydro Pole
- Drainage Feature
- Unevaluated Wetland — ONTARIO GEOHUB OPEN DATA
- Category 3 Butternut Trees — FROM McKINLEY ENVIRONMENTAL (2022)
- BH21-01 Monitoring Well Locations — GOLDER 2021
- Parcel Fabric
- A1 Cross Sections — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS

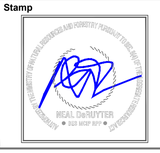
Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

MNRF Approval Stamp

Stamp



north

Applicant

TOMLINSON

R. W. Tomlinson Limited
100 CitiGate Drive, Ottawa Ontario, K2J 6K7
Tel: (613) 822-1867 Fax: (613) 822-6844

Rob Pierce
R.W. Tomlinson Limited
Vice President Planning and Development

Project

Storyland Pit

ARA Licence Reference No.

Pre-approval review:

For Submittal to MNRF - November 2022

Plan Scale **1:3,000 (Arch D)**

SCALE
50 0 50 100
METRES

Plot Scale 1:3 [1mm = 3 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. **9137W**

File Name

EXISTING FEATURES PLAN

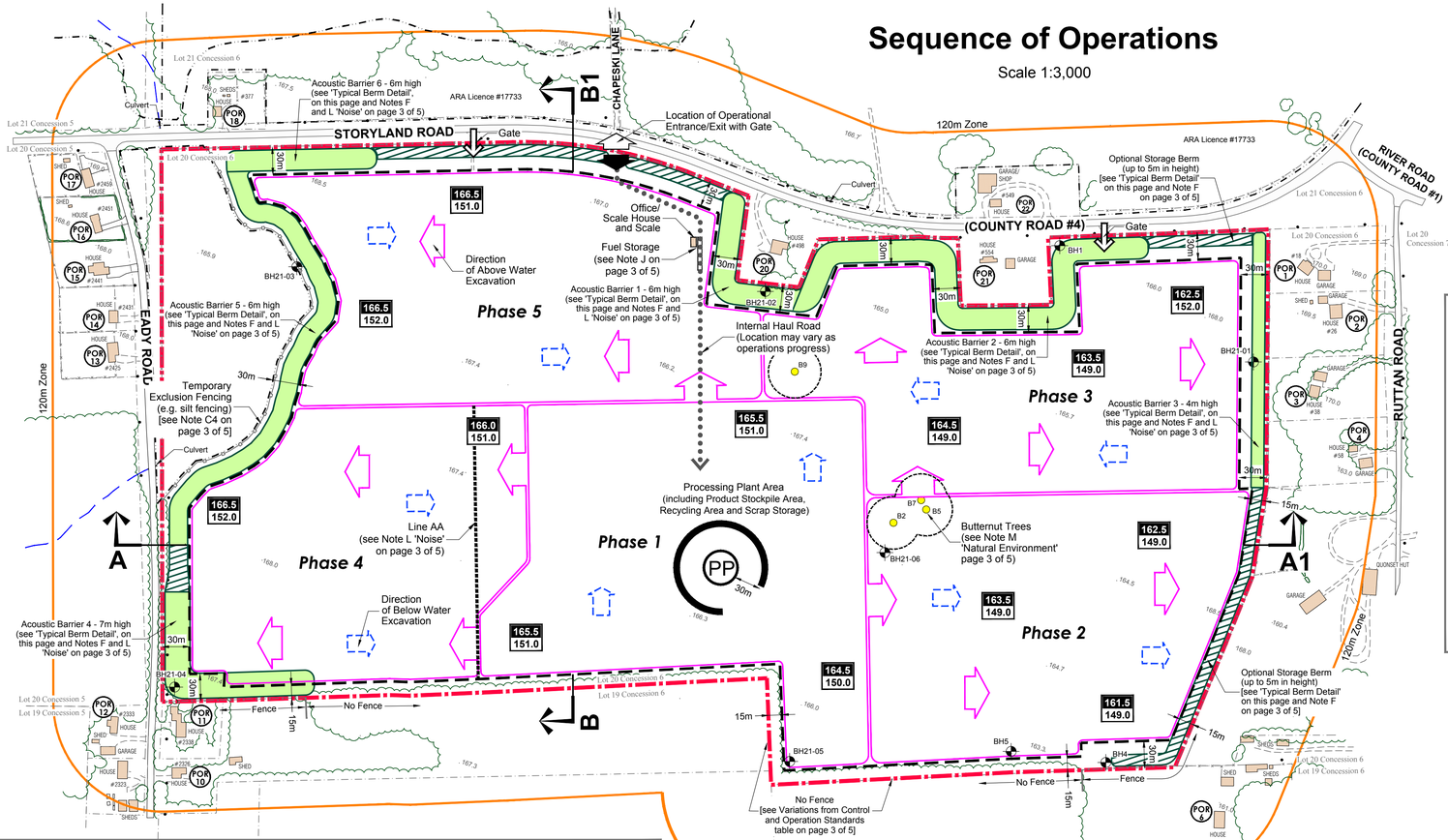
Drawing No.

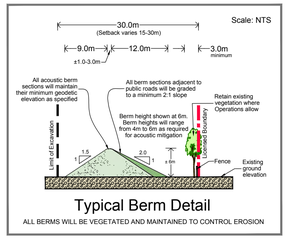
1 OF 5

K:\9137W Renfrew Twp Horton\A\Exfeplan 1of5 November2022.dwg

Sequence of Operations

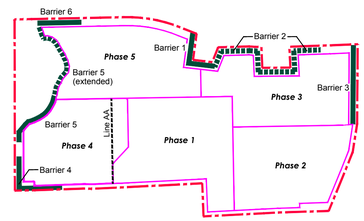
Scale 1:3,000





Phasing of Acoustic Berms

Scale: NTS



Barrier 1 - Prior to commencement of operations in Phase 1 and 2.
Barrier 2/3 - Prior to commencement of extraction operations in Phase 3.
Barrier 4/5 - Prior to commencement of extraction operations west of Line AA in Phase 4.
Barrier 5 (extended) - When operating in Phase 5.
Barrier 6 - Prior to commencement of extraction operations in Phase 5.

Source: Acoustic Assessment for the Proposed Storyland Pit Township of Horton, County of Renfrew, Ontario" November 2022 (Source: Freefield Ltd.)

Phase Diagrams

Scale: NTS

- Proposed Water Body
- Stripping
- Extraction Above Water
- Extraction Below Water
- Progressive Rehabilitation
- Final Rehabilitation

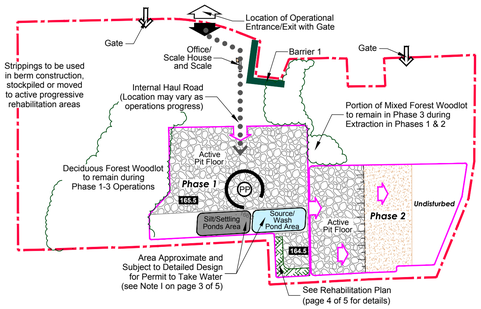


Diagram 1 (Phase 1 & 2 Above Water)

1. Site preparation in Phase 1 to include: confirm that there is existing fencing on the licensed boundary; install 1.2m marker posts on south portion of licensed boundary where the is no fencing; removal of vegetation where applicable; initial stripping of overburden/topsoil and constructing berms as shown; and establishing operational entrance/exit.
2. Build office/scale house and scale as required on-site.
3. Establish fuel storage and equipment parking/highway truck parking areas on-site.
4. Begin Phase 1 and 2 above water extraction in the direction as shown.
5. Construct processing plant. Source/settling ponds may be created during Phase 1 extraction in the approximate areas as shown.
6. Initiate progressive rehabilitation of above water side slopes in Phase 1 as shown.
7. Establish scrap area in the vicinity of the processing plant.
8. Commence site preparation in Phase 3.

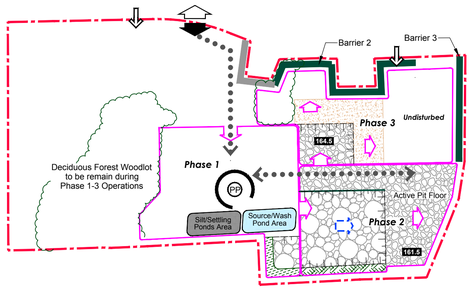


Diagram 2
(Phase 2 Below Water / Phase 3 Above Water)

1. Site preparation in Phase 3 to include: removal of vegetation where applicable; initial stripping of overburden/topsoil and constructing berms as shown;
2. Begin Phase 3 above water extraction in the direction as shown.
3. Extraction below water to occur in the eastern portion of Phase 1 and western portion of Phase 2, in an easterly direction.
4. Continue rehabilitation activities of above water side slopes in Phase 2.
5. Commence site preparation in Phase 4.

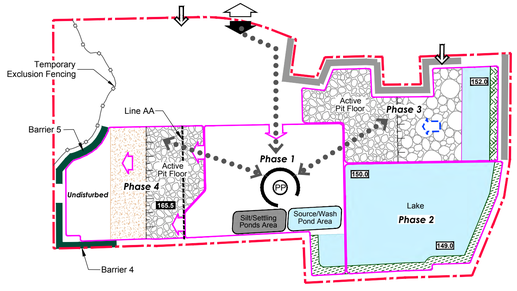


Diagram 3
(Phase 3 Below Water / Phase 4 Above Water)

1. Site preparation in Phase 4 to include: removal of vegetation where applicable; initial stripping of overburden/topsoil, constructing berms and installation of temporary exclusion fencing (e.g. silt fencing) as shown;
2. Begin Phase 4 above water extraction in the direction as shown.
3. Continue below water extraction in Phase 3.
4. Finalize side slope rehabilitation in Phase 2.
5. Commence site preparation in Phase 5.

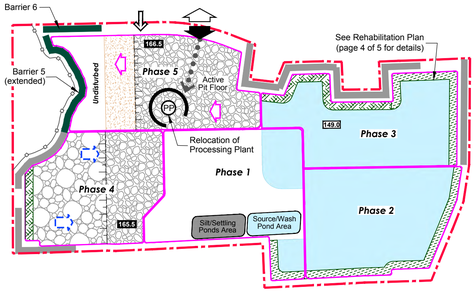


Diagram 4
(Phase 4 Below Water / Phase 5 Above Water)

1. Site preparation in Phase 5 to include: removal of vegetation where applicable; initial stripping of overburden/topsoil and constructing berms as shown;
2. Begin Phase 5 above water extraction in the direction as shown.
3. Commence Phase 4 below water extraction and continue below water extraction in Phase 1.
4. Continue progressive rehabilitation in Phase 3 and begin progressive rehabilitation in Phase 4.
5. Processing Plant to be moved to Phase 5 once material above water table has been mined and sufficient operational area is available.

Not Shown on Phase Diagrams

1. The processing plant will remain on site until the encroachment of below water extraction in Phase 5 requires the removal of the plant.
2. Remove any equipment, scrap, haul roads and buildings on site.
3. Finalize rehabilitation of site (see Rehabilitation Plan on page 4 of 5 for details).

Legal Description

PART OF LOT 20 CONCESSION 6
(geographic township of Horton)
TOWNSHIP OF HORTON
COUNTY OF RENFREW

Legend

- Boundary of Area to be Licensed
- Existing Fence — PAGE WIRE FENCE UNLESS OTHERWISE NOTED
- Existing Spot Elevation — METRES ABOVE SEA LEVEL
- Private Laneway
- Farm/Field Access
- Existing Vegetation
- Drainage Feature
- Unevaluated Wetland — ONTARIO GEOHUB OPEN DATA
- Monitoring Well Locations — GOLDER 2021
- Category 3 Butternut Trees — FROM McKINLEY ENVIRONMENTAL (2022)
- Cross Sections — SEE PAGE 4 OF 4 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Excavation — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Licensed Boundary — ARA LICENCE #17733
- General Direction of Above Water Excavation — (SEE NOTES ON THIS PAGE)
- Operational Access — MAINTAINED BY A GATE WHICH WILL BE CLOSED WHEN PIT IS NOT IN OPERATION
- Direction of Below Water Excavation — SEE NOTES ON THIS PAGE/PAGE 3 OF 5
- Acoustic Berm — SEE "TYPICAL BERM DETAIL" AND NOTES ON THIS PAGE/PAGE 3 OF 5
- Optional Storage Berm — SEE "TYPICAL BERM DETAIL" AND NOTES ON THIS PAGE/PAGE 3 OF 5
- Elevation — ABOVE WATER DEPTH OF EXTRACTION; MAXIMUM DEPTH OF BELOW WATER EXTRACTION/PIT FLOOR
- Internal Haul Road — LOCATION TO VARY AS OPERATIONS PROGRESS
- Receptor Locations — WITHIN 120m OF THE SITE

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
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MNRF Approval Stamp

Stamp

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Project

Storyland Pit

ARA Licence Reference No.

Pre-approval review:

For Submittal to MNRF - November 2022

Plot Scale: 1:3 [1mm = 3 units] MODEL

Plan Scale: **See Plan**

SCALE
50 0 50 100
METRES

Drawn By: D.G.S.

Checked By: N.D.

File No.: **9137W**

File Name

OPERATIONAL PLAN

Drawing No.

2 OF 5

K:\9137W Renfrew Twp Horton\A\Operplan 2of5 November2022.dwg

A. General
1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class A licence for a pit below the ground water table and follows the Aggregate Resources of Ontario: Site Plan Standards August 2020.
2. Area Calculations:
   Licence Area: 69.5 hectares (172 acres)   Limit of Excavation: 55.9 hectares (138 acres)
3. The maximum number of tonnes of aggregate to be removed from this site is 1,000,000 tonnes in any calendar year.
4. An office/scale house, scale and processing plant may be located on the site as shown on the Sequence of Operations drawing on page 2 of 5.
5. The elevation of the on-site groundwater table ranges from 165 masl in the western portion of the site to 160 masl in the eastern portion of the site The existing water table elevations are shown on each cross section on page 5 of 5.
6. Setbacks will be as shown and labelled on the Sequence of Operations Diagram (page 2 of 5) and on the Existing Features Plan (page 1 of 5).
7. Agricultural production may continue in areas not under extraction.
8. Source Water Protection: The site is not located in a Source Water Protection Area.

B. Hours of Operation
1. Operation of the pit may take place on a 24 hour basis.

C. Site Access and Fencing
1. The existing field accesses may be utilized for monitoring, setback maintenance and agricultural access. The accesses shall be gated, kept closed during hours of non-operation and shall be maintained throughout the life of the licence. Aggregate trucks shall not be permitted to access the site at these locations.
2. The site shall be accessed through the operational entrance/exit which will be opposite to Chapeski Lane and it will be gated.
3. The majority of the site is currently fenced. Portions of the south licence boundary within the existing woodlot will not be fenced (see Note M 'Variations from Control and Operation Standards'). Where there is no fencing, 1.2m marker posts will be installed that are visible from one to the other.
4. Temporary exclusion fencing (e.g. silt fencing) shall be installed along the west portion of the limit of extraction between the area to be disturbed and the wetlands to the west, prior to commencement of work in Phase 4 (see Note L 'Natural Environment').

D. Drainage
1. Drainage of undisturbed areas will continue and be in the directions shown on the Existing Features drawing on page 1 of 5.

