



**447 Bayview Drive
Barrie, ON**

**Proposed Self-Storage Facility
Traffic Impact Study**

Paradigm Transportation Solutions Limited

September 2022
220465



Project Summary



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447 Bayview Drive, Barrie, ON Proposed Self-Storage Facility Traffic Impact Study

Client
Cobidana Investments Limited

Client Contact
Randy Shiff

Consultant Project Team
Adrian Soo, P.Eng.
Wenting Li, M.A.Sc., EIT



Signing Licensee/Engineer, P.Eng.

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Paradigm Transportation Solutions Limited
5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684
www.ptsl.com



Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) was retained to conduct this Traffic Impact Study (TIS) for a proposed self-storage facility located at the municipal address of 447 Bayview Drive in the City of Barrie. This study has been prepared in support of a Site Plan Approval (SPA) application.

The development as proposed is a four-storey building with a total gross floor area (GFA) of 11,768.4 SM (126,674 SF). The proposed development will be served via two full-movement driveways with Churchill Drive. A total of 24 parking spaces along with three loading spaces are proposed to serve the development. These provisions are compliant with the City of Barrie Zoning By-law and the site would satisfactorily accommodate passenger car and truck circulation and maneuvering.

The TIS includes an analysis of existing (2022) and future (2028) traffic conditions for the study area intersections and reaches the key conclusion that the proposed development can be accommodated by the existing road network without any improvements.

Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing conditions, the study area intersections are operating at good level of service and well within capacity during the weekday AM and PM peak hours;
- ▶ Under future background traffic conditions, the study area intersections operations would be slightly worse in comparison to existing conditions. All traffic movements are forecast to continue to operate at good level of service and well within capacity;
- ▶ With development of the proposed self-storage facility, it is forecast to generate 11 and 19 vehicular trips during the weekday AM and PM peak hours, respectively;
- ▶ Under future total traffic conditions, the operations at the study area intersections are similar to future background traffic conditions, due to the imperceptible amount of site-generated traffic. The development is not anticipated to result in any undue impacts on the surrounding transportation network;



- ▶ Auxiliary right-turn and left-turn lanes are not required on Churchill Drive to accommodate the site-generated traffic;
- ▶ The proposed vehicular parking and loading space provisions satisfy the City of Barrie Zoning By-law requirements;
- ▶ All anticipated design vehicles are found to access the site and circulate on-site without any conflicts; and
- ▶ The two site access connections with Churchill Drive satisfy the TAC GDGCR corner clearance and sight distance requirements.

Recommendations

The recommendations of this study are as follows:

- ▶ The City of Barrie should recognize the conclusions drawn above; and
- ▶ From a transportation perspective, the required planning applications to allow the proposed development should be approved.



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1 Introduction

Paradigm Transportation Solutions Limited (Paradigm) was retained to prepare this Traffic Impact Study for a proposed self-storage facility development located at the municipal address of 447 Bayview Drive in the City of Barrie. This study has been prepared in support of a Site Plan Approval (SPA) application.

Figure 1.1 illustrates the site location, which is generally situated in the southeast quadrant of the intersection of Bayview Drive and Churchill Drive/Concert Way. The proposed site is located within a special policy area R as documented within the City of Barrie Official Plan, Schedule C, Defined policy area¹.

The scope of this study is as follows:

- ▶ A study area comprising the intersection of Bayview Drive and Churchill Drive/Concert Way (signalized), and the intersections of Churchill Drive with the proposed site accesses (proposed as unsignalized);
- ▶ Traffic forecasts for the horizon year 2028, representing a period of five years from the anticipated build-out year (2023); and
- ▶ Analysis time periods including the weekday AM and PM peak hours.

The methodology used in this study is summarized below:

- ▶ Estimate the future peak hour background traffic for the 2028 horizon based upon a 1.0% per annum growth rate, while accounting for the inclusion of other area background developments, if any;
- ▶ Estimate the net increase in traffic due to the proposed self-storage development;
- ▶ Combine the future background traffic with the net increase in site traffic for the future horizon year;
- ▶ Analyze the peak hour intersection operations for future background and total traffic conditions;
- ▶ Determine the net impact on operational performance due to site traffic and the need for any road and/or operational traffic control improvements to address any identified impacts;

¹ City of Barrie, *Official Plan, Schedule C – Defined Policy Areas*, January 2018.



- ▶ Confirm parking and loading provisions comply with municipal requirements;
- ▶ Confirm the site can adequately provide for vehicle circulation as required for parking and loading maneuvers; and
- ▶ Confirm corner clearance and sufficient sight distances at the proposed accesses on Churchill Drive.

This study has been carried out in accordance with the City of Barrie Transportation Impact Study Guidelines². Pre-study consultation correspondence exchanged with City of Barrie staff has been undertaken. **Appendix A** contains the correspondence for reference.

² City of Barrie, *Transportation Impact Study Guidelines* (Version 1.0), December 1 2021.





Site Location

2 Proposed Development

The subject site is located at the municipal address of 447 Bayview Drive in the City of Barrie. The land is currently vacant.

The applicant is proposing to develop a 11,768.4 SM (126,674 SF) Gross Floor Area (GFA) four-storey self-storage facility.