E. Site Preparation
1. Prior to site preparation, a Spills Contingency Plan shall be developed to address any potential spills from equipment on-site [O.Reg 244/ 97 Section 0.12 (3) 2].
2. Timber resources will be salvaged for use as saw logs, fence posts and fuel wood where appropriate. Non-merchantable timber, stumps and brush may be used in for aquatic habitat enhancement or mulched for use in progressive rehabilitation. Excess material not required for uses mentioned above will be burned (with applicable permits).
3. Topsoil and overburden shall be stripped and stored separately in accordance with the Sequence of Operations diagram.
4. Excess topsoil and overburden not required for immediate use in the construction of acoustic berms or rehabilitation, may be temporarily stockpiled inside the licensed area. Topsoil and overburden stockpiles shall be located within the limit of excavation and remain a minimum of 30 metres from the licence boundary and 90 metres from a property with residential use.
5. Temporary topsoil and overburden stockpiles which remain for more than one year shall have their slopes vegetated to control erosion. Seeding shall not be required if these stockpiles have vegetated naturally in the first year.

F. Berms and Screening
1. Berms shall be constructed as specified in the locations shown on the Sequence of Operations (see also 'Phasing of Acoustic Berms' Detail on page 2 of 5). The heights shown are the minimum required for acoustic berms.
2. Berm side slopes shall not exceed 1.5:1 on the interior (extraction) side and 2:1 on the exterior side facing a public road. Berms that are not adjacent to a public road shall have side slopes not exceeding 1:5:1. See 'Typical Berm Detail' on page 2 of 5.
3. Berms shall not be located within three (3.0) metres of the licence boundary.
4. All proposed berms will be constructed in accordance with the 'Typical Berm Detail' on page 2 of 5 and will be vegetated and maintained to control erosion using a low maintenance grass/legume seed mixture (e.g. MTO Seed Mix) composed of Creeping red Fescue, Perennial Ryegrass, Kentucky Bluegrass and White Clover. Temporary erosion control will be implemented as required.
5. Berms shall be maintained (vegetated to prevent erosion) throughout the operational life of the pit.
6. Optional storage berms may fill in gaps between acoustic berms where applicable.
7. Existing vegetation within the setbacks shall be maintained except where noise attenuation berms are required or to accommodate truck entrance.
8. Berms that encroach within the limit of extraction shall be removed, and the underlying aggregate may be extracted, as part of final extraction/rehabilitation of the site.

G. Extraction Sequence
1. The operational plan depicts a schematic operations sequence for this property. Phases do not represent any specific or equal time period. The direction of extraction will be in accordance with the Sequence of Operations diagram shown on page 2 of 5. All extraction, processing and transportation equipment operating within these Phases shall comply with the restrictions identified in Note L 'Noise'.
2. Rehabilitation will be progressive and proceed as limits of extraction (area and depth) are reached. Notwithstanding the operation and rehabilitation notes, demand for certain products or blending of materials may require minor deviations in the extraction and rehabilitation sequence. Any major deviations from the operations sequence shown will require approval from MNRF.
3. See Phase Diagrams on page 2 of 5 for details.

H. Extraction Details
1. The maximum depth of extraction is as shown as spot elevations and extraction will occur in up to 2 lifts through the five phases as shown on the Sequence of Operations Diagram on page 2 of 5 and in accordance with the Ministry of Labour requirements. The proposed pit floor will be located at an elevation of 149-152 masl or 10 m to 14 m below the existing ground surface.
2. Aggregate stockpiles will be located on the pit floor (interim elevations) and will move throughout the life of the operations of the pit. Stockpiles will not be located within 30m of the Licensed boundary.
3. Internal haul road locations will vary as extraction progresses and will be located on the above water table (interim) pit floor.

I. Equipment and Processing
1. The equipment used on site for aggregate operations and may include: Wash Plant, Extraction Loaders or Excavators, Dragline, Cutter Suction Dredge and Trucks.
2. The wash plant including associated activities (e.g. source pond, silt pond etc.) is planned to be located in Phase 1 subject to detailed design and applicable Permit to Take Water.

J. Fuel Storage
1. Fuel or associated products may be stored on site. See Sequence of Operations drawing on page 2 of 5. The licensee or permittee shall ensure that fuel storage tanks are installed and maintained in accordance with the *Technical Standards and Safety Act, 2000* [O.Reg 244/ 97 Section 0.12 (3) 1].

K. Scrap and Recycling
1. Temporary scrap storage will be located within the processing plant area. Scrap will only include materials derived from the operation of the pit such as scrap metal or lumber, discarded machinery and equipment. Scrap will not be located within 30m of any body of water or within 30m of the boundary of the site. All scrap will be removed on an ongoing basis. The property will be kept in an orderly condition.
2. Recycling activities:
   - may occur on site and will be in close proximity to the processing plant in Phase 1 or Phase 5.
   - recycling activities shall remain accessory to the pit operation and once extraction ceases, recycling activities will be no longer permitted
   - shall not interfere with the operational phases of the site or rehabilitation of the site [O.Reg 244/ 97 Section 0.13 (1) 32]

L. Report Recommendations
1. **Noise: "Acoustic Assessment for the Proposed Storyland Pit Township of Horton, County of Renfrew, Ontario" November 2022 (Source: Freefield Ltd.)**

Noise Barriers and Berms
- a. Noise barriers and berms are to be provided as per Table 7 and Figure 13, 14 and 15 in the report.
- b. Noise barriers shielding receptors on vacant lots zoned for potential noise sensitive use are only required following development of a noise sensitive use.
- c. Noise shielding portable equipment may be progressively established to shield line of site from equipment operation to the identified receptors.
- d. Noise barriers and berms are to be solid, having no gaps, and are to have a surface density of no less than 20 kg/m2. Examples of suitable barriers or berms are as follow:
  - Lift face or existing terrain;
  - Earth, gravel or aggregate berms or stockpiles;
  - Concrete or brick walls;
  - Commercial noise barriers;
  - Shipping containers or buildings

Wash Plant

The operation of the wash plant and associated diesel generator may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:
- a. The wash plant is to be located on the pit floor at a maximum elevation of 165.5 mASL in locations shown in Figure 2 in the report.
- b. Noise barriers are to be provided as per Table 7 and Figure 14 and 15 in the report.
- c. The maximum outdoor sound power of the generator, if used to provide power to the wash plant, must not exceed the levels given in Table 2 in the report. To achieve these ratings the generator will likely need to be fitted with an exhaust silencer that meets the minimum insertion loss requirements listed in Table 8 in the report. The silencer is to be located inside the enclosures or as close as possible to the location where the exhaust exits the enclosures with the duct material between the silencer and the generator constructed of 16-gauge weather resistant metal. The silencers shall have a high transmission loss casing.
- d. Item c. above does not apply if hydro is used to provide power to the plant

Loaders and Excavators
- a. The operation of the loaders may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:
  - During the daytime period (07:00 to 19:00): A maximum of three loaders or excavators may be in operation concurrently with a maximum of two loaders or excavators in operation at the extraction face.
  - During the evening and nighttime period (19:00 to 07:00): A maximum of two loaders or excavators may be in operation concurrently with a maximum of one loader or excavator in operation at the extraction face.

Trucks

The loading and shipping of product using highway trucks may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:
- When operating on-site, highway trucks shall not exceed 20 km/h and shall not use compression braking (Jake Brakes).

Portable Construction Equipment

Portable construction equipment used for site preparation (e.g. land clearing and construction of berms) and rehabilitation shall comply with MECP Publication NPC-115, Construction Equipment, August 1978. (This publication gives noise standards to be met by construction equipment in Ontario.) Site preparation and rehabilitation activities shall take place only during daytime hours (07:00 - 19:00).

New Process

If a new process is introduced to the site, then this process shall be assessed by a qualified acoustical consultant prior to commissioning. Noise mitigation measures shall be reviewed, and altered, if necessary, to ensure that MECP sound level limits are met at all points of reception.

2. **Natural Environment: "Storyland Road Aggregate Development Natural Environment Report & Environmental Impact Statement" November 2022 (Source: McKinley Environmental Solutions)**

Tree Protection Mitigation Measures:

Soil compaction, vegetation damage, intrusion of construction equipment and other potential impacts on the root systems of trees adjacent to the edge of the development area will be avoided by restricting grading, placement of fill, excavation, and other site alteration activities to the development area. This will be achieved by providing construction fencing or another form of suitable boundary definition to clearly mark the boundaries between the edge of the development area and the retained features. The boundaries between the development area and the retained features will be marked during each phase of tree clearing and operation.

Staff will be provided with the following instructions when clearing trees and vegetation:
- Mark the edge of the tree clearing area to ensure only designated trees are removed. Protect the Critical Root Zone (CRZ) of retained trees, where the CRZ is established as being 10 cm from the trunk of a tree for every centimeter of trunk diameter at breast height (dbh). The CRZ is calculated as dbh x 10 cm;
- When trees to be removed overlap with the CRZ of trees to be retained, cut the roots at the edge of the CRZ and grind down the stumps after tree removal. Do not pull out the stumps. Ensure there is not root pulling or disturbance of the ground within the CRZ;
- If roots must be cut, roots 20 mm or larger should be cut at right angles with clean and sharp horticultural tools;
- Do not place any material or equipment within the CRZ of any retained tree;
- Do not attach any signs, notices, or posters to any retained tree;
- Do not damage the root system, trunk, or branches of any retained tree; and
- Ensure that exhaust fumes from all equipment are directed away from any retained tree canopy

Wetland Setback:

30 m wide setback will be maintained from the edge of the Mixed Willow Deciduous Thicket Swamp during the development of the Site. A Noise Attenuation Berm (acoustic barrier) will be installed within the 30 m wide wetland setback. The Noise Attenuation Berm will be vegetated and it will be constructed as close to the limit of the extraction area as possible.

Butternut Tree Regulatory Requirements:

Three (3) Category 2 (retainable) Butternut Trees (endangered) were found within the Site (Refer to Section 3.5.3 of the report for additional details). All three (3) Category 2 Butternut Trees will be removed during the development of the Site. The rules and regulations of the Ontario Endangered Species Act (ESA) allow proponents to address requirements for up to fifteen (15) Category 2 Butternuts Trees through the Ministry of Environment, Conservation, and Parks (MECP) Online Impact Registration Process. The MECP Online Impact Registration Process for the three (3) Category 2 Butternut Trees has been completed (Registration #M-103-3428458887, refer to Appendix D of the report). The rules and regulations of the Ontario ESA require projects that are registered through the MECP Online Impact Registration Process to compensate for impacts to Butternut Trees by planting Butternut seedlings. A Butternut planting program will be undertaken to compensate for the impacts to the Category 2 Butternut Trees.

Four (4) Category 3 (archivable) Butternut Trees were found within the Site (Refer to Section 3.5.3 for additional details). The rules and regulations of the Ontario ESA allow proponents to address requirements for up to five (5) Category 3 Butternuts Trees through the MECP Online Impact Registration Process. Per the rules and regulations of the Ontario ESA, a 25 m wide setback from the Butternut Trees is required in order to avoid impacting the trees during development activities. During the initial phases of the development, a 25 m wide setback will be maintained surrounding the four (4) Category 3 Butternut Trees in order to avoid impacting the trees. If required, an authorization under the Ontario ESA will be obtained prior to undertaking any development activities which may negatively impact the four (4) Category 3 Butternut Trees.

Construction Stage Mitigation Measures:

Construction stage mitigation measures for Species at Risk (SAR) and wildlife will include the following:

Pre-Stressing: Prior to vegetation removal, the area will be pre-stressed by traversing the Site with a loud noise such as an excavator horn. This will encourage wildlife to leave the area;

Tree Clearing Direction: The trees will be cleared from the northwest to the southeast (within each phase of the development). This will encourage any wildlife fleeing the development area to move towards the adjacent forest located south and southeast of the Site;

Temporary Exclusion Fencing: Prior to the commencement of work in Phase 4 of the development, it is recommended that temporary exclusion fencing (e.g. toed-in silt fencing) should be installed between the edges of the development area and the Mixed Willow Deciduous Thicket Swamp. The development phasing is shown above in the Operational Plan. The temporary exclusion fencing will mitigate the risk of reptiles, amphibians and other wildlife entering the development area, while also providing a sediment and erosion control function.

Vehicle Operation: Vehicles and equipment are to be operated on Construction Travelways (e.g. roads within the development area) at a speed at which drivers are able to stop safely to avoid wildlife;

Species at Risk (SAR) Encounters: If a Species at Risk (SAR) is encountered in the development area, construction in the vicinity must be stopped immediately and measures must be taken to ensure that the SAR is not harmed. The project biologist and the Ministry of Environment, Conservation, and Parks (MECP) must be contacted to discuss how to proceed prior to the recommencement of work;

General Provisions: General provisions for the management of the development area include the following:

Do not harm, feed, or unnecessarily harass wildlife;

Drive slowly and avoid hitting wildlife; and

Keep the development area tidy and free of garbage and food wastes. Secure all garbage in appropriate sealed containers.

Timing Windows: The core migratory bird nesting season is defined as April 15th to August 15th each year. The clearing of trees and shrubs must be undertaken outside of the core migratory bird nesting season.

3. **Archaeology: "Stage 1 Archaeological Assessment: Storyland Road, Part Lot 20, Concession 6, Geographic Township of Horton, County of Renfrew, Ontario" March 2021 (Source: Paterson Group) and "Stage 2 Archaeological Assessment: 432 Storyland Road, Part Lot 20, Concession 6, PIN 57271-0024 Geographic Township of Horton, County of Renfrew, Ontario" June 2021 (Source: Matrix Heritage Inc.)**
   - Based on the results of this investigation it is recommended that: No further archaeological study is required for the subject property as delineated in Map 1 of the report (Stage 2 assessment)

4. **Hydrogeology: "Level 1 and Level 2 Water Report Proposed Storyland Pit, Horton Township Ontario" November 2022 (Source: WSP Golder)**

   The following water level monitoring program shall be implemented by the Licensee:
   - Quarterly water levels shall be collected from BH21-01, BH21-02, BH21-03, BH21-04, BH-1 and SW-1. A datalogger will be installed at SW-1 to record water level measurements at least once per day.
   - In the event of a well interference complaint, the Licensee shall implement the Complaints Response Program outlined in Section 6.0 of this report.

Maximum Predicted Water Table Report: "Proposed Storyland Pit Horton Township, Ontario" November 2022 (Source: WSP Golder)

Based on the available groundwater elevation data, the maximum predicted water table on the site is 165.3 metres asl on the western edge of the extraction area corner (as measured at BH21-03). Based on the groundwater elevation data measured at BH4 located on the southeastern side of the site, the water table slopes down moving from west to southeast, and the maximum predicted water table on the east side of the site is approximately 159.9 metres asl.

5. **Traffic: "Traffic Impact Assessment, Proposed Mineral Extraction Site 432 Storyland Road, County of Renfrew" November 3, 2022 (Source: Castleglenn Consultants Ltd.)**
   - The preferred access location from a traffic operational perspective offering the least disruption to surrounding lands and residents was found to be directly opposite the Storyland Road/Chapeski Lane intersection. The proposed access does not require any auxiliary slip nor storage lanes, but remains to be designed in terms of throat length, tapers, curve radii and drainage accommodation.

M. Variations from Control and Operation Standards

No.	O.Reg 244/97 Section 0.13	Variation	Rationale
1	(3)(a)	Fencing is not required along a portion of the southern boundary that runs through the woodlot.	Lands are not publicly accessible which will limit potential access to this area of the site. Furthermore, this variation will avoid unnecessary disturbance to the woodland. A portion of the south licensed boundary will be demarcated by 1.2m high marker posts that are visible from one to the other.
2	(1)19i	Below water side slopes may vary from a slope that is at least three horizontal metres for every vertical metre (3:1). These will slope at minimum to the natural angle of repose.	Slopes will be no steeper than a 2:1 slope below water or the natural angle of repose.

Legal Description

PART OF LOT 20 CONCESSION 6
(geographic township of Horton)
TOWNSHIP OF HORTON
COUNTY OF RENFREW

Site Plan Amendments

No.	Date	Description	By

MHBC
PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
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MNRF Approval Stamp

Stamp

AUTHORIZED BY THE MINISTRY OF NATURAL RESOURCES AND FORESTRY PURSUANT TO SEC. 8(4) OF THE AGGREGATE RESOURCES ACT
NEAL DeRUYTER
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Rob Pierce
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Project

Storyland Pit

ARA Licence Reference No.

Pre-approval review:

For Submittal to MNRF - November 2022

Plan Scale: **NTS**

Plot Scale 1:3 [1mm = 3 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. **9137W**

File Name **OPERATIONAL NOTES PLAN**

Drawing No. **3 OF 5**

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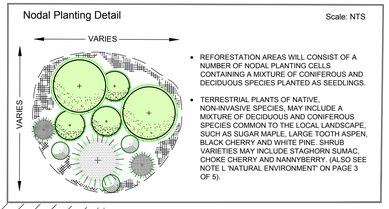
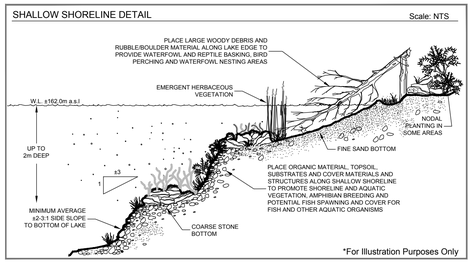
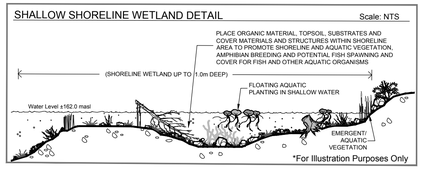
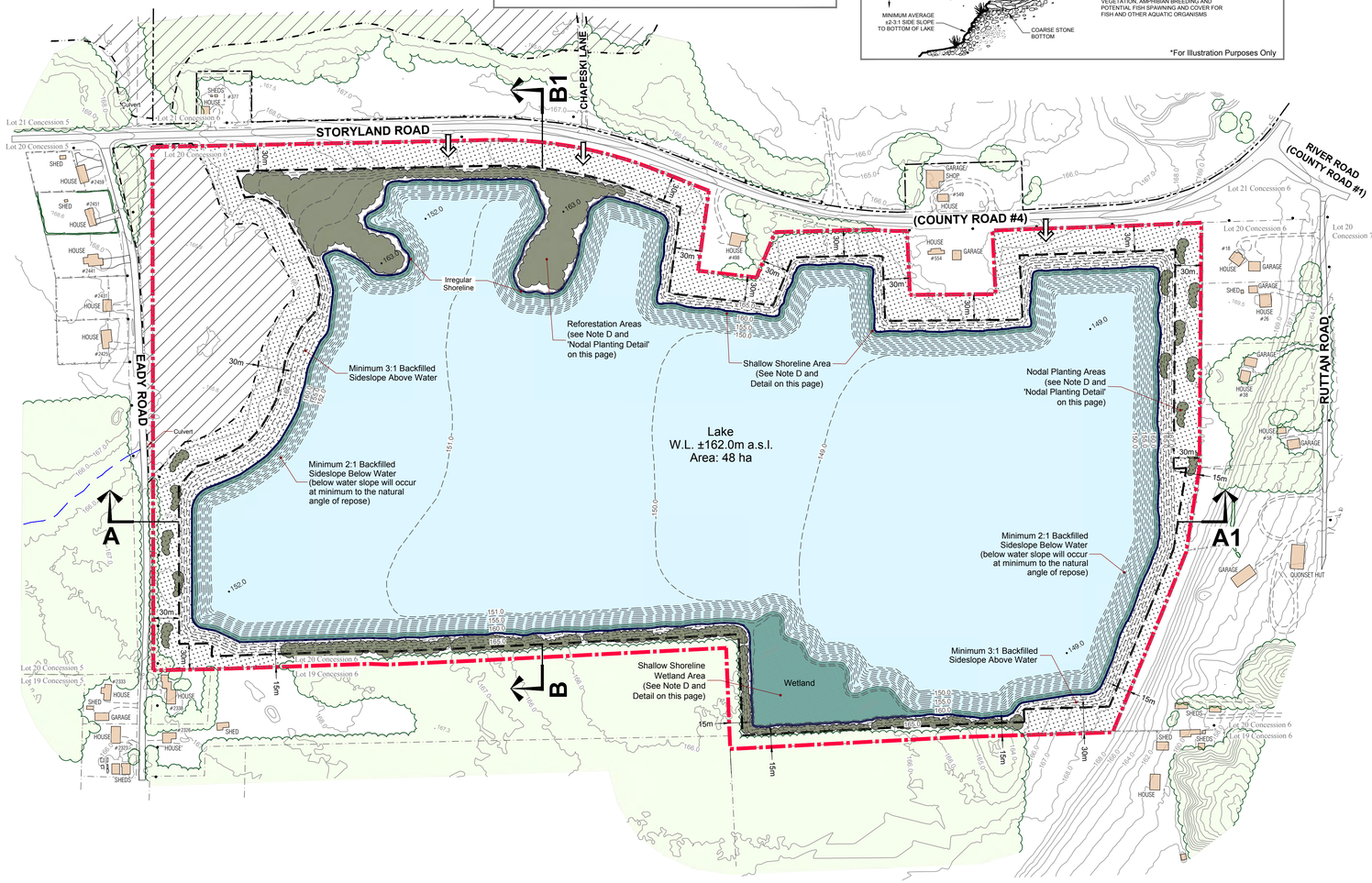








A. General

1. Area Calculations: Licence Area: 69.5 hectares (172 acres)
   Limit of Excavation: 55.9 hectares (138 acres)
2. The rehabilitated landform of this site will include: lake, shallow shoreline and shallow shoreline wetland areas, reforestation, various side slope treatments and nodal tree and shrub planting areas.

B. Phasing

1. The proposed Storyland Pit will be rehabilitated on a progressive basis, corresponding to the operational progression of the pit excavation, to form a lake at final rehabilitation.
2. As the pit is excavated to its maximum, or any other/lesser terminal limits, both horizontally and vertically on a lift-by-lift basis, progressive rehabilitation will follow provided the subject area is of an appropriate area to undergo rehabilitation (See Note G on page 3 of 5 for details).
3. The excavation perimeter will be fully side sloped at a maximum 2:1 (from original ground to floor) at a portion of the north, the entire west and the entire south side slope areas. Sloping will occur as the limits of the pit excavation are reached. See Rehabilitation Plan drawing and Note D on this page.
4. Side slopes will be vegetated where located above the final water level of the pit lake and will include nodal tree and shrub plantings in suitable locations in order to introduce a diversity of native vegetation types and species that are anticipated to spread around the rehabilitated side slopes (see Note D and 'Nodal Planting Detail' on this page).

C. Slopes and Grading

1. Topsoil and overburden will be used in the progressive rehabilitation of the side slope areas. Overburden and/or imported material will be used to backfill pit faces to create the topography of the side slopes (i.e. 3:1 slope). Above water side slope areas that will be vegetated will be covered with a minimum 15 cm of topsoil/organic matter prior to planting.
2. Importation of fill/excess soil:
   a. Excess soil, as defined in Ontario Regulation 244/97 may be imported to this site to facilitate the following rehabilitation:
      i. Establish final grades as described on the site plan
      ii. Top dressing to establish vegetation
   c. The quality of excess soil imported to the site for final placement must be equivalent to or more stringent than the applicable excess soil quality standards as determined in accordance with Ontario Regulation 244/97 as amended from time to time and must be consistent with the site conditions and the end use identified in the approved rehabilitation plan.
   d. Where a qualified person is retained or required to be retained in accordance with Ontario Regulation 244/97, the quality, storage, and final placement of excess soils shall be done according to the advice of the qualified person.
   e. Excess soil imported to facilitate rehabilitation as described on this site plan shall be undertaken in accordance with Ontario Regulation 244/97 under the Aggregate Resources Act, as amended from time to time.

D. Proposed Vegetation and Rehabilitated Features

1. All planting and seeding will consist of native species. All ground covers on side slopes will be established as part of the phased stripping operations that proceed extraction and will be maintained and replaced as soon as possible if the vegetative cover fails to establish itself to control erosion.

2. *Shallow Shoreline Area Habitat Creation*
   Shallow shoreline areas will be created around the perimeter of the lake. Shallow shoreline habitats shall be created up to 2 m deep and shall include habitat features such as boulders, submerged logs, etc. Organic material and topsoil shall be added to the shoreline areas to promote shoreline vegetation, and the placement of basking logs along the shoreline is recommended to create turtle basking areas, waterfowl nesting areas and bird perching sites (see "Shallow Shoreline Detail" on this page). Shoreline and Aquatic plantings will coincide with the final stages of site rehabilitation. Species suitable for aquatic plantings are listed in the species planting list on this page.

3. *Shallow Shoreline Wetland Habitat*
   Wetland areas will be created along the shoreline in the southeast part of the lake. These areas will be backfilled to the desired elevations and plants shall be established by broadcast seeding an Ontario Native Wetland/Riparian Restoration Seed Mix.

4. *Terrestrial Habitat Creation on sideslope and in setback areas*
   Side slope areas above the water table will be covered with a minimum 15 cm of topsoil/organic matter and planted/seeded. Any undisturbed setback areas will also be planted in nodal plantings and seeded with Ontario Native Grassland Seed Mix.

5. *Reforestation and Nodal Plantings*
   Terrestrial nodal plantings on the side slope and within the setback areas and reforestation areas shall include a mixture of coniferous and deciduous tree and shrub species to promote species diversity and provide a variety of species to compensate for any substrate deficiencies (see nodal planting detail on this page). Recommended species are outlined in the species planting list. The establishment of nodal planting areas will occur progressively and follow the sequence of excavation and side slope/setback grading and seeding. Nodal planting areas are conceptually shown on the drawing.

6. *Rehabilitated Landform*
   The proposed rehabilitation includes an opportunity to enhance the biological diversity of the local landscape by providing features that will attract migratory waterfowl and terrestrial and aquatic habitat features that will be of value to locally resident wildlife. Rehabilitation of this site involves the creation of 48 ha of lake and terrestrial landform comprised of above water overburden side slopes and setback areas. Some of the rehabilitated area will be rehabilitated to forest cover through nodal tree and shrub plantings as shown conceptually on this plan. The final landform will be in accordance with the drawing as shown on this page.

E. Drainage

1. Final surface drainage will follow the rehabilitated contours as shown and be directed towards the post-extraction lake and existing wetland.

F. Final Rehabilitation

1. No buildings or structures associated with aggregate operations will remain on site.
2. The water level of the proposed lake (±162m a.s.l.) and the post- extraction ground water table, are as shown on pages 1, 4 and 5 of 5 as per hydrogeological/ hydrological assessment.

Species Planting List - Recommended Species

Nodal Plantings/Reforestation	Wetland/Shoreline Areas	Above Shoreline Area
Sugar Maple	Ontario Native Wetland/ Riparian Restoration Seed Mix	Ontario Native Grassland Seed Mix
Large Tooth Aspen		
White Pine		
Basswood		
Black Cherry		
Ironwood		
Red Oak		
White Birch		
Staghorn Sumac		
Choke Cherry		
Nannyberry		
Red Elderberry		

Legal Description

PART OF LOT 20 CONCESSION 6
(geographic township of Horton)
TOWNSHIP OF HORTON
COUNTY OF RENFREW

Legend

- Boundary of Area to be Licensed
- Contour with Elevation — METRES ABOVE SEA LEVEL
- Existing Fence — PAGE WIRE FENCE UNLESS OTHERWISE NOTED
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE.
- Public Road (Paved) / Public Road (Gravel)
- Private Laneway
- Field Access
- Existing Vegetation
- Drainage Feature
- Unevaluated Wetland — ONTARIO GEOHUB OPEN DATA
- Cross Sections — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Excavation — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Licensed Boundary — ARA LICENCE #17733
- Proposed Contour — METRES ABOVE SEA LEVEL (m A.S.L.)
- Proposed Elevation — REHABILITATED ELEVATION
- Nodal Planting Areas — LOCATION APPROXIMATE
- Post Extraction Lake
- Shallow Shoreline Area — (SEE DETAIL ON THIS PAGE)
- Grassland Area — (SEE NOTE D ON THIS PAGE)

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

MNRF Approval Stamp

Stamp

NEAL SWUTTER — RPF

north

Applicant

TOMLINSON

R. W. Tomlinson Limited
100 CitiGate Drive, Ottawa Ontario, K2J 6K7
Tel: (613) 822-1867 Fax: (613) 822-6844

Rob Pierce
R.W. Tomlinson Limited
Vice President Planning and Development

Project

Storyland Pit

ARA Licence Reference No.

Pre-approval review:

For Submittal to MNRF - November 2022

Plan Scale **1:3,000 (Arch D)**

SCALE
50 0 50 100
METRES

Plot Scale 1:3 [1mm = 3 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. **9137W**

File Name

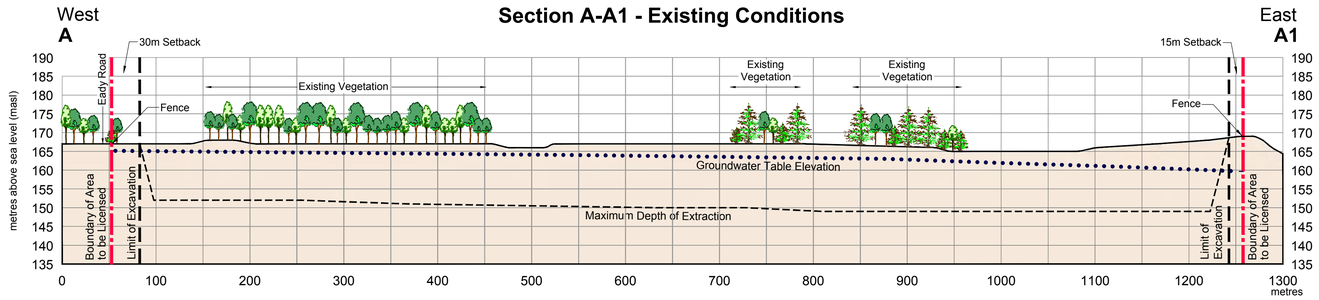
REHABILITATION PLAN

Drawing No.