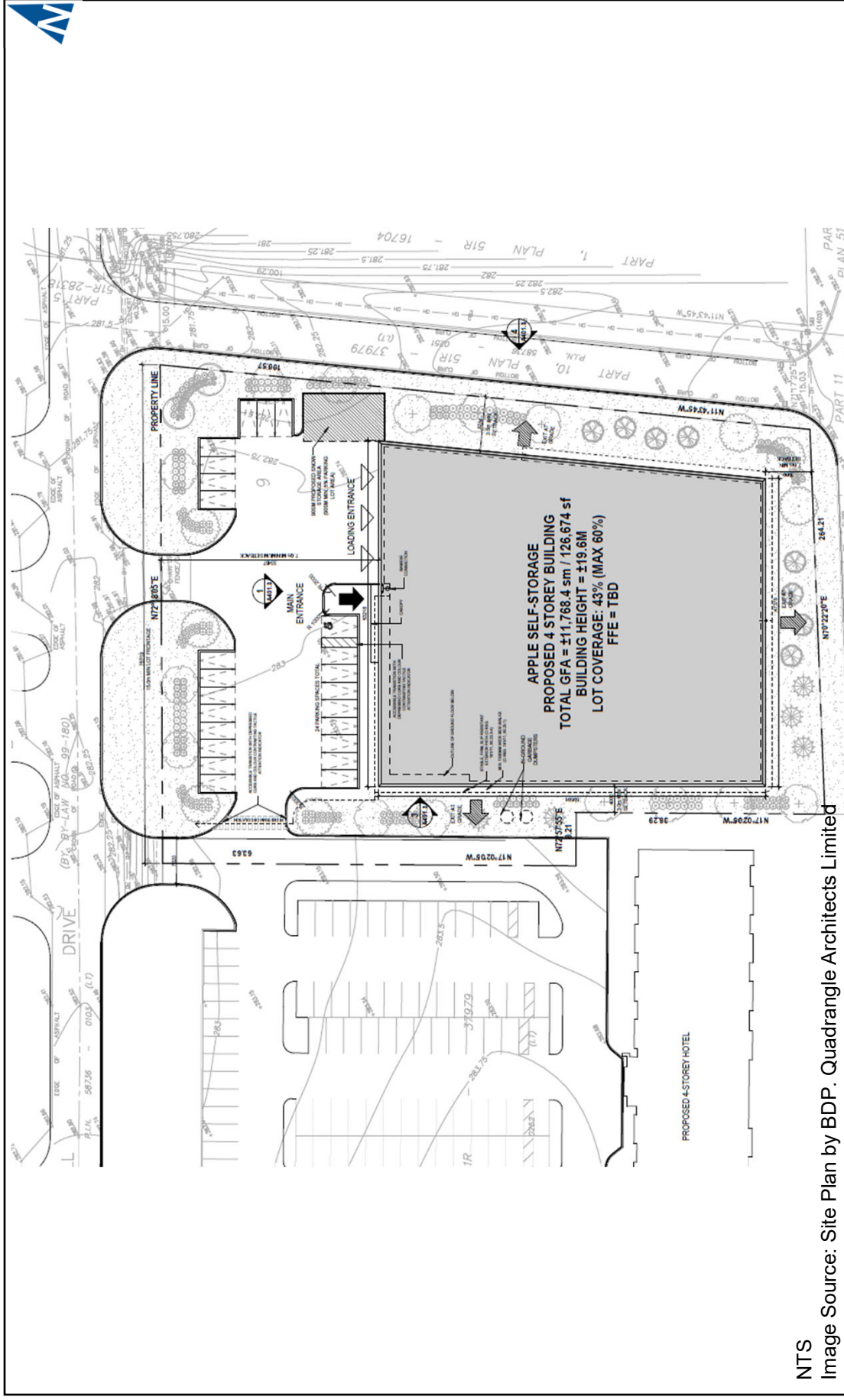
Vehicular access to the site would be via two full-movement driveways on Churchill Drive. It is noted these driveways would be aligned directly opposite existing driveways serving a commercial site on the north side of Churchill Drive.

The proposed western driveway, herein referred as “Site Access (West)”, is a shared driveway that provides access to the adjacent development west of the subject site. The proposed eastern driveway, herein referred as “Site Access (East)”, is the main access for the subject site.

A total of 24 surface parking spaces (including one barrier-free parking space) along with three loading spaces are proposed based on the current site plan.

Figure 2.1 illustrates the proposed development concept site plan.





3 Existing Conditions

3.1 Road and Traffic Control

The characteristics of the roads and intersections near the subject site are described below. Reference was made to the City of Barrie Official Plan – Schedule D Roads Plan³.

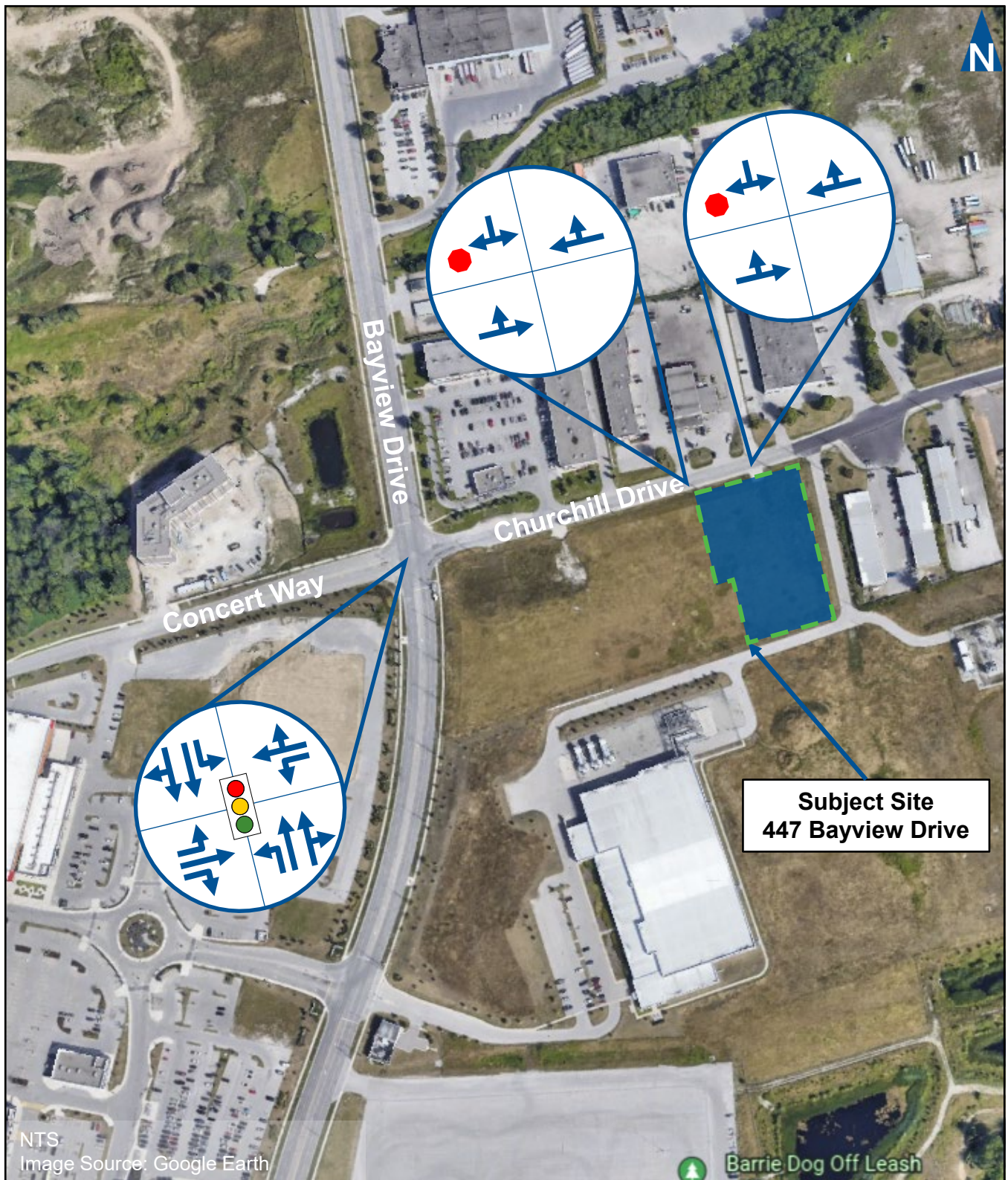
- ▶ **Bayview Drive** is a north-south five-lane major collector road under the jurisdiction of the City of Barrie. Two travel lanes are provided in each direction along with a centre two-way left-turn lane. A posted speed limit of 50 km/h is noted within the study area. No stopping signage is posted along both sides of Bayview Drive; and
- ▶ **Churchill Drive** is an east-west two-lane minor collector roadway under the jurisdiction of the City of Barrie. The roadway extends from Bayview Drive easterly to Welham Road. One travel lane is provided in each direction. An access (Concert Way) for the commercial-retail Park Place development is aligned opposite Churchill Drive on the west side of Bayview Drive. No posted speed limit signage is evident along this section of Churchill Drive; therefore, the assumed statutory speed limit of 50 km/h governs.