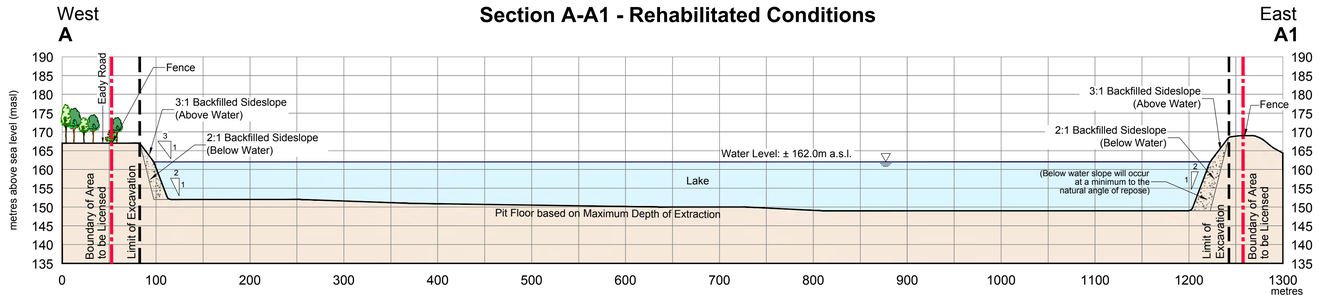
4 OF 5

K:\9137W Renfrew Twp Horton\A\Rehaplan 4of5 November2022.dwg

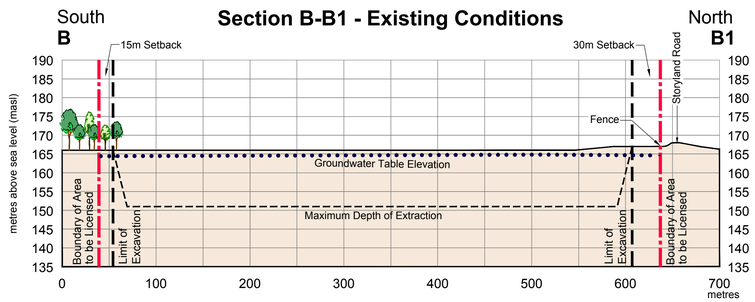
Section A-A1 - Existing Conditions



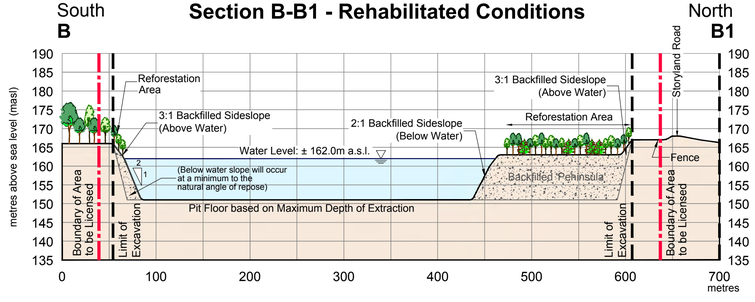
Section A-A1 - Rehabilitated Conditions



Section B-B1 - Existing Conditions



Section B-B1 - Rehabilitated Conditions

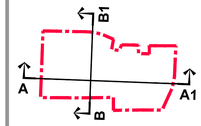


Legal Description

PART OF LOT 20 CONCESSION 6
(geographic township of Horton)
TOWNSHIP OF HORTON
COUNTY OF RENFREW

Legend

- Boundary of Area to be Licensed
- Limit of Excavation
  ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Groundwater Table
  (SEE NOTE 2, THIS PAGE)
- Maximum Depth of Extraction
- Vegetation/Trees



Cross Sections
SEE PAGES 1,2 & 4 OF 5 FOR PLAN VIEW LOCATION OF CROSS SECTIONS

General Notes

1. THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT (ARA) FOR A CLASS A LICENCE PIT BELOW THE GROUND WATER TABLE. THIS SITE PLAN FOLLOWS THE AGGREGATE RESOURCES OF ONTARIO: SITE PLAN STANDARDS AUGUST 2020.
2. THE GROUNDWATER TABLE ELEVATION ON SITE RANGES BETWEEN 165 MASL IN THE WESTERN PORTION OF THE SITE TO 160 MASL IN THE EASTERN PORTION OF THE SITE. THE EXISTING WATER TABLE ELEVATIONS ARE SHOWN ON EACH CROSS SECTION ON PAGE 5 OF 5. GROUNDWATER TABLE ELEVATIONS PROVIDED BY WSP GOLDER (NOVEMBER 2022).
3. LICENCE AREA 69.5 hectares (172 acres)
   LIMIT OF EXTRACTION 55.9 hectares (138 acres)
4. ALL MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES.

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

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Storyland Pit

ARA Licence Reference No.

Pre-approval review:

For Submittal to MNRF - November 2022

Plan Scale **1:3,000 Horizontal (Arch D)**
4x Exaggeration (vertical)

HORIZONTAL SCALE
50 0 50 100 METRES

Plot Scale 1:3 [1mm = 3 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. **9137W**

File Name

CROSS SECTION PLAN

Drawing No.

5 OF 5

K:\9137W Renfrew Twp Horton\A\Xsecplan 5of5 November2022.dwg

APPENDIX "B"

BACKGROUND TRAFFIC COUNTS

Storyland Road and River Road

Morning Peak Hour Results (June 30, 2021)

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Total
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
	From / To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1	7:00 7:15	0	1	0	0	0	4	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	9	35	1	0	0	10	45	55	55
2	7:15 7:30	0	3	0	0	0	2	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	3	37	0	3	0	3	52	55	110
3	7:30 7:45	0	2	0	0	0	1	0	0	1	2	11	0	0	0	0	0	0	0	0	0	0	0	0	0	27	3	3	0	5	45	50	160
4	7:45 8:00	1	3	0	0	0	0	0	0	2	1	12	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	2	47	49	209
5	8:00 8:15	0	4	0	0	1	0	0	0	2	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	26	2	4	0	6	42	48	202
6	8:15 8:30	2	6	0	0	0	3	0	0	1	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	2	0	3	59	62	209
7	8:30 8:45	0	3	0	0	0	3	0	0	1	1	9	0	0	0	0	0	0	0	0	0	0	0	0	2	23	0	7	0	3	46	49	208
8	8:45 9:00	0	4	0	0	0	1	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	1	0	0	41	41	200
1	**7:00 8:00**	*<<<Calculated Peak Hour*																															
	AM Peak Period	3	26	0	0	1	14	0	0	9	8	70	0	0	0	0	0	0	0	0	0	0	0	0	14	238	6	20	0	32	377	409	
	Heavy Vehicle %	10%		#DIV/0!		7%			0%		10%		#DIV/0!			#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		6%		23%			8%		
	AM Peak Hour	1	9	0	0	0	7	0	0	5	3	33	0	0	0	0	0	0	0	0	0	0	0	0	12	129	4	6	0	20	189	209	
	Heavy Vehicle %	10%		#DIV/0!		0%			0%		8%		#DIV/0!			#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		9%		40%			10%		
	AM Peak Hr Total	10		0		7			5		36		0			0		0		0			0		141		10						
	Peak Hr Approach To	17							41							0							151										

Afternoon Peak Hour Results (June 30, 2021)

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Total
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
	From / To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
7	3:30 3:45	0	9	0	0	0	2	0	0	2	4	48	0	0	0	0	0	0	0	0	0	0	0	0	1	18	0	3	0	5	82	87	87
8	3:45 4:00	0	3	0	0	0	1	0	0	2	1	40	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	8	0	1	75	76	163
9	4:00 4:15	0	8	0	0	0	0	0	0	4	1	51	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	4	0	1	92	93	256
10	4:15 4:30	0	9	0	0	0	1	0	0	3	3	55	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	6	0	3	101	104	360
11	4:30 4:45	0	11	0	0	0	4	0	0	2	0	59	0	0	0	0	0	0	0	0	0	0	0	0	1	29	0	5	0	1	110	111	384
12	4:45 5:00	0	6	0	0	0	1	0	0	2	0	48	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	2	0	0	85	85	393
13	5:00 5:15	0	6	0	0	0	2	0	0	2	0	44	0	0	0	0	0	0	0	0	0	0	0	0	2	23	0	1	0	2	78	80	380
14	5:15 5:30	0	10	0	0	0	1	0	0	1	2	42	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	9	0	2	90	92	368
15	5:30 5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	257
16	5:45 6:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172
9	**4:00 5:00**	*<<<Calculated Peak Hour*																															
	PM Peak Period	0	62	0	0	0	12	0	0	18	11	387	0	0	0	0	0	0	0	0	0	0	0	0	4	196	0	38	0	15	713	728	
	Heavy Vehicle %	0%		#DIV/0!		0%			0%		3%		#DIV/0!			#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		2%		0%			2%		
	PM Peak Hour	0	34	0	0	0	6	0	0	11	4	213	0	0	0	0	0	0	0	0	0	0	0	0	1	107	0	17	0	5	388	393	
	Heavy Vehicle %	0%		#DIV/0!		0%			0%		2%		#DIV/0!			#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		1%		0%			1%		
	PM Peak Hr Total	34		0		6			11		217		0			0		0		0			0		108		17						
	Peak Hr Approach To	40							228							0							125										

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement Total Count and Peak Summary Report

Description: HWY 17 @ CTY RD 4 - STORYLAND RD/ PINNACLE RD

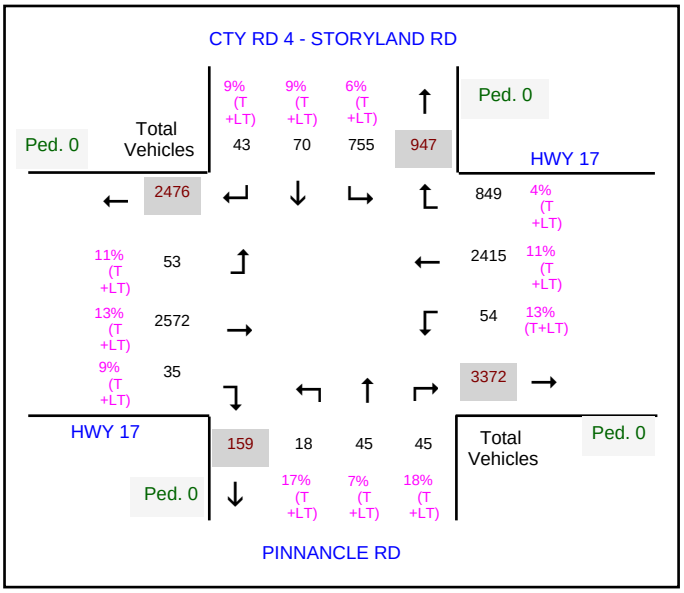
Region: EASTERN | **Survey Type:** TM – Intersection | **Hwy:** 17

Start Date: 17-Jul-2019 (Wed) | **I/C Side:** | **LHRS:** 20708

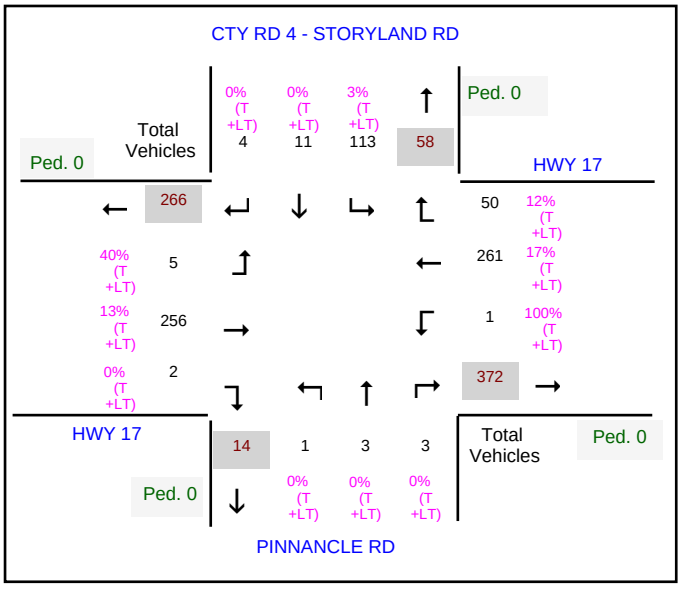
End Date: 17-Jul-2019 (Wed) | **Int. Type:** Four Leg | **Offset:** 0

Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

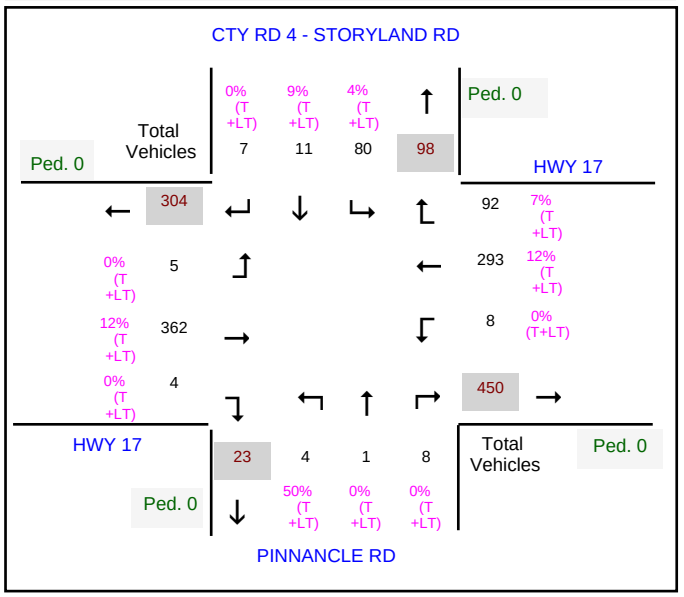
Total Count — Number of hours: 8



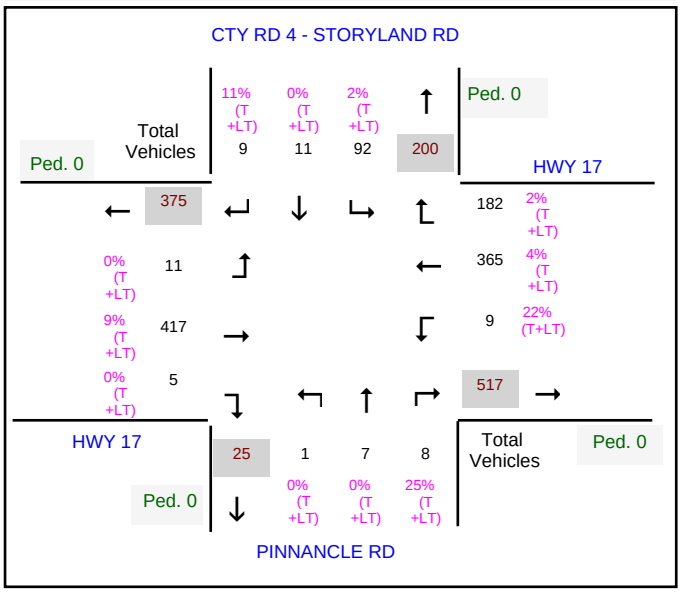
AM Peak Hour Report — Start Time: 07:15



Midday Peak Hour Report — Start Time: 12:45



PM Peak Hour Report — Start Time: 15:45



Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 17 @ CTY RD 4 - STORYLAND RD/ PINNACLE RD
Region: EASTERN **Survey Type:** TM – Intersection **Hwy:** 17
Start Date: 17-Jul-2019 (Wed) **I/C Side:** **LHRS:** 20708
End Date: 17-Jul-2019 (Wed) **Int. Type:** Four Leg **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																				
	East HWY 17										West HWY 17										North CTY RD 4 - STORYLAND RD										South PINNANCLE RD										
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
Period 1																																										
07:00	0	52	8	0	4	0	0	6	1	0	1	48	0	0	2	0	0	3	0	0	28	2	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	**160**
07:15	0	59	11	0	5	0	0	10	0	0	1	43	0	0	1	0	1	11	0	0	33	3	2	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	**183**
07:30	0	50	10	0	4	0	0	8	0	0	0	62	0	0	1	0	0	7	0	0	29	1	1	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	**176**
07:45	0	60	11	0	2	0	0	9	3	0	1	62	1	0	0	0	1	4	0	0	21	4	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**181**
08:00	0	47	12	0	6	0	1	1	3	0	1	56	1	0	2	0	0	7	0	0	27	3	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**170**
08:15	0	60	12	0	4	0	0	6	2	0	0	51	0	0	1	0	0	4	0	0	25	0	1	1	0	0	1	0	0	0	1	0	3	0	0	0	0	0	0	0	**172**
08:30	0	53	9	0	7	1	0	7	0	0	2	46	0	0	4	0	1	4	0	0	19	2	0	0	0	0	1	0	0	0	1	2	1	0	0	0	0	0	0	0	**160**
08:45	2	63	14	0	2	0	0	5	0	0	3	55	3	0	1	0	0	9	0	0	37	0	1	1	0	0	4	1	0	0	1	1	0	0	0	0	0	0	0	0	**203**
Period 2																																										
11:00	1	77	21	0	3	1	0	10	1	0	1	72	0	0	4	1	0	6	0	0	28	2	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	**232**
11:15	1	82	11	0	6	1	0	7	1	0	0	72	0	0	5	0	0	8	0	0	20	0	3	1	0	0	1	0	0	0	0	0	2	0	0	0	0	1	0	0	**222**
11:30	0	65	20	0	2	0	0	3	0	0	1	57	1	1	0	0	0	12	1	0	23	1	0	0	0	0	0	0	0	0	1	5	2	0	0	0	0	0	0	0	**195**
11:45	0	54	27	0	0	0	0	7	1	0	2	66	0	0	2	0	0	11	0	0	11	3	1	1	0	1	0	0	0	0	0	2	1	0	0	0	0	0	3	0	**193**
12:00	3	63	25	0	3	1	0	7	0	0	3	73	1	1	2	0	0	5	0	0	13	2	2	2	1	0	4	0	0	0	0	0	1	0	0	0	0	1	0	0	**213**
12:15	1	68	27	0	4	2	0	6	1	0	0	48	0	0	3	0	0	6	0	0	19	0	3	3	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	**194**
12:30	1	51	22	0	4	0	0	4	0	0	0	71	1	0	3	0	0	7	0	0	22	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	**190**
12:45	2	68	26	0	2	0	0	5	2	0	1	88	0	0	1	0	0	9	0	0	22	0	3	2	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	**234**
13:00	1	50	21	0	1	1	0	8	1	0	1	70	2	0	2	0	0	8	0	0	22	4	3	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	**201**
13:15	1	75	20	0	2	0	0	4	1	0	2	83	2	0	2	0	0	16	0	0	14	3	1	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	**230**
13:30	4	64	19	0	4	0	0	10	1	0	1	78	0	0	2	0	0	3	0	0	19	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	**210**
13:45	1	60	20	0	3	0	0	5	0	0	1	94	0	0	4	0	0	13	0	0	26	1	0	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	**232**
Period 3																																										
15:00	0	87	34	0	3	1	1	4	0	0	0	71	1	0	5	0	0	8	0	0	22	2	2	0	0	0	1	1	0	0	1	2	1	0	0	0	0	0	2	0	**249**
15:15	1	62	31	0	5	0	0	4	0	0	2	79	3	0	5	0	0	12	1	0	21	1	1	3	0	0	1	0	0	0	0	4	2	0	0	0	0	0	0	0	**238**

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 17 @ CTY RD 4 - STORYLAND RD/ PINNACLE RD
Region: EASTERN **Survey Type:** TM – Intersection **Hwy:** 17
Start Date: 17-Jul-2019 (Wed) **I/C Side:** **LHRS:** 20708
End Date: 17-Jul-2019 (Wed) **Int. Type:** Four Leg **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																					Minor Road Approaches																					
	East HWY 17										West HWY 17										North CTY RD 4 - STORYLAND RD										South PINNANCLE RD											
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
15:30	0	80	28	1	0	0	0	6	1	0	1	89	5	1	2	0	0	6	0	0	24	1	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	0	0	**249**
15:45	2	91	40	0	1	0	0	5	1	0	4	96	1	0	5	0	0	5	0	0	24	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	**279**
16:00	1	88	38	0	1	1	2	1	0	0	2	82	1	0	2	0	0	9	0	0	24	6	2	1	0	1	0	0	0	0	0	3	2	0	0	0	0	0	0	0	**267**
16:15	2	84	52	0	0	0	0	4	1	0	4	90	1	0	2	0	0	9	0	0	24	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	**279**
16:30	2	87	49	0	0	0	0	3	0	0	1	110	2	0	3	0	0	4	0	0	18	3	4	1	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	**292**
16:45	6	78	27	0	2	0	0	5	0	0	1	70	4	0	4	0	0	4	0	0	17	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**223**
17:00	7	64	47	0	0	0	2	4	0	0	5	79	0	0	0	0	0	8	0	0	20	0	0	1	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	**241**
17:15	3	62	40	0	2	0	0	10	1	0	1	70	0	0	3	0	0	8	0	0	14	4	1	1	0	0	3	0	0	0	0	5	0	0	0	1	1	0	0	0	**230**
17:30	1	65	45	0	0	1	0	7	1	0	3	57	2	0	0	0	0	7	0	0	19	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**213**
17:45	4	78	39	0	1	0	0	4	0	0	1	62	0	0	0	0	0	16	0	0	25	5	1	0	0	0	1	0	0	0	0	3	3	0	0	0	0	0	0	0	**243**

APPENDIX "C"

SYNCHRO TRAFFIC ANALYSIS
FORECAST EXISTING 2022 AND BACKGROUND (2023 AND 2028)

Intersection	
Int Delay, s/veh	3.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	266	2	1	271	52	1	3	3	118	11	4
Future Vol, veh/h	5	266	2	1	271	52	1	3	3	118	11	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	13	0	0	0	3	0	0
Mvmt Flow	5	280	2	1	285	55	1	3	3	124	12	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	285	0	0	282	0	0	585	577	280	581	579	285
Stage 1	-	-	-	-	-	-	290	290	-	287	287	-
Stage 2	-	-	-	-	-	-	295	287	-	294	292	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.13	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.527	4	3.3
Pot Cap-1 Maneuver	1046	-	-	877	-	0	425	430	764	424	429	759
Stage 1	-	-	-	-	-	0	722	676	-	718	678	-
Stage 2	-	-	-	-	-	0	718	678	-	712	675	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1046	-	-	877	-	-	412	427	764	418	426	759
Mov Cap-2 Maneuver	-	-	-	-	-	-	412	427	-	418	426	-
Stage 1	-	-	-	-	-	-	718	673	-	714	677	-
Stage 2	-	-	-	-	-	-	701	677	-	702	672	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12	17.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	523	877	-	1046	-	-	424
HCM Lane V/C Ratio	0.014	0.001	-	0.005	-	-	0.33
HCM Control Delay (s)	12	9.1	-	8.5	-	-	17.6
HCM Lane LOS	B	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	0	-	-	1.4

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	7	10	36	5	10	141
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	7	11	38	5	11	148

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	207	38	0	0	38	0
Stage 1	38	-	-	-	-	-
Stage 2	169	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	786	1012	-	-	1359	-
Stage 1	990	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	779	1012	-	-	1359	-
Mov Cap-2 Maneuver	779	-	-	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	858	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	901	1359	-
HCM Lane V/C Ratio	-	-	0.02	0.008	-
HCM Control Delay (s)	-	-	9.1	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	4.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	11	434	5	9	380	189	1	7	8	96	11	9
Future Vol, veh/h	11	434	5	9	380	189	1	7	8	96	11	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	8	9	0	22	4	9	0	0	25	3	0	20
Mvmt Flow	12	457	5	9	400	199	1	7	8	101	12	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	400	0	0	462	0	0	910	899	457	909	904	400
Stage 1	-	-	-	-	-	-	481	481	-	418	418	-
Stage 2	-	-	-	-	-	-	429	418	-	491	486	-
Critical Hdwy	4.18	-	-	4.32	-	-	7.1	6.5	6.45	7.13	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.272	-	-	2.398	-	-	3.5	4	3.525	3.527	4	3.48
Pot Cap-1 Maneuver	1127	-	-	1002	-	0	258	281	559	255	279	613
Stage 1	-	-	-	-	-	0	570	557	-	610	594	-
Stage 2	-	-	-	-	-	0	608	594	-	557	554	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1127	-	-	1002	-	-	242	275	559	242	273	613
Mov Cap-2 Maneuver	-	-	-	-	-	-	242	275	-	242	273	-
Stage 1	-	-	-	-	-	-	564	551	-	603	589	-
Stage 2	-	-	-	-	-	-	582	589	-	536	548	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	15.4	31.1
HCM LOS			C	D

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	364	1002	-	1127	-	-	257
HCM Lane V/C Ratio	0.046	0.009	-	0.01	-	-	0.475
HCM Control Delay (s)	15.4	8.6	-	8.2	-	-	31.1
HCM Lane LOS	C	A	-	A	-	-	D
HCM 95th %tile Q(veh)	0.1	0	-	0	-	-	2.4

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	6	34	217	11	17	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	0	0	1
Mvmt Flow	6	36	228	12	18	114

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	377	228	0	0	228	0
Stage 1	228	-	-	-	-	-
Stage 2	149	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	629	816	-	-	1352	-
Stage 1	815	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	620	816	-	-	1352	-
Mov Cap-2 Maneuver	620	-	-	-	-	-
Stage 1	815	-	-	-	-	-
Stage 2	872	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	779	1352	-
HCM Lane V/C Ratio	-	-	0.054	0.013	-
HCM Control Delay (s)	-	-	9.9	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	3.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	277	2	1	282	54	1	3	3	123	11	5
Future Vol, veh/h	5	277	2	1	282	54	1	3	3	123	11	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	13	0	0	0	3	0	0
Mvmt Flow	5	292	2	1	297	57	1	3	3	129	12	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	297	0	0	294	0	0	610	601	292	605	603	297
Stage 1	-	-	-	-	-	-	302	302	-	299	299	-
Stage 2	-	-	-	-	-	-	308	299	-	306	304	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.13	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.527	4	3.3
Pot Cap-1 Maneuver	1035	-	-	867	-	0	409	417	752	408	416	747
Stage 1	-	-	-	-	-	0	712	668	-	708	670	-
Stage 2	-	-	-	-	-	0	706	670	-	702	667	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1035	-	-	867	-	-	396	414	752	402	414	747
Mov Cap-2 Maneuver	-	-	-	-	-	-	396	414	-	402	414	-
Stage 1	-	-	-	-	-	-	708	665	-	704	669	-
Stage 2	-	-	-	-	-	-	688	669	-	692	664	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.1	0	12.2	18.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	509	867	-	1035	-	-	410
HCM Lane V/C Ratio	0.014	0.001	-	0.005	-	-	0.357
HCM Control Delay (s)	12.2	9.2	-	8.5	-	-	18.6
HCM Lane LOS	B	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	0	-	-	1.6

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	7	10	37	5	10	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	7	11	39	5	11	155

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	215	39	0	0	39	0
Stage 1	39	-	-	-	-	-
Stage 2	176	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	778	1010	-	-	1358	-
Stage 1	989	-	-	-	-	-
Stage 2	859	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	771	1010	-	-	1358	-
Mov Cap-2 Maneuver	771	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	851	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	896	1358	-
HCM Lane V/C Ratio	-	-	0.02	0.008	-
HCM Control Delay (s)	-	-	9.1	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	4.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	11	451	5	9	395	197	1	7	8	100	11	9
Future Vol, veh/h	11	451	5	9	395	197	1	7	8	100	11	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	8	9	0	22	4	9	0	0	25	3	0	20
Mvmt Flow	12	475	5	9	416	207	1	7	8	105	12	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	0	480	0	0	944	933	475	943	938	416
Stage 1	-	-	-	-	-	-	499	499	-	434	434	-
Stage 2	-	-	-	-	-	-	445	434	-	509	504	-
Critical Hdwy	4.18	-	-	4.32	-	-	7.1	6.5	6.45	7.13	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.272	-	-	2.398	-	-	3.5	4	3.525	3.527	4	3.48
Pot Cap-1 Maneuver	1111	-	-	986	-	0	244	268	545	242	266	600
Stage 1	-	-	-	-	-	0	557	547	-	598	585	-
Stage 2	-	-	-	-	-	0	596	585	-	545	544	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1111	-	-	986	-	-	229	263	545	230	261	600
Mov Cap-2 Maneuver	-	-	-	-	-	-	229	263	-	230	261	-
Stage 1	-	-	-	-	-	-	551	541	-	591	580	-
Stage 2	-	-	-	-	-	-	570	580	-	524	538	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	15.8	34.6
HCM LOS			C	D

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	350	986	-	1111	-	-	244
HCM Lane V/C Ratio	0.048	0.01	-	0.01	-	-	0.518
HCM Control Delay (s)	15.8	8.7	-	8.3	-	-	34.6
HCM Lane LOS	C	A	-	A	-	-	D
HCM 95th %tile Q(veh)	0.2	0	-	0	-	-	2.7

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	6	35	226	11	18	112
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	0	0	1
Mvmt Flow	6	37	238	12	19	118

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	394	238	0	0	238	0
Stage 1	238	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	615	806	-	-	1341	-
Stage 1	806	-	-	-	-	-
Stage 2	877	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	606	806	-	-	1341	-
Mov Cap-2 Maneuver	606	-	-	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	864	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	769	1341	-
HCM Lane V/C Ratio	-	-	0.056	0.014	-
HCM Control Delay (s)	-	-	10	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	4.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	6	303	2	1	309	59	1	3	3	135	13	5
Future Vol, veh/h	6	303	2	1	309	59	1	3	3	135	13	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	13	0	0	0	3	0	0
Mvmt Flow	6	319	2	1	325	62	1	3	3	142	14	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	325	0	0	321	0	0	668	658	319	662	660	325
Stage 1	-	-	-	-	-	-	331	331	-	327	327	-
Stage 2	-	-	-	-	-	-	337	327	-	335	333	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.13	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.527	4	3.3
Pot Cap-1 Maneuver	1008	-	-	844	-	0	375	387	726	374	386	721
Stage 1	-	-	-	-	-	0	687	649	-	684	651	-
Stage 2	-	-	-	-	-	0	681	651	-	677	647	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1008	-	-	844	-	-	360	384	726	368	383	721
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	384	-	368	383	-
Stage 1	-	-	-	-	-	-	683	645	-	680	650	-
Stage 2	-	-	-	-	-	-	661	650	-	667	643	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12.7	21.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	475	844	-	1008	-	- 375
HCM Lane V/C Ratio	0.016	0.001	-	0.006	-	- 0.429
HCM Control Delay (s)	12.7	9.3	-	8.6	-	- 21.6
HCM Lane LOS	B	A	-	A	-	- C
HCM 95th %tile Q(veh)	0	0	-	0	-	- 2.1

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	11	41	6	11	161
Future Vol, veh/h	8	11	41	6	11	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	8	12	43	6	12	169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	236	43	0	0	49	0
Stage 1	43	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	757	1005	-	-	1346	-
Stage 1	985	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	749	1005	-	-	1346	-
Mov Cap-2 Maneuver	749	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	837	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	879	1346	-
HCM Lane V/C Ratio	-	-	0.023	0.009	-
HCM Control Delay (s)	-	-	9.2	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	6.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	13	495	6	10	433	215	1	8	9	109	13	11
Future Vol, veh/h	13	495	6	10	433	215	1	8	9	109	13	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	9	0	22	4	12	0	0	25	3	0	20
Mvmt Flow	14	521	6	11	456	226	1	8	9	115	14	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	456	0	0	527	0	0	1040	1027	521	1039	1033	456
Stage 1	-	-	-	-	-	-	549	549	-	478	478	-
Stage 2	-	-	-	-	-	-	491	478	-	561	555	-
Critical Hdwy	4.17	-	-	4.32	-	-	7.1	6.5	6.45	7.13	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.263	-	-	2.398	-	-	3.5	4	3.525	3.527	4	3.48
Pot Cap-1 Maneuver	1079	-	-	946	-	0	210	236	513	208	234	569
Stage 1	-	-	-	-	-	0	524	520	-	566	559	-
Stage 2	-	-	-	-	-	0	563	559	-	510	516	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1079	-	-	946	-	-	193	230	513	195	228	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	230	-	195	228	-
Stage 1	-	-	-	-	-	-	517	513	-	559	552	-
Stage 2	-	-	-	-	-	-	532	552	-	486	509	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	17.2	51.4
HCM LOS			C	F