The intersection of Bayview Drive and Churchill Drive/Concert Way is signalized. Auxiliary left-turn lanes are provided on all intersection approaches. An auxiliary right-turn lane is provided on the eastbound approach for traffic exiting from Park Place. Pedestrian signals as well as delineated crossings are provided at all intersection approaches.

Figure 3.1 illustrates the existing lane arrangements and traffic control devices at the study area intersections.

³ City of Barrie, *Official Plan, Schedule D – Roads Plan*, January 2018.





Existing Lane Configurations & Traffic Control

3.2 Transit

Barrie Transit is the public transit operator for the City of Barrie and provides services within the study area along Bayview Drive and Churchill Drive. The closest transit stops are located at the intersection of Bayview Drive and Churchill Drive/Concert Way.

Reference was made to the Barrie Transit schedule and maps to obtain details on current route information. The following surface bus routes operate within the vicinity of the subject site:

- ▶ **Route 1A (Georgian Mall)** operates eastbound on Churchill Drive in the vicinity of the subject site. The route operates from Park Place to Georgian Mall, Monday to Sunday. During the weekday peak hours, the route operates with headways in the order of 30 minutes.
- ▶ **Route 3A (Bayview)** operates northbound on Bayview Drive in the vicinity of the subject site. The route operates from Barrie South GO Station to the Downtown Terminal, Monday to Sunday. During the weekday peak hours, the route operates with headways in the order of 30 minutes; and
- ▶ **Route 3B (Painswick)** travels the same route as Route 3A in the opposite direction (southbound on Bayview Drive). The route operates Monday to Sunday and travels with headways in the order of 30 minutes during the weekday peak hours.

It is noted there is a transit hub within Park Place where direct connections can be made to other local transit services, including Barrie Transit Routes 2, 7, 8, and OnDemand transit. These transit services provide connections to and from the Downtown Terminal, Allandale Waterfront GO Station, and the Barrie South GO Station. Therefore, inter-regional travel via local transit is a viable option for the subject site.

Figure 3.2 illustrates the existing Barrie Transit Network.





3.3 Active Transportation

No dedicated or designated bicycle facilities are currently provided along the study area roads; therefore, cycling trips would be accommodated within the travelled sections of the existing roadways.

Pedestrian travel within the study area is facilitated by sidewalks on both sides of Bayview Drive, and the north side of Concert Way. No sidewalks are currently provided along Churchill Drive. Delineated crosswalks and pedestrian pushbuttons/signal indications are provided for all approaches at the intersection of Bayview Drive and Churchill Drive/Concert Way.

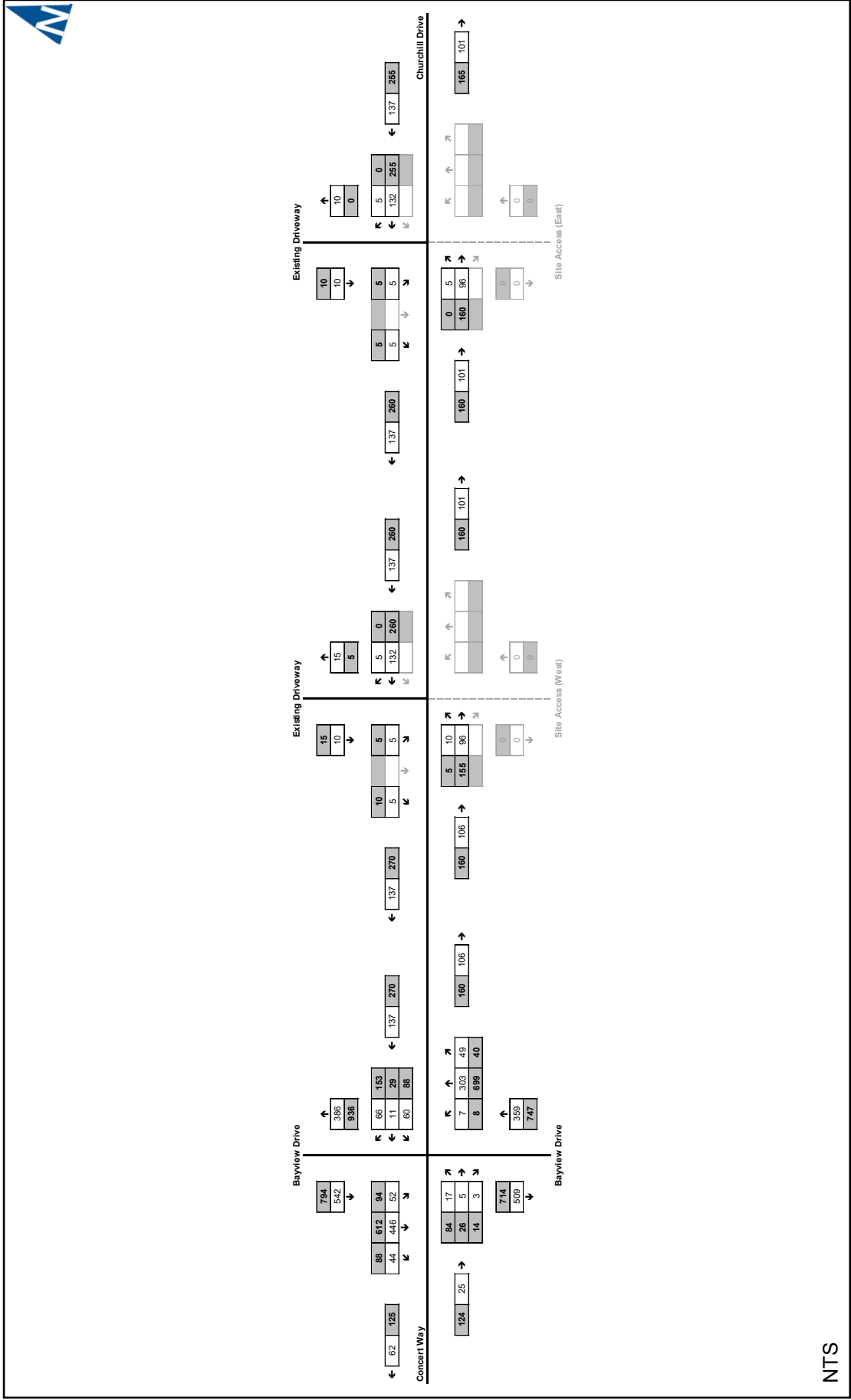
3.4 Traffic Volumes

To assess intersection operations, turning movement counts (TMCs) are used to quantify the movement of vehicles, pedestrians, trucks, buses, and cyclists through an intersection. Existing traffic data at an intersection or on a road section forms the foundation for operational analysis. The counts are usually collected during peak periods to complete level of service (LOS) analysis under its worst-case operating conditions.