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	313	946	-	1079	-	- 209
HCM Lane V/C Ratio	0.061	0.011	-	0.013	-	- 0.67
HCM Control Delay (s)	17.2	8.8	-	8.4	-	- 51.4
HCM Lane LOS	C	A	-	A	-	- F
HCM 95th %tile Q(veh)	0.2	0	-	0	-	- 4.1

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	7	39	247	13	19	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	0	0	1
Mvmt Flow	7	41	260	14	20	129

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	429	260	0	0	260	0
Stage 1	260	-	-	-	-	-
Stage 2	169	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	587	784	-	-	1316	-
Stage 1	788	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	578	784	-	-	1316	-
Mov Cap-2 Maneuver	578	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	852	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	744	1316	-
HCM Lane V/C Ratio	-	-	0.065	0.015	-
HCM Control Delay (s)	-	-	10.2	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	11	41	6	11	161
Future Vol, veh/h	8	11	41	6	11	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	8	12	43	6	12	169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	236	43	0	0	49	0
Stage 1	43	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	757	1005	-	-	1346	-
Stage 1	985	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	749	1005	-	-	1346	-
Mov Cap-2 Maneuver	749	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	837	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	879	1346	-
HCM Lane V/C Ratio	-	-	0.023	0.009	-
HCM Control Delay (s)	-	-	9.2	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	1	59	9	1	5	148
Future Vol, veh/h	1	59	9	1	5	148
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	100	12	40	0	0	3
Mvmt Flow	1	62	9	1	5	156

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	176	10	0	0	9	0
Stage 1	10	-	-	-	-	-
Stage 2	166	-	-	-	-	-
Critical Hdwy	7.4	6.32	-	-	4.1	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	4.4	3.408	-	-	2.2	-
Pot Cap-1 Maneuver	633	1043	-	-	1624	-
Stage 1	809	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	631	1043	-	-	1624	-
Mov Cap-2 Maneuver	631	-	-	-	-	-
Stage 1	809	-	-	-	-	-
Stage 2	671	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	8.7	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	1032	1624	-
HCM Lane V/C Ratio	-	-	0.061	0.003	-
HCM Control Delay (s)	-	-	8.7	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	6	2	3	4	14	135
Future Vol, veh/h	6	2	3	4	14	135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yield
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	40	0	0	0	0	3
Mvmt Flow	6	2	3	4	15	142

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	96	86	15	0	-	0
Stage 1	86	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.8	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.86	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	819	978	1616	-	-	-
Stage 1	850	-	-	-	-	-
Stage 2	923	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	817	978	1616	-	-	-
Mov Cap-2 Maneuver	817	-	-	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	923	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	9.3	3.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1616	-	852	-	-
HCM Lane V/C Ratio	0.002	-	0.01	-	-
HCM Control Delay (s)	7.2	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	39	247	13	19	123
Future Vol, veh/h	7	39	247	13	19	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	7	41	260	14	20	129

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	429	260	0	0	274	0
Stage 1	260	-	-	-	-	-
Stage 2	169	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	587	760	-	-	1099	-
Stage 1	788	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	575	760	-	-	1099	-
Mov Cap-2 Maneuver	575	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	849	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	725	1099	-
HCM Lane V/C Ratio	-	-	0.067	0.018	-
HCM Control Delay (s)	-	-	10.3	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	5.8

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	10	215	21	1	10	122
Future Vol, veh/h	10	215	21	1	10	122
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	22	2	0	25	11	2
Mvmt Flow	11	226	22	1	11	128

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	173	23	0	0	22	0
Stage 1	23	-	-	-	-	-
Stage 2	150	-	-	-	-	-
Critical Hdwy	6.62	6.22	-	-	4.21	-
Critical Hdwy Stg 1	5.62	-	-	-	-	-
Critical Hdwy Stg 2	5.62	-	-	-	-	-
Follow-up Hdwy	3.698	3.318	-	-	2.299	-
Pot Cap-1 Maneuver	773	1054	-	-	1537	-
Stage 1	950	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	767	1054	-	-	1537	-
Mov Cap-2 Maneuver	767	-	-	-	-	-
Stage 1	950	-	-	-	-	-
Stage 2	824	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	9.5	0	0.6
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	1037	1537	-
HCM Lane V/C Ratio	-	-	0.228	0.007	-
HCM Control Delay (s)	-	-	9.5	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	13	6	9	9	23	109
Future Vol, veh/h	13	6	9	9	23	109
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yield
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	25	0	2
Mvmt Flow	14	6	9	9	24	115

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	109	82	24	0	-	0
Stage 1	82	-	-	-	-	-
Stage 2	27	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	893	983	1604	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	1001	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	888	983	1604	-	-	-
Mov Cap-2 Maneuver	888	-	-	-	-	-
Stage 1	940	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	9	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1604	-	916	-	-
HCM Lane V/C Ratio	0.006	-	0.022	-	-
HCM Control Delay (s)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX "D"

SYNCHRO CAPACITY ANALYSIS FORECAST BUILD-OUT (2023) AND BUILD-OUT + 5-YEARS (2028)

Intersection	
Int Delay, s/veh	4.2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	6	277	2	1	282	61	1	3	3	130	11	5
Future Vol, veh/h	6	277	2	1	282	61	1	3	3	130	11	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	30	0	0	0	14	0	0
Mvmt Flow	6	292	2	1	297	64	1	3	3	137	12	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	297	0	0	294	0	0	612	603	292	607	605	297
Stage 1	-	-	-	-	-	-	304	304	-	299	299	-
Stage 2	-	-	-	-	-	-	308	299	-	308	306	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.24	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.24	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.24	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.626	4	3.3
Pot Cap-1 Maneuver	1035	-	-	867	-	0	408	416	752	391	415	747
Stage 1	-	-	-	-	-	0	710	667	-	685	670	-
Stage 2	-	-	-	-	-	0	706	670	-	677	665	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1035	-	-	867	-	-	395	413	752	385	412	747
Mov Cap-2 Maneuver	-	-	-	-	-	-	395	413	-	385	412	-
Stage 1	-	-	-	-	-	-	706	663	-	681	669	-
Stage 2	-	-	-	-	-	-	688	669	-	667	661	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12.2	19.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	508	867	-	1035	-	-	393
HCM Lane V/C Ratio	0.015	0.001	-	0.006	-	-	0.391
HCM Control Delay (s)	12.2	9.2	-	8.5	-	-	19.9
HCM Lane LOS	B	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	0	-	-	1.8

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	43	8	0	154	8	0
Future Vol, veh/h	43	8	0	154	8	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	100	0	8	100	2
Mvmt Flow	45	8	0	162	8	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	53	0	211	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	162	-
Critical Hdwy	-	-	4.1	-	7.4	6.22
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.318
Pot Cap-1 Maneuver	-	-	1566	-	602	1020
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	676	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1566	-	602	1020
Mov Cap-2 Maneuver	-	-	-	-	602	-
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	602	-	-	1566	-
HCM Lane V/C Ratio	0.014	-	-	-	-
HCM Control Delay (s)	11.1	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	5.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	12	451	5	9	395	204	1	7	8	107	11	10
Future Vol, veh/h	12	451	5	9	395	204	1	7	8	107	11	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	8	9	0	22	4	9	0	0	25	12	0	20
Mvmt Flow	13	475	5	9	416	215	1	7	8	113	12	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	0	480	0	0	947	935	475	945	940	416
Stage 1	-	-	-	-	-	-	501	501	-	434	434	-
Stage 2	-	-	-	-	-	-	446	434	-	511	506	-
Critical Hdwy	4.18	-	-	4.32	-	-	7.1	6.5	6.45	7.22	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.22	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.22	5.5	-
Follow-up Hdwy	2.272	-	-	2.398	-	-	3.5	4	3.525	3.608	4	3.48
Pot Cap-1 Maneuver	1111	-	-	986	-	0	243	267	545	232	266	600
Stage 1	-	-	-	-	-	0	556	546	-	581	585	-
Stage 2	-	-	-	-	-	0	595	585	-	527	543	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1111	-	-	986	-	-	227	261	545	220	260	600
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	261	-	220	260	-
Stage 1	-	-	-	-	-	-	549	539	-	574	580	-
Stage 2	-	-	-	-	-	-	568	580	-	506	536	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	15.8	39.1
HCM LOS			C	E

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	349	986	-	1111	-	-	235
HCM Lane V/C Ratio	0.048	0.01	-	0.011	-	-	0.573
HCM Control Delay (s)	15.8	8.7	-	8.3	-	-	39.1
HCM Lane LOS	C	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.2	0	-	0	-	-	3.2

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	237	8	0	119	8	0
Future Vol, veh/h	237	8	0	119	8	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	100	0	2	100	0
Mvmt Flow	249	8	0	125	8	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	257	0	378	253
Stage 1	-	-	-	-	253	-
Stage 2	-	-	-	-	125	-
Critical Hdwy	-	-	4.1	-	7.4	6.2
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.3
Pot Cap-1 Maneuver	-	-	1320	-	470	791
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1320	-	470	791
Mov Cap-2 Maneuver	-	-	-	-	470	-
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	706	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	470	-	-	1320	-
HCM Lane V/C Ratio	0.018	-	-	-	-
HCM Control Delay (s)	12.8	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	4.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	7	303	2	1	309	66	1	3	3	142	13	6
Future Vol, veh/h	7	303	2	1	309	66	1	3	3	142	13	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	30	0	0	0	12	0	0
Mvmt Flow	7	319	2	1	325	69	1	3	3	149	14	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	325	0	0	321	0	0	670	660	319	664	662	325
Stage 1	-	-	-	-	-	-	333	333	-	327	327	-
Stage 2	-	-	-	-	-	-	337	327	-	337	335	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.22	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.22	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.22	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.608	4	3.3
Pot Cap-1 Maneuver	1008	-	-	844	-	0	373	386	726	361	385	721
Stage 1	-	-	-	-	-	0	685	647	-	665	651	-
Stage 2	-	-	-	-	-	0	681	651	-	657	646	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1008	-	-	844	-	-	357	383	726	355	382	721
Mov Cap-2 Maneuver	-	-	-	-	-	-	357	383	-	355	382	-
Stage 1	-	-	-	-	-	-	680	642	-	660	650	-
Stage 2	-	-	-	-	-	-	660	650	-	646	641	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12.7	23.2
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	474	844	-	1008	-	-	364
HCM Lane V/C Ratio	0.016	0.001	-	0.007	-	-	0.466
HCM Control Delay (s)	12.7	9.3	-	8.6	-	-	23.2
HCM Lane LOS	B	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0	-	0	-	-	2.4

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	47	8	0	169	8	0
Future Vol, veh/h	47	8	0	169	8	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	100	0	8	100	2
Mvmt Flow	49	8	0	178	8	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	57	0	231	53
Stage 1	-	-	-	-	53	-
Stage 2	-	-	-	-	178	-
Critical Hdwy	-	-	4.1	-	7.4	6.22
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.318
Pot Cap-1 Maneuver	-	-	1560	-	584	1014
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	663	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1560	-	584	1014
Mov Cap-2 Maneuver	-	-	-	-	584	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	663	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	584	-	-	1560	-
HCM Lane V/C Ratio	0.014	-	-	-	-
HCM Control Delay (s)	11.3	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	14	495	6	10	433	222	1	8	9	116	13	11
Future Vol, veh/h	14	495	6	10	433	222	1	8	9	116	13	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	9	0	22	4	18	0	0	25	11	0	20
Mvmt Flow	15	521	6	11	456	234	1	8	9	122	14	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	456	0	0	527	0	0	1042	1029	521	1041	1035	456
Stage 1	-	-	-	-	-	-	551	551	-	478	478	-
Stage 2	-	-	-	-	-	-	491	478	-	563	557	-
Critical Hdwy	4.17	-	-	4.32	-	-	7.1	6.5	6.45	7.21	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Follow-up Hdwy	2.263	-	-	2.398	-	-	3.5	4	3.525	3.599	4	3.48
Pot Cap-1 Maneuver	1079	-	-	946	-	0	210	236	513	200	234	569
Stage 1	-	-	-	-	-	0	522	519	-	552	559	-
Stage 2	-	-	-	-	-	0	563	559	-	495	515	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1079	-	-	946	-	-	193	230	513	187	228	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	230	-	187	228	-
Stage 1	-	-	-	-	-	-	515	512	-	544	552	-
Stage 2	-	-	-	-	-	-	532	552	-	471	508	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	17.2	60.4
HCM LOS			C	F

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	313	946	-	1079	-	- 201
HCM Lane V/C Ratio	0.061	0.011	-	0.014	-	- 0.733
HCM Control Delay (s)	17.2	8.8	-	8.4	-	- 60.4
HCM Lane LOS	C	A	-	A	-	- F
HCM 95th %tile Q(veh)	0.2	0	-	0	-	- 4.8

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	260	8	0	130	8	0
Future Vol, veh/h	260	8	0	130	8	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	100	0	2	100	0
Mvmt Flow	274	8	0	137	8	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	282	0	415	278
Stage 1	-	-	-	-	278	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	7.4	6.2
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.3
Pot Cap-1 Maneuver	-	-	1292	-	444	766
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	697	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1292	-	444	766
Mov Cap-2 Maneuver	-	-	-	-	444	-
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	697	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	444	-	-	1292	-
HCM Lane V/C Ratio	0.019	-	-	-	-
HCM Control Delay (s)	13.3	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	4.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	6	277	2	1	282	69	1	3	3	138	11	5
Future Vol, veh/h	6	277	2	1	282	69	1	3	3	138	11	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	40	0	0	0	20	0	0
Mvmt Flow	6	292	2	1	297	73	1	3	3	145	12	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	297	0	0	294	0	0	612	603	292	607	605	297
Stage 1	-	-	-	-	-	-	304	304	-	299	299	-
Stage 2	-	-	-	-	-	-	308	299	-	308	306	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.3	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.3	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.3	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.68	4	3.3
Pot Cap-1 Maneuver	1035	-	-	867	-	0	408	416	752	383	415	747
Stage 1	-	-	-	-	-	0	710	667	-	673	670	-
Stage 2	-	-	-	-	-	0	706	670	-	665	665	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1035	-	-	867	-	-	395	413	752	377	412	747
Mov Cap-2 Maneuver	-	-	-	-	-	-	395	413	-	377	412	-
Stage 1	-	-	-	-	-	-	706	663	-	669	669	-
Stage 2	-	-	-	-	-	-	688	669	-	655	661	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12.2	20.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	508	867	-	1035	-	- 386
HCM Lane V/C Ratio	0.015	0.001	-	0.006	-	- 0.42
HCM Control Delay (s)	12.2	9.2	-	8.5	-	- 20.9
HCM Lane LOS	B	A	-	A	-	- C
HCM 95th %tile Q(veh)	0	0	-	0	-	- 2

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	43	16	0	154	16	0
Future Vol, veh/h	43	16	0	154	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	100	0	8	100	2
Mvmt Flow	45	17	0	162	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	62	0	216	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	162	-
Critical Hdwy	-	-	4.1	-	7.4	6.22
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.318
Pot Cap-1 Maneuver	-	-	1554	-	597	1013
Stage 1	-	-	-	-	768	-
Stage 2	-	-	-	-	676	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1554	-	597	1013
Mov Cap-2 Maneuver	-	-	-	-	597	-
Stage 1	-	-	-	-	768	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	597	-	-	1554	-
HCM Lane V/C Ratio	0.028	-	-	-	-
HCM Control Delay (s)	11.2	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	6.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	12	451	5	9	395	212	1	7	8	115	11	10
Future Vol, veh/h	12	451	5	9	395	212	1	7	8	115	11	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	8	9	0	22	4	20	0	0	25	15	0	20
Mvmt Flow	13	475	5	9	416	223	1	7	8	121	12	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	0	480	0	0	947	935	475	945	940	416
Stage 1	-	-	-	-	-	-	501	501	-	434	434	-
Stage 2	-	-	-	-	-	-	446	434	-	511	506	-
Critical Hdwy	4.18	-	-	4.32	-	-	7.1	6.5	6.45	7.25	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.25	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.25	5.5	-
Follow-up Hdwy	2.272	-	-	2.398	-	-	3.5	4	3.525	3.635	4	3.48
Pot Cap-1 Maneuver	1111	-	-	986	-	0	243	267	545	229	266	600
Stage 1	-	-	-	-	-	0	556	546	-	576	585	-
Stage 2	-	-	-	-	-	0	595	585	-	522	543	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1111	-	-	986	-	-	227	261	545	217	260	600
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	261	-	217	260	-
Stage 1	-	-	-	-	-	-	549	539	-	569	580	-
Stage 2	-	-	-	-	-	-	568	580	-	501	536	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	15.8	43
HCM LOS			C	E

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SER	SWLn1
Capacity (veh/h)	349	986	-	1111	-	-	231
HCM Lane V/C Ratio	0.048	0.01	-	0.011	-	-	0.62
HCM Control Delay (s)	15.8	8.7	-	8.3	-	-	43
HCM Lane LOS	C	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.2	0	-	0	-	-	3.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	237	16	0	119	16	0
Future Vol, veh/h	237	16	0	119	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	100	0	2	100	0
Mvmt Flow	249	17	0	125	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	266	0	383	258
Stage 1	-	-	-	-	258	-
Stage 2	-	-	-	-	125	-
Critical Hdwy	-	-	4.1	-	7.4	6.2
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.3
Pot Cap-1 Maneuver	-	-	1310	-	466	786
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1310	-	466	786
Mov Cap-2 Maneuver	-	-	-	-	466	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	706	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	466	-	-	1310	-
HCM Lane V/C Ratio	0.036	-	-	-	-
HCM Control Delay (s)	13	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	5.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	7	303	2	1	309	74	1	3	3	150	13	6
Future Vol, veh/h	7	303	2	1	309	74	1	3	3	150	13	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	50	13	0	100	17	30	0	0	0	14	0	0
Mvmt Flow	7	319	2	1	325	78	1	3	3	158	14	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	325	0	0	321	0	0	670	660	319	664	662	325
Stage 1	-	-	-	-	-	-	333	333	-	327	327	-
Stage 2	-	-	-	-	-	-	337	327	-	337	335	-
Critical Hdwy	4.6	-	-	5.1	-	-	7.1	6.5	6.2	7.24	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.24	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.24	5.5	-
Follow-up Hdwy	2.65	-	-	3.1	-	-	3.5	4	3.3	3.626	4	3.3
Pot Cap-1 Maneuver	1008	-	-	844	-	0	373	386	726	358	385	721
Stage 1	-	-	-	-	-	0	685	647	-	661	651	-
Stage 2	-	-	-	-	-	0	681	651	-	653	646	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1008	-	-	844	-	-	357	383	726	352	382	721
Mov Cap-2 Maneuver	-	-	-	-	-	-	357	383	-	352	382	-
Stage 1	-	-	-	-	-	-	680	642	-	656	650	-
Stage 2	-	-	-	-	-	-	660	650	-	642	641	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0	12.7	24.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	474	844	-	1008	-	- 361
HCM Lane V/C Ratio	0.016	0.001	-	0.007	-	- 0.493
HCM Control Delay (s)	12.7	9.3	-	8.6	-	- 24.3
HCM Lane LOS	B	A	-	A	-	- C
HCM 95th %tile Q(veh)	0	0	-	0	-	- 2.6

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	47	16	0	169	16	0
Future Vol, veh/h	47	16	0	169	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	100	0	8	100	2
Mvmt Flow	49	17	0	178	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	66	0	236	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	178	-
Critical Hdwy	-	-	4.1	-	7.4	6.22
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.318
Pot Cap-1 Maneuver	-	-	1549	-	580	1008
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	663	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1549	-	580	1008
Mov Cap-2 Maneuver	-	-	-	-	580	-
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	663	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	580	-	-	1549	-
HCM Lane V/C Ratio	0.029	-	-	-	-
HCM Control Delay (s)	11.4	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	9.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	14	495	6	10	433	230	1	8	9	124	13	11
Future Vol, veh/h	14	495	6	10	433	230	1	8	9	124	13	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	120	-	120	210	-	210	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	9	0	22	4	18	0	0	25	13	0	20
Mvmt Flow	15	521	6	11	456	242	1	8	9	131	14	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	456	0	0	527	0	0	1042	1029	521	1041	1035	456
Stage 1	-	-	-	-	-	-	551	551	-	478	478	-
Stage 2	-	-	-	-	-	-	491	478	-	563	557	-
Critical Hdwy	4.17	-	-	4.32	-	-	7.1	6.5	6.45	7.23	6.5	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.23	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.23	5.5	-
Follow-up Hdwy	2.263	-	-	2.398	-	-	3.5	4	3.525	3.617	4	3.48
Pot Cap-1 Maneuver	1079	-	-	946	-	0	210	236	513	198	234	569
Stage 1	-	-	-	-	-	0	522	519	-	548	559	-
Stage 2	-	-	-	-	-	0	563	559	-	492	515	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	1079	-	-	946	-	-	193	230	513	185	228	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	230	-	185	228	-
Stage 1	-	-	-	-	-	-	515	512	-	540	552	-
Stage 2	-	-	-	-	-	-	532	552	-	468	508	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	0.2	17.2	68.7
HCM LOS			C	F

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SEL	SET	SERSWLn1
Capacity (veh/h)	313	946	-	1079	-	- 198
HCM Lane V/C Ratio	0.061	0.011	-	0.014	-	- 0.787
HCM Control Delay (s)	17.2	8.8	-	8.4	-	- 68.7
HCM Lane LOS	C	A	-	A	-	- F
HCM 95th %tile Q(veh)	0.2	0	-	0	-	- 5.4

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	260	16	0	130	16	0
Future Vol, veh/h	260	16	0	130	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	100	0	2	100	0
Mvmt Flow	274	17	0	137	17	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	291	0	420	283
Stage 1	-	-	-	-	283	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	-	-	4.1	-	7.4	6.2
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.2	-	4.4	3.3
Pot Cap-1 Maneuver	-	-	1282	-	441	761
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	697	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1282	-	441	761
Mov Cap-2 Maneuver	-	-	-	-	441	-
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	697	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	441	-	-	1282	-
HCM Lane V/C Ratio	0.038	-	-	-	-
HCM Control Delay (s)	13.5	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	11	41	6	11	161
Future Vol, veh/h	8	11	41	6	11	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	8	12	43	6	12	169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	236	43	0	0	49	0
Stage 1	43	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	757	1005	-	-	1346	-
Stage 1	985	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	749	1005	-	-	1346	-
Mov Cap-2 Maneuver	749	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	837	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	879	1346	-
HCM Lane V/C Ratio	-	-	0.023	0.009	-
HCM Control Delay (s)	-	-	9.2	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	1	66	10	1	6	155
Future Vol, veh/h	1	66	10	1	6	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	100	30	50	100	0	12
Mvmt Flow	1	69	11	1	6	163

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	187	12	0	0	11	0
Stage 1	12	-	-	-	-	-
Stage 2	175	-	-	-	-	-
Critical Hdwy	7.4	6.5	-	-	4.1	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	4.4	3.57	-	-	2.2	-
Pot Cap-1 Maneuver	623	993	-	-	1621	-
Stage 1	807	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	621	993	-	-	1621	-
Mov Cap-2 Maneuver	621	-	-	-	-	-
Stage 1	807	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	8.9	0	0.3
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	984	1621	-
HCM Lane V/C Ratio	-	-	0.072	0.004	-
HCM Control Delay (s)	-	-	8.9	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	8	0	47	8	0	169
Future Vol, veh/h	8	0	47	8	0	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	100	2	10	100	0	8
Mvmt Flow	8	0	49	8	0	178

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	231	53	0	0	57	0
Stage 1	53	-	-	-	-	-
Stage 2	178	-	-	-	-	-
Critical Hdwy	7.4	6.22	-	-	4.1	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	4.4	3.318	-	-	2.2	-
Pot Cap-1 Maneuver	584	1014	-	-	1560	-
Stage 1	769	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	584	1014	-	-	1560	-
Mov Cap-2 Maneuver	584	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	584	1560	-
HCM Lane V/C Ratio	-	-	0.014	-	-
HCM Control Delay (s)	-	-	11.3	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.6

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	7	2	3	4	14	142
Future Vol, veh/h	7	2	3	4	14	142
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yield
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	50	0	0	0	0	14
Mvmt Flow	7	2	3	4	15	149

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	100	90	15	0	-	0
Stage 1	90	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.9	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	794	973	1616	-	-	-
Stage 1	826	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	792	973	1616	-	-	-
Mov Cap-2 Maneuver	792	-	-	-	-	-
Stage 1	824	-	-	-	-	-
Stage 2	902	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	9.4	3.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1616	-	826	-	-
HCM Lane V/C Ratio	0.002	-	0.011	-	-
HCM Control Delay (s)	7.2	0	9.4	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	39	247	13	19	123
Future Vol, veh/h	7	39	247	13	19	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	300	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	10	8	0	40	9
Mvmt Flow	7	41	260	14	20	129

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	429	260	0	0	274	0
Stage 1	260	-	-	-	-	-
Stage 2	169	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.5	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.56	-
Pot Cap-1 Maneuver	587	760	-	-	1099	-
Stage 1	788	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	575	760	-	-	1099	-
Mov Cap-2 Maneuver	575	-	-	-	-	-
Stage 1	788	-	-	-	-	-
Stage 2	849	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	725	1099	-
HCM Lane V/C Ratio	-	-	0.067	0.018	-
HCM Control Delay (s)	-	-	10.3	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	5.5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	10	222	22	1	11	153
Future Vol, veh/h	10	222	22	1	11	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	20	6	13	0	20	6
Mvmt Flow	11	234	23	1	12	161

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	209	24	0	0	23	0
Stage 1	24	-	-	-	-	-
Stage 2	185	-	-	-	-	-
Critical Hdwy	6.6	6.26	-	-	4.3	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	3.354	-	-	2.38	-
Pot Cap-1 Maneuver	741	1041	-	-	1483	-
Stage 1	954	-	-	-	-	-
Stage 2	805	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	734	1041	-	-	1483	-
Mov Cap-2 Maneuver	734	-	-	-	-	-
Stage 1	954	-	-	-	-	-
Stage 2	798	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	9.6	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	1023	1483	-
HCM Lane V/C Ratio	-	-	0.239	0.008	-
HCM Control Delay (s)	-	-	9.6	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	8	0	47	8	0	169
Future Vol, veh/h	8	0	47	8	0	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	100	2	10	100	0	8
Mvmt Flow	8	0	49	8	0	178

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	231	53	0	0	57	0
Stage 1	53	-	-	-	-	-
Stage 2	178	-	-	-	-	-
Critical Hdwy	7.4	6.22	-	-	4.1	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	4.4	3.318	-	-	2.2	-
Pot Cap-1 Maneuver	584	1014	-	-	1560	-
Stage 1	769	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	584	1014	-	-	1560	-
Mov Cap-2 Maneuver	584	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	663	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	584	1560	-
HCM Lane V/C Ratio	-	-	0.014	-	-
HCM Control Delay (s)	-	-	11.3	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	14	6	9	9	23	140
Future Vol, veh/h	14	6	9	9	23	140
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Yield
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	0	25	0	10	7
Mvmt Flow	15	6	9	9	24	147

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	125	98	24	0	-	0
Stage 1	98	-	-	-	-	-
Stage 2	27	-	-	-	-	-
Critical Hdwy	6.5	6.2	4.35	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.3	2.425	-	-	-
Pot Cap-1 Maneuver	851	963	1454	-	-	-
Stage 1	906	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	846	963	1454	-	-	-
Mov Cap-2 Maneuver	846	-	-	-	-	-
Stage 1	901	-	-	-	-	-
Stage 2	975	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	9.2	3.7	0
HCM LOS	A		

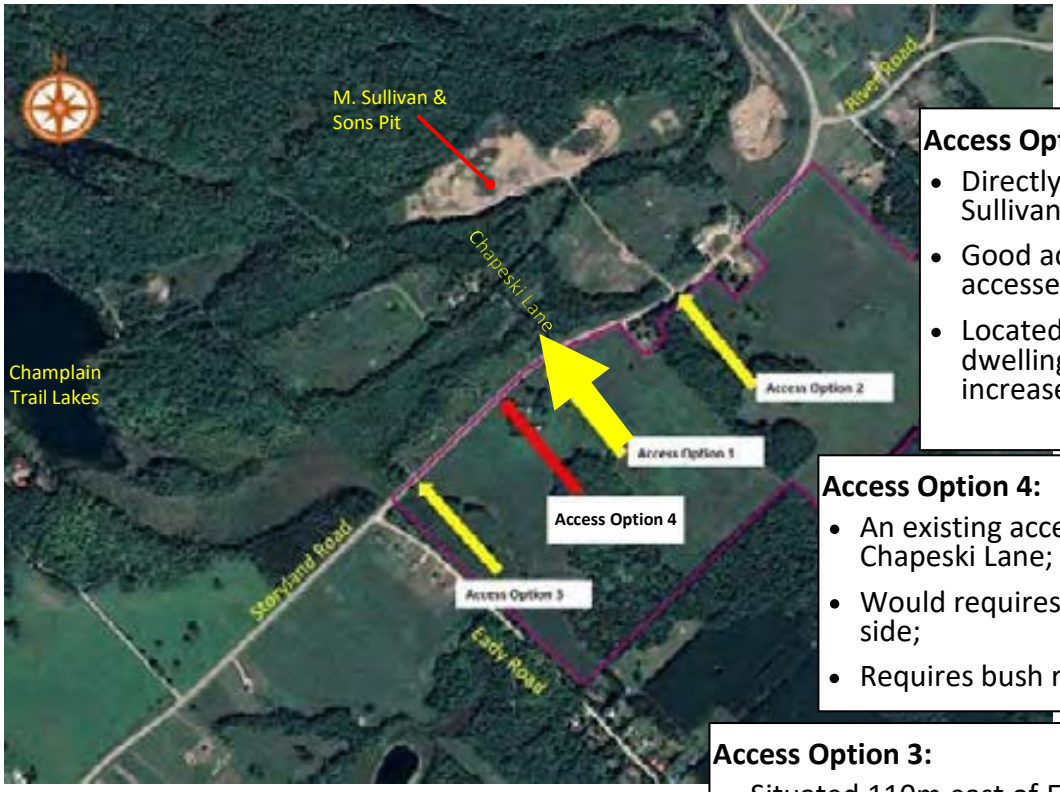
Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	1454	-	878	-	-
HCM Lane V/C Ratio	0.007	-	0.024	-	-
HCM Control Delay (s)	7.5	0	9.2	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX "E"

ACCESS LOCATION REVIEW

Appendix "E": ALTERNATIVE ACCESS LOCATION REVIEW

CastleGlenn conducted an evaluation of several possible access locations along the Storyland Road corridor and determined three viable alternative access options. Exhibit D-1 illustrates the options that were considered. Each option was reviewed from a sight line perspective taking into account the roadway horizontal curvature, the presence/proximity of adjacent dwellings and the presence of existing accesses.