Paradigm conducted traffic counts at the intersection of Bayview Drive and Churchill Drive/Concert Way, and at the Churchill Drive/Commercial site accesses on 7 September 2022. Specifically, only spot counts were conducted at the existing commercial site accesses. The latter intersections are of interest as the proposed development accesses would be aligned on the opposite side of the existing driveways.

Figure 3.3 illustrates the existing weekday AM and PM peak hour traffic volumes. **Appendix B** contains the raw traffic data for reference.





Existing Traffic Volumes

Figure 3.3

3.5 Traffic Observations

Paradigm staff visited the study area to conduct traffic observations on Wednesday 7 September 2022 during the AM and PM peak periods. Existing lane configurations, traffic signage, and sight distances were confirmed in the field.

Paradigm staff noted a good level of service is being provided at the study area intersections. No anomalies were noted as traffic was observed to be operating without any unusual delay. During the observation period pedestrian traffic and cycling trips were noted to be low.

The existing commercial site accesses aligned across from the proposed site access driveways were observed to be low volume. During the AM peak hour less than 15 inbound trips at either driveway were noted, and similarly during the PM peak hour less than 15 outbound trips at either driveway were observed.

A sight distance assessment for the proposed driveway locations was also conducted as described in **Section 6.3.4**.

3.6 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to opposing traffic flows, intersection geometry, and at signalized intersections, signal timing.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume-to-capacity ratio is greater than 1.00, the movement is classed as LOS F. Remedial measures are usually implemented if they are feasible.

The City of Barrie Transportation Impact Study Guidelines⁴ identifies critical movements as follows:

- For signalized intersections:

⁴ City of Barrie, *Transportation Impact Study Guidelines* (Version 1.0), December 1 2021, P13-14.



- Volume-to-capacity (v/c) ratios for overall intersection operations, through movements, or shared through/turning movements increase to 0.85 or above;
 - V/C ratios for exclusive movements increase to 0.85 or above;
 - Where the 50th and 95th percentile queue length exceed available turning lane storage; and
 - Queues for exclusive left- and right-turn lanes that are inaccessible due to the through lane queue length.
- For unsignalized intersections:
- LOS, based on average delay per vehicle, on individual movements exceed LOS E; and
 - The estimated 95th percentile queue length for an individual movement exceeds the lesser of 5 vehicles or the available queue storage.

To assess the existing peak hour automobile conditions, an operational analysis was conducted for the weekday AM and PM peak hour traffic volumes at the study area intersections using Synchro software, which implements the methods of the Highway Capacity Manual. The key parameters used in the analysis include:

- Existing lane configurations;
- Heavy vehicle percentages as derived from existing traffic count data;
- Conflicting pedestrian volumes as derived from existing traffic count data;
- Calculated intersection peak hour factors (PHFs), which facilitates an assessment of the busiest 15-minute period within the peak hour;
- Signal timing information as extracted from a Traffic Impact Study⁵ for a development west of the subject site. **Appendix B** includes the signal timing data for reference; and
- Synchro default values for all other inputs.

Table 3.1 summarizes the operational analysis results including the level of service (LOS), average delay in seconds, volume-to-capacity (v/c) ratio, and 95th percentile queue length in metres for the weekday AM and PM peak hours. Any critical movements are highlighted in

⁵ Paradigm Transportation Solutions Limited, *Proposed Office Development Traffic Impact Study*, May 2018, P62-64 of the PDF.



yellow in the result table. **Appendix C** contains the Synchro analysis outputs for reference.

The analysis of existing conditions indicates that all traffic movements are operating at a good level of service and well within capacity. The results are consistent with the field traffic observations conducted.

The 95th percentile queue lengths were checked for all turn lanes against provided storage, and queue lengths for through movements were also checked. No spillback or storage issues were found.



TABLE 3.1: EXISTING TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayview Drive & Churchill Drive/Concert Way <i>Signalized</i>	EB	Left	C	27	0.12	8	C	27	0.50	25
		Thru	C	26	0.02	4	C	24	0.09	10
		Right	C	26	0.00	< 1	C	23	0.01	2
	WB	Left	C	29	0.44	19	C	26	0.41	25
		Thru/Right	C	27	0.11	12	C	25	0.29	23
	NB	Left	A	3	0.01	2	A	4	0.02	2
		Thru-Thru/Right	A	4	0.17	14	A	6	0.37	37
	SB	Left	A	4	0.10	7	A	7	0.26	14
		Thru-Thru/Right	A	4	0.24	21	A	6	0.34	34
	Overall Intersection		A	8	0.27	-	A	10	0.39	-
Churchill Drive & Existing West Commercial Access <i>Unsignalized</i>	EB	Left/Thru	A	1	0.01	< 1	A	< 1	0.00	< 1
	WB	Right/Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	10	0.01	< 1	B	10	0.02	1
Churchill Drive & Existing East Commercial Access <i>Unsignalized</i>	EB	Left/Thru	A	< 1	0.00	< 1	A	< 1	0.00	< 1
	WB	Right/Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	10	0.01	< 1	B	11	0.02	< 1
¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume-to-capacity ratio; ⁴ 95 th percentile queue, metres										

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume-to-capacity ratio; ⁴ 95th percentile queue, metres



4 Forecast

4.1 Horizon Years and Future Background Traffic

4.1.1 Generalized Background Growth

It is noted that Paradigm previously completed a Traffic Impact Study⁶ for a proposed office development located west of the subject site.

For consistency, the same growth rate used in that study was adopted. Specifically, a 1.0% per annum compounded growth rate was applied to the base year traffic volumes to estimate the 2028 traffic conditions. The horizon year 2028 represents a period of five years from anticipated build-out in 2023.

It should be noted the growth rate of 1.0% per annum was derived from the City of Barrie travel demand model and was confirmed by City staff in the previous study.

4.1.2 Other Area Developments

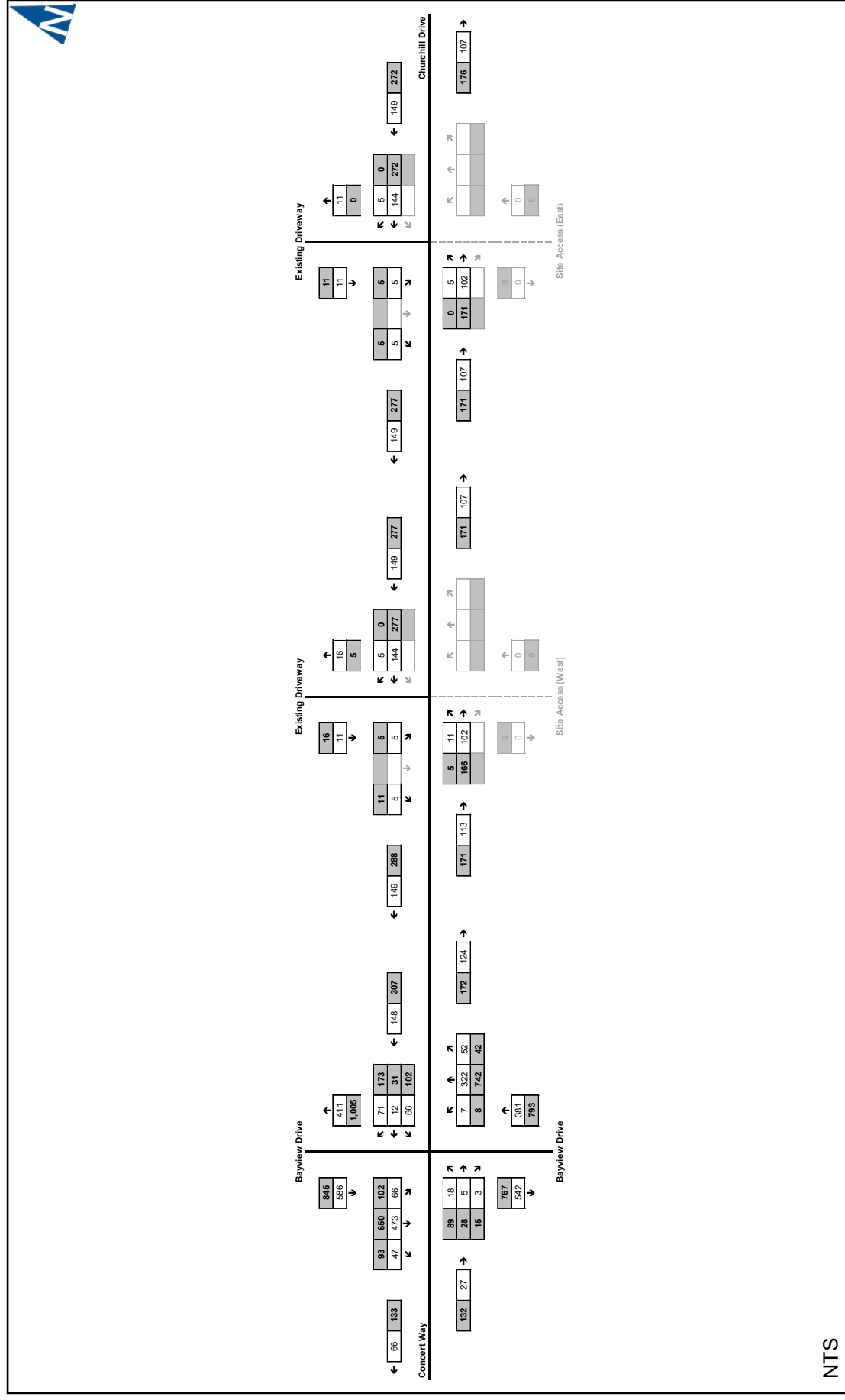
Aforementioned, an office development located west of the subject site was proposed and Paradigm previously conducted a Traffic Impact Study for the development. The anticipated site-generated traffic for the office development has been accounted for as part of the background traffic forecasts.

Figure 4.1 illustrates the 2028 background traffic forecasts.

Appendix D provides the background traffic forecast components for reference.

⁶ Paradigm Transportation Solutions Limited, *Proposed Office Development Traffic Impact Study*, May 2018, P14.





4.2 Site Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition)⁷ data was used to estimate the peak hour vehicular traffic volumes generated by the proposed development. The description for the Land Use Code (LUC) used in this study, as given by the Trip Generation Manual is as follows:

- **LUC 151 (Mini-Warehouse):** is a building in which a number of storage units or vaults are rented for the storage of goods. They are typically referred to as “self-storage” facilities. Each unit is physically separated from other units, and access is usually provided through an overhead door or other common access point.

Table 4.1 summarizes the resultant weekday AM and PM peak hour site trip generation.

TABLE 4.1: SITE TRIP GENERATION

Land Use Code	Size (GFA)	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 151	126,674 SF	0.09	6	5	11	0.15	9	10	19
Total			6	5	11		9	10	19
LUC 151: AM peak hour - In 59%/Out 41%; PM peak hour - In 47%/Out 53%.									

A total of 11 AM peak hour and 19 PM peak hour vehicle trips are forecast to be added to the study area road network due to the proposed development.

4.3 Site Trip Distribution and Assignment

The directional distribution of traffic approaching and departing the subject lands is a function of several variables including population densities, existing travel patterns, and efficiency of the roadways leading to the site.

The trip distribution for the subject lands was estimated based on the trip patterns documented in the existing turning movement count data.

Table 4.2 summarizes the trip distribution used in this study.

⁷ Institute of Transportation Engineers, *Trip Generation Manual*, 11th ed., (Washington, DC: ITE, 2021).



TABLE 4.2: TRIP DISTRIBUTION

To/From	Via	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
North	Bayview Drive	52%	38%	44%	52%
South	Bayview Drive	35%	51%	41%	39%
East	Churchill Drive	13%	11%	15%	9%
Total		100%	100%	100%	100%

For assessment purposes a conservative approach (i.e., errs on the high side) was taken and all site trips were assigned to Site Access (East).