Access Option 2:

- Directly opposite of existing access to Sullivan Pit;
- Good access management as both accesses meet sight line requirements;
- Located between two residential dwellings (498 and 554 Storyland Road) with increased noise potential.

Access Option 4:

- An existing access is located 150m south of Chapeski Lane;
- Would requires signage relocation on the east side;
- Requires bush removal in the ditch to the west.

Access Option 3:

- Situated 110m east of Eady Road and opposite a single residential driveway (377 Storyland Road), increased noise potential for residents along Eady Road;
- An existing access is present to the south, is gated and overgrown.

Exhibit D-1: Alternative Site Access

Option 4 represents an existing access located approximately 150m west of the Storyland Road /Chapeski Lane intersection. A sight line review conducted for this access revealed sufficient available sight lines to the west of the mineral pit entrance, however, the available sight lines to the east of the entrance are under 120 metres due to interference with the horizontal curvature of Storyland Road.

The minimum required sight distance between the proposed access in either direction was determined using TAC methodology[2] and was found to be 290 metres. As such, Access Option 4 was determined not to provide sufficient sight distance of vehicles approaching from the east.

Access Option 2 was found to be located too close to existing residential dwellings located on either side of the access.

The existing access located at Option 3 was found to be located immediately opposite an existing residential driveway.

Access Option 1 would be located directly opposite Chapeski Lane and was found to achieve a sight line distance of over 300 metres in both east and west directions along Storyland Road and represented the preferred access alternative and would represent the minimal disruption to local residents and adheres to the Ministry's access spacing guidelines in that the access is located 2.3 km from the Highway 17/Storyland Road intersection.

APPENDIX “F”

CONSULTANTS' CVs

Arthur Gordon

B.A., B.Eng., P. Eng.

Principal

Recently Completed Projects, Education and Memberships

Mr. Gordon is President of CastleGlenn Consultants Inc. He has served in the capacity as Director and Manager of Transportation Planning within major Canadian consulting engineering firms.

He has been responsible for numerous transportation planning and engineering design studies throughout Canada requiring detailed analysis, establishment of existing and forecast travel patterns and the development of sound rationale and justification for transportation/transit related infrastructure solutions.

Mr. Gordon has recently led the Highway 43 (Fox Creek) Major FPS and Highway 16-Highway 21 Major FPS to successful completion. In each case, he led a multi-disciplinary team of engineers to deliver a high-quality transportation solution to meet the needs of local residents and the Province. He worked with Alberta Transportation in the coordination and conduct of three Multiple Account Evaluation Sessions that saw more then 3-dozen interchange concepts presented, analyzed and evaluated from a variety of factors.

Mr. Gordon recently received the (2019) Minister's Award for Transportation Innovation by the Alberta Provincial government. This evidences his extensive experience with the development of transportation infrastructure within urbanized environments involving criteria and approaches that assess mobility, accessibility, level of service, parking circulation, operations and transit/pedestrian circulation measures within nationally significant campus environments. As well, his background includes life cycle analysis, road inventory, asset inventory, environmental assessment, transportation and transit economics, cost estimating and transportation implementation systems.

Mr. Gordon provides extensive consulting management expertise in major transportation functional planning and transit engineering studies and projects. He has managed and directed large interchange, freeway, highway and municipal transportation infrastructure initiatives inclusive of master planning studies addressing river and rail crossings. He offers multi-modal experience incorporating truck, airport, light rail as well as cycling, pedestrian design, traffic management, traffic impact, parking, site evaluation, traffic forecasting and transportation safety projects.

Mr. Gordon offers substantial functional planning experience having completed over 55 major functional planning and design assignments throughout his career.

Mr. Gordon is experienced with the development of transportation infrastructure within an urbanized environment involving criteria and approaches to assess mobility, accessibility, level of service, parking circulation, tourism operations and pedestrian circulation patterns within nationally significant campus environments.

Mr. Gordon has been retained by the Province of Alberta on several occasions to provide a peer review of other consultants functional planning submissions to address issues related to functionality, design adherence, cost, economic development impacts and provide added innovation. In many cases these assignments required political endorsement of the constituent municipalities.

Mr. Gordon also offers significant expertise in addressing the impacts of heavy vehicle traffic. He was a co-project manager responsible for the City of Edmonton's "*Truck Route and Regulation Study*" and has undertaken the "*National Capital Area Goods Movement Study*" and the "*Oakville Truck Route and Regulation Study*".

Mr. Gordon has developed a reputation of excellence in the area of communication and presentation skills. This has been displayed through numerous public consultation/ outreach exercises, providing expert witness testimony and prepared presentations to municipal councils, tribunals, executive committees and has testified to the Alberta Land Compensation Board and the Ontario Municipal Board. Most recently, Mr. Gordon was involved with the Hwy 63 Atmore Land Compensation Board. Mr. Gordon is known for incorporating public participation within the engineering process having coordinated technical review committee and public focus groups aimed at developing solutions that are community driven. He has participated in numerous exercises involving peer review and value engineering aimed at undertaking reviews of infrastructure proposals and preliminary design plans on behalf of municipalities, Alberta Transportation and the Ministry of Transportation of Ontario.

For the Province of Newfoundland and Environment Canada, he undertook the "*Trans-Canada Highway Improvements in the Vicinity of Terra Nova National Park*" (Newfoundland) that was used to assess alternative

Castleglenn Consultants
Engineers, Project Managers & Planners

Arthur Gordon
B.A., B.Eng., P. Eng.
Principal

Recently Completed Projects, Education and Memberships

corridors and their impacts upon a provincially significant national park and the adjacent communities.

Within the field of transportation planning within a municipal setting Mr. Gordon's experience is diverse and multi-faceted. He co-authored the "*Implementing Employer Based Transportation Demand Management (TDM) Programs"* on behalf of the City of Ottawa. He is currently working with the Edmonton International Airport (EIA) to assess their infrastructure requirements. Moreover, he provided transportation planning expertise on the "*Parliamentary Precinct Study*" in the National Capital.

In addition, he is thoroughly familiar with various evaluation frameworks which address infrastructure upgrading, safety, road-user benefit / cost analysis, level of service, socio-economic impact analysis, economic justification, and the requirements necessary to meet Federal EA processes.

Mr. Gordon's experience includes rigorous technical analysis involving surveys of all heavy registered commercial vehicles, comprehensive community involvement, and a thorough operational comparative impact evaluation and assessment. Variables such as the adjacent area land uses, roadway classification, the number of lanes, geometric features, intensity of pedestrian activity, level of congestion, access density, origin-destination demand, alternate route viability, route continuity and consistency economic simulation. He has developed numerous methodologies for determining forecast travel patterns and the requirements for producing sound justifications for proposed improvements within an urban setting.

Transportation Engineering/Planning – Alberta -

- Highway 16 Clover Bar Road Functional Planning Study
- Highway 43 Fox Creek Functional Planning Study
- Coal Loading Facility Functional Planning: Integration with Hwy 3/3X Provincial Plans Detailed Design (Blairmore)
- Detailed Roadway Design - Airport Road East from Sparrow Dr to 5th St (Leduc County)
- East Ramp Terminal Detailed Design - Hwy 2:32 Interchange at Airport Road (Leduc County)
- EIA Commercial Development TIS (Edmonton International Airport)
- Leduc County Annexation Review (Leduc County)
- Highway 2 Corridor Improvement Study CIS (Calgary to Edmonton)
- City of Leduc Transportation Master Plan (Leduc)
- Airport Road Interchange Functional Planning Study (Edmonton International Airport)
- QE II - 65th Ave Interchange FPS (Leduc)
- Highway 63:01 FPS (Boyle)
- Highway 1 FPS (Old Banff Coach Road) & Hwy 563
- Athabasca Truck Route Study
- Highway 43 FPS (Hwy 33 to Hwy 16)
- Hwy 22X FPS (Calgary to Indus)
- QE II/Hwy 27 FPS (Olds)
- Bypass Discussion Paper
- Safety Rest Area Discussion Paper
- Highway 63 Median Vehicle Inspection Station Design
- Highway 63 FPS
- Highway 28A/28 FPS (Gibbons)
- Highway 1-RR33 Interchange Design FPS
- Highway 855 Corridor FPS
- Highway 27 (Olds & Sundre) FPS
- QE II (Bowden) FPS
- QE II &Township Road 265 Partial Interchange (Airdrie)
- Highway 3 & 6 Interchange FPS (Pincher Creek)
- Highway 14 FPS (Wainwright)
- Lacombe/Blackfalds Traffic Impact Assessment (Lacombe County)
- Highway 2A FPS (Ponoka)
- Highway 27 & Olds FPS (Olds)
- Highway 2A Transportation Planning Study (Blackfalds to Lacombe)
- QE II Corridor Management Study (Calgary to Innisfail)
- Highway 2A Transportation Planning Study (Red Deer to Blackfalds)
- Highway 1 Dunmore FPS
- Highway 3 & 36 Taber Access Management Planning Study
- QE II & Hwy 3 FPS, Fort Macleod, Alberta Transportation
- Highway 1 FPS, Brooks, Alberta Transportation
- Highway Vicinity Access Management Agreement, Highway 11 East of Red Deer FPS
- Highway 11 Realignment Study, East of Red Deer
- Highway 34 & Highway 2 Interchange, Grand Prairie, Functional Design
- QE II & Hwy 11 Interchange Upgrades Red Deer
- Highway 11 Twinning
- Review of Ontario Access Management Policies
- Review of Interstate Highway (FHWA) Access Management Policies

Castleglenn Consultants
Engineers, Project Managers & Planners

Arthur Gordon

B.A., B.Eng., P. Eng.

Principal

Recently Completed Projects, Education and Memberships

- Edmonton Transportation Master Plan: Truck Route Study

In addition, Mr. Gordon has undertaken numerous studies within Ontario as well as work in British Columbia and Newfoundland. A few of the relevant design projects are listed below:

- Woodroffe Avenue Reconstruction Traffic Management Plan
- Ottawa Civic Hospital Parking Garage Evaluation
- Ottawa General Hospital Smyth Road Intersection Modifications Detailed Design
- 1450 & 1454 Merivale Road Detailed Design, Tender Document and Construction Administration
- Craig Henry and Greenbank Road Intersection Improvement - Detailed Design
- Silver Seven Road Median Preliminary and Detailed Design
- Hunt Club Road - New Proposed Development Access and Right-In/Right-Out Access East of Hawthorne Road
- Moodie Drive and Dibble Road Intersection Modifications
- Mer Bleue Roundabout Design
- Strandherd Drive Pavement Markings and Signage Plan
- 350 Cresthaven Retail Development Design

Memberships

- Association of Professional Engineers, Geologists and Geophysicists of Alberta
- Professional Engineers, Ontario
- Institute of Transportation Engineers, Past President, National Capital Section
- Transportation Association of Canada, Transportation Planning Committee

Education

- B.Eng. Civil Engineering, Carleton University, 1984
- B.A. Economics and Law, Carleton University, 1980
- Masters Courses
- Accredited Health and Safety Auditor – Alberta Construction Safety Association

Andrey Kirillov

B.Eng

Transportation Planner

Mr. Andrey Kirillov is a *Transportation Planner* with CastleGlenn Consultants Inc.

Mr. Kirillov offers extensive training within the field of transportation planning, traffic analysis and functional planning. He has developed a diverse set of skills in the fields related to transportation traffic engineering, infrastructure planning and engineering.

Mr. Kirillov has knowledge of analyzing multi-modal traffic streams with both macro-and-micro modelling techniques, having been involved in numerous traffic operations studies, and transportation impact assessments (TIA), as well as major functional planning studies (FPS), and Transportation Master Plans.

Major Planning Projects (Ongoing)

- *Leduc County Transportation Master Plan (TMP) (Leduc County, Alberta):* Mr. Kirillov assisted with traffic analysis, communications and public engagement aspects of the project. His duties included helping with organization of in-person public houses, production of GIS exhibits and report review. A component of the TMP process involved identifying intersection upgrade requirements over the next 10 and 20-year time horizons throughout the entire county as well as addressing deficiencies in adherence to municipal design standards.

Transportation Impact Assessments

- *36B Harris Street Residential Development, (Perth, Ontario);* Mr. Kirillov lead the traffic analysis component of the traffic study in Town of Perth (about 7,500 residents). The study involved traffic forecasting, assignment and distribution for proposed new residential developments, and the analysis of 8 signalized and unsignalized intersections for existing, interim and future conditions. The findings were summarized to determine the traffic impact of the proposed residential development on the community and the timing and impacts to adjacent intersections.
- *IHA Seniors' Residence Development (Alexandria, Ontario)* Mr. Kirillov assisted with traffic analysis on the senior housing development within a community of 3,000 persons. The impact of the 500-unit development upon the community was evaluated from a traffic perspective inclusive of pedestrian connectivity within the surrounding area. The development was phased to determine the timing/staging of infrastructure/ new accesses upon the community.
- *Westhaven Subdivision (Arnprior, Ontario);* Mr. Kirillov was the lead traffic analyst for the Westhaven Subdivision Traffic Impact Study in the Town of Arnprior, ON (9,000 residents). The objective of the study was to evaluate the impact of the proposed residential subdivision on the adjacent road network. The analysis dealt with existing, future background and future design conditions using Synchro.
- *150 Kanata Avenue-1200 Maritime Way Residential Development (Ottawa, Ontario);* Mr. Kirillov was the lead traffic analyst for this study, which involved an analysis of nine intersections accounting for existing, interim, and future design horizons. The study included screening of mitigation strategies, such as roadway widening, signal timing and traffic signal phase adjustments, and implementation of a roundabout configuration. Analysis of mitigated conditions was conducted using both Synchro™ and Sidra™ softwares.
- *5329 Boundary Road Commercial Development (Ottawa, Ontario)*: Mr. Kirillov was the senior traffic analyst for this TIA in support of the proposed major fuel/commercial development. The study was required to follow both municipal and Provincial requirements, and dealt with a review of existing traffic, site traffic, site circulation and access management effecting the design of both municipal and provincial infrastructure.

Key skills

- Excellent verbal communication skills;
- Experienced in planning and problem solving;
- Experienced in engaging with public and stakeholders;
- Proficient in technical writing;
- Strong analytical capacity; and
- Proficient with…
  - Synchro versions 8/10;
  - Sidra Roundabout Analysis;
  - Microsimulation analysis using SimTraffic™ to model real-time vehicle conflicts and safety elements;
  - HCM 2000/HCM 2010/HCM 6 Traffic Analysis; and
  - ArcGIS and QGIS platforms.
  - Google Earth and similar GIS platforms
  - Microsoft Word Suite (Word, Excel, PowerPoint, Outlook, etc.)

Education

- B. Eng. Civil Engineering with Cooperative Education, Carleton University, 2021