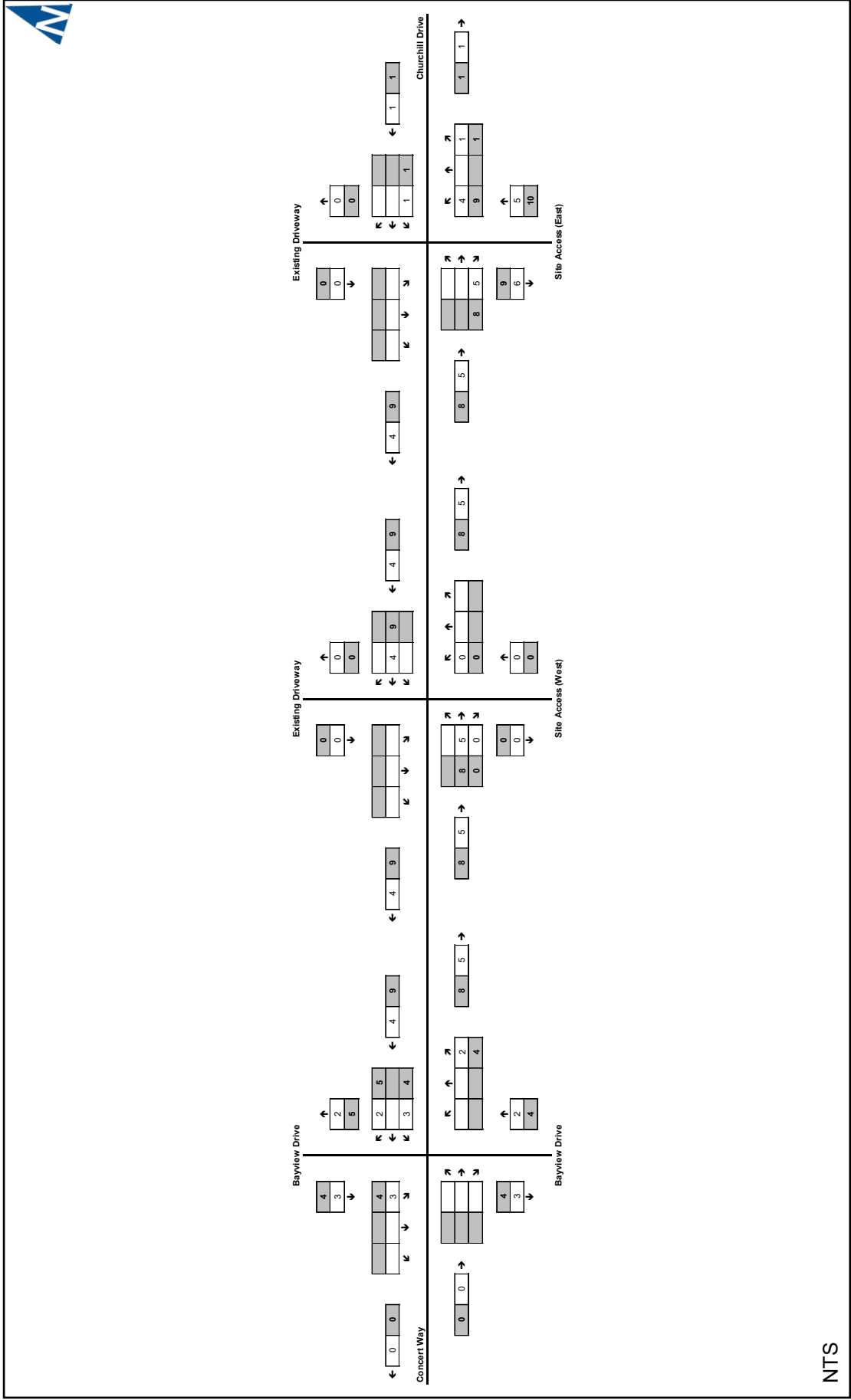
Figure 4.2 illustrates the site-generated trips assigned to the road network for the weekday AM and PM peak hours. Slight differences with respect to the trip generation estimates are due to rounding.

4.4 Future Total Traffic

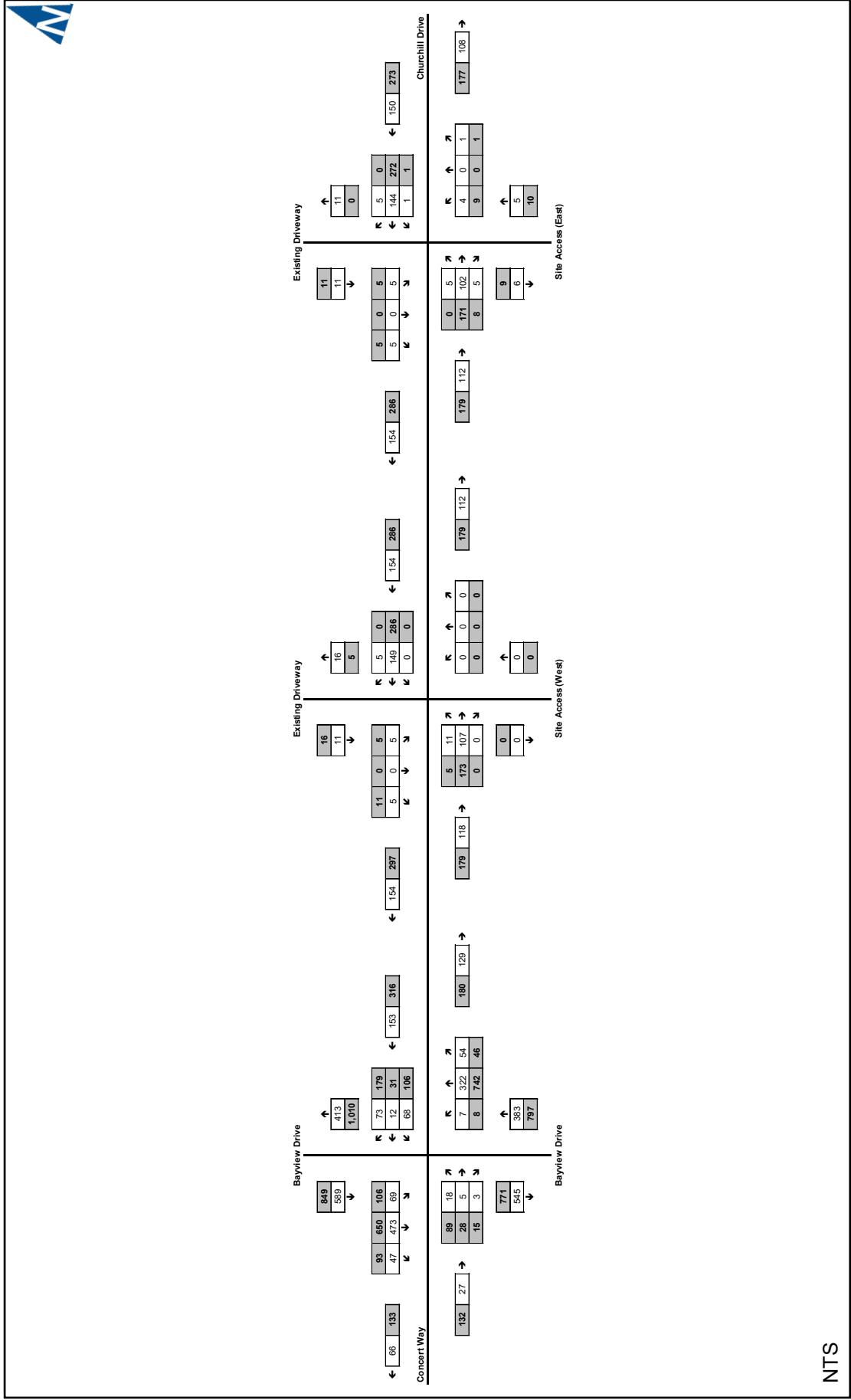
The future weekday AM and PM peak hour background traffic forecasts were combined with the site traffic assignments to determine the future total traffic volumes for the 2028 horizon year.

Figure 4.3 illustrates the 2028 total traffic volumes for the weekday AM and PM peak hours.





Site-Generated Traffic Volumes



2028 Total Traffic Volumes

Figure 4.3

5 Transportation Impact Assessment

5.1 Future Background Traffic Operations

To assess the automobile operating conditions for the future weekday AM and PM peak hour background traffic forecasts, an operational analysis was undertaken using the same methodology, parameters, lane arrangements, and traffic control devices as in the analysis of existing conditions.

Table 5.1 summarizes the results of the operational analysis for the 2028 background traffic conditions. **Appendix E** contains the Synchro analysis outputs for reference.

The results of the analysis indicate the study area intersections are forecast to operate with similar level of service as noted under existing conditions, but slightly exacerbated accounting for background growth and the other area development.

Under the future background conditions (without the subject development), the study area intersections are forecast to continue operating at a good level of service and well within capacity.



TABLE 5.1: 2028 BACKGROUND TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayview Drive & Churchill Drive/Concert Way <i>Signalized</i>	EB	Left	C	27	0.12	8	C	31	0.58	27
		Thru	C	26	0.02	4	C	24	0.09	10
		Right	C	26	0.00	< 1	C	23	0.01	2
	WB	Left	C	30	0.47	20	C	27	0.47	28
		Thru/Right	C	27	0.12	13	C	26	0.42	31
	NB	Left	A	3	0.01	2	A	4	0.02	2
		Thru-Thru/Right	A	4	0.18	15	A	6	0.39	41
	SB	Left	A	4	0.12	8	A	7	0.30	17
		Thru-Thru/Right	A	4	0.25	22	A	6	0.36	38
	Overall Intersection		A	8	0.29	-	B	11	0.43	-
Churchill Drive & Existing West Commercial Access <i>Unsignalized</i>	EB	Left/Thru	A	1	0.01	< 1	A	<1	0.00	< 1
	WB	Right/Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	10	0.01	< 1	B	11	0.03	1
Churchill Drive & Existing East Commercial Access <i>Unsignalized</i>	EB	Left/Thru	A	<1	0.00	< 1	A	<1	0.00	< 1
	WB	Right/Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	10	0.01	< 1	B	11	0.02	< 1

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume-to-capacity ratio; ⁴ 95th percentile queue, metres

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume-to-capacity ratio; ⁴ 95th percentile queue, metres



5.2 Future Total Traffic Operations

To assess the automobile operating conditions for the future weekday AM and PM peak hour total traffic forecasts, an operational analysis was undertaken using the same methodology, parameters, lane arrangements, and traffic control devices as in the analysis of background conditions. The exception being the assessment of the proposed site access connections with Churchill Drive.

Table 5.2 presents the results of the operational analysis for the 2028 total traffic conditions. **Appendix F** contains the Synchro analysis outputs for reference.

The results of the analysis indicate that the study area intersections are forecast to operate at a similar level of service as is noted for both existing and background traffic conditions.

The development of the subject site is anticipated to have a negligible impact on traffic operations at the Bayview Drive/Churchill Drive intersection and at the site access driveways proposed on Churchill Drive (operating in conjunction with the existing commercial site accesses).

The 95th percentile queue lengths are forecast to remain within existing storage lane lengths.



TABLE 5.2: 2028 TOTAL TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayview Drive & Churchill Drive/Concert Way <i>Signalized</i>	EB	Left	C	26	0.12	8	C	30	0.58	27
		Thru	C	26	0.02	4	C	24	0.09	10
		Right	C	26	0.00	<1	C	23	0.01	2
	WB	Left	C	30	0.48	21	C	27	0.47	29
		Thru/Right	C	26	0.12	13	C	26	0.44	32
	NB	Left	A	3	0.01	2	A	5	0.02	2
		Thru-Thru/Right	A	4	0.18	16	A	6	0.39	43
	SB	Left	A	4	0.13	9	A	8	0.32	18
		Thru-Thru/Right	A	4	0.26	23	A	6	0.36	39
	Overall Intersection		A	8	0.29	-	B	11	0.43	-
Churchill Drive & Existing West Commercial Access/West Site Access <i>Unsignalized</i>	EB	Left/Thru/Right	A	1	0.01	<1	A	<1	0.00	<1
	WB	Left/Thru/Right	A	<1	0.00	<1	A	<1	0.00	<1
	NB	Left/Thru/Right	A	<1	0.00	<1	A	<1	0.00	<1
	SB	Left/Thru/Right	A	10	0.01	<1	B	11	0.03	1
Churchill Drive & Existing East Commercial Access/East Site Access <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	<1	0.00	<1
	WB	Left/Thru/Right	A	<1	0.00	<1	A	<1	0.00	<1
	NB	Left/Thru/Right	B	10	0.01	<1	B	12	0.02	1
	SB	Left/Thru/Right	A	10	0.01	<1	B	11	0.02	<1

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume-to-capacity ratio; ⁴ 95th percentile queue, metres



6 Functional Review

6.1 Parking and Loading

6.1.1 Vehicular Parking Review

The current site plan indicates a total parking supply of 24 spaces will be provided to serve the development's parking demands, including one Type A barrier-free parking space.

The vehicular parking requirements for the subject site have been verified against the City of Barrie Zoning By-law 2009-141⁸.

Table 6.1 summarizes the required parking for the proposed development in comparison to the proposed parking supply.

TABLE 6.1: REQUIRED AND PROVIDED VEHICULAR PARKING

Land Use and Size	Zoning By-law Requirements	Spaces Required	Spaces Proposed	Surplus/ Deficit
Self Storage 11,768.4 SM GFA	1 space per 500 SM of GFA	24	24	Nil
Total		24	24	Nil

As shown above, the proposed vehicle parking supply for the development meets and satisfies the City's by-law requirement.

Accessible parking spaces are required when more than four parking spaces are required on a lot. The minimum number of accessible parking spaces to be provided is one Type A barrier-free parking space for parking requirements ranging from 5 to 25 spaces provided per the City's by-law requirement.

The proposed accessible parking supply satisfies and is compliant with the City's by-law requirement.

6.1.2 Loading Review

The current site plan indicates a total of three loading spaces are provided.

The loading requirement for the proposed development under Zoning By-law Section 4.7.1 is as follows:

⁸ City of Barrie Zoning By-law 2009-141, § section 4.6 – Parking Standards.



- ▶ For a gross floor area size of 7,500 - 13,999 SM, three loading spaces are to be provided.

The proposed three loading spaces satisfies and is compliant with the City's by-law requirement.

6.2 On-Site Circulation

AutoTURN software was used to review and confirm that the design of the site accesses, internal circulation, parking layout, and loading area will accommodate the design vehicles expected on-site. The analysis reviewed the following vehicles:

- ▶ Pumper fire truck;
- ▶ Molok truck (waste collection vehicle); and
- ▶ Delivery vehicle (TAC Heavy Single-Unit truck).

No conflicts have been identified for the design vehicles. All vehicles will be able to ingress/egress the site, and circulate the site without any conflicts. **Appendix G** contains the vehicle manoeuvring diagrams for reference.

6.3 Access Review

The two site access connections have been assessed to determine whether there are design issues, safety-related concerns, and/or anticipated operational issues that may be affected by the locations, and whether an alternative arrangement would be preferred from a design perspective.

6.3.1 Auxiliary Turn Lanes

Pre-application comments from the City requested a review for the requirements of auxiliary turn lanes on Churchill Drive at the two site accesses.

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR)⁹ was referenced for the auxiliary turn lane warrant analysis.

Per Section 2.3.5.2 in the TAC GDGCR, the implementation of auxiliary right-turn lanes should be considered at unsignalized

⁹ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, June 2017.



intersections when the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard.

The projected right-turn traffic volume generated by the proposed development is estimated to be less than 10 vehicles per peak hour. This amount of right-turn traffic volume is not anticipated to result in any adverse impact to the through traffic volume; therefore, the provision of an auxiliary right-turn lane is not anticipated to be required on Churchill Drive at the site access intersections.

In consideration of auxiliary left-turn lanes on Churchill Drive, the through traffic volume along Churchill Drive is anticipated to be less than 350 vehicles per peak hour. The magnitude of the through traffic is noted to be well below the warrant thresholds of advancing and opposing volumes required to trigger provision of a left-turn lane.

In conclusion, the forecast traffic volumes are not anticipated to warrant the provision of auxiliary right-turn or left-turn lanes at the site access intersections.

6.3.2 Corner Clearance

The two proposed site access locations were reviewed in terms of spacing from the intersection of Bayview Drive and Churchill Drive/Concert Way and the stop-controlled intersection just east of the subject site. Based upon the guidance provided within the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR)¹⁰, the document suggests spacing requirements for access management applications including corner clearance at Major Intersections.

Per Section 8.8.1, “Corner clearance is the distance from an intersection to the nearest access upstream or downstream of it. Corner clearance is the distance measured from the near curb of the cross roadway to the near edge of the access throat. It consists of three components: the curb return radius at the intersection, a length tangent, and the curb return radius or flare dimension at the driveway. Inadequate corner clearance between accesses and intersections along a major road, such as a major arterial, can create operational issues”.

The suggested minimum corner clearance as stipulated by TAC GDGCR are as follows:

¹⁰ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, June 2017.



► **Collector Roadways**

- 55.0 metres (curb radii to curb radii) downstream and upstream of a signalized intersection.
- 25.0 metres (curb radii to curb radii) downstream and upstream of a stop-controlled intersection.

Table 6.2 and **Table 6.3** summarize the available corner clearance and the TAC GDGCR required corner clearance from the intersection of Bayview Drive and Churchill Drive/Concert Way and the stop-controlled intersection just east of the subject site, respectively.

TABLE 6.2: CORNER CLEARANCE FROM BAYVIEW DRIVE AND CHURCHILL DRIVE/CONCERT WAY

Site Access	Available Corner Clearance (m)	TAC GDGCR Corner Clearance Requirement (m)	Requirements Met?
Site Access (West)	163	55	Yes
Site Access (East)	210	55	Yes

TABLE 6.3: CORNER CLEARANCE FROM THE STOP-CONTROLLED INTERSECTION

Site Access	Available Corner Clearance (m)	TAC GDGCR Corner Clearance Requirement (m)	Requirements Met?
Site Access (West)	72	25	Yes
Site Access (East)	30	25	Yes

As shown above, the proposed site access locations on Churchill Drive are located outside the functional area of the adjacent intersections satisfying the TAC GDGCR minimum corner clearance requirements.

6.3.3 Site Access Location in Relation of Other Driveways

The current site plan indicates the presence of four driveways on the north side of Churchill Drive opposite the proposed driveway connections. Two of the four driveways will be aligned directly across while the remaining two will be slightly offset.



The proposed site accesses in relation to the road layout and spacing/offset to other nearby driveways will not result in any operational or safety issues. The following rationale is provided:

- ▶ The proposed site access locations will result in several offset commercial driveways on the north side of Churchill Drive. The primary issues to consider with offset intersections are the possibility of overlapping left turns and the potential difficulty in making a weaving manoeuvre to travel between the offset legs of the intersection. **Figure 6.1**, which has been extracted from the TAC GDGCR, Figure 8.9.3, illustrates these issues.
- ▶ The proposed site accesses would result in a similar situation as shown in Diagram “a” and “b” in **Figure 6.1**.
- ▶ With respect to the weaving manoeuvre that would be required to travel between the proposed self-storage facility and the commercial sites on the north side of Churchill Drive, it is reasoned that the potential for this traffic movement is negligible. It is anticipated the volume of vehicular cross traffic between these sites will be little to none.

Therefore, unlike a situation where an offset intersection may comprise two busy public roads or private driveways with a high expectation of weaving traffic travelling between the offset legs, it can be concluded that there would be no weaving traffic issue with respect to trips to and from the proposed self-storage facility site accesses.

- ▶ Another issue to consider with the offset would be conflicting vehicle movements with respect to the potential for simultaneous outbound left turns to Churchill Drive from the offset legs.
- ▶ There are good sight lines between the offset legs. Outbound motorists would be able to see the opposing driveway leg and any vehicles present prior to performing a turning movement.
- ▶ Given the good sight lines and low travel speeds related to these movements, the occurrence of vehicular conflicts would be negligible.
- ▶ Further to the above, as related to spacing considerations for driveways on opposite sides of the road, the TAC GDGCR notes in Section 8.9.9, “For low volume roadways, such as locals and most collectors, the spatial relationship between driveways on opposite sides of the road is not a necessary design consideration. Similarly, if one or both of the driveways are low volume, this relationship does not impact traffic operations”.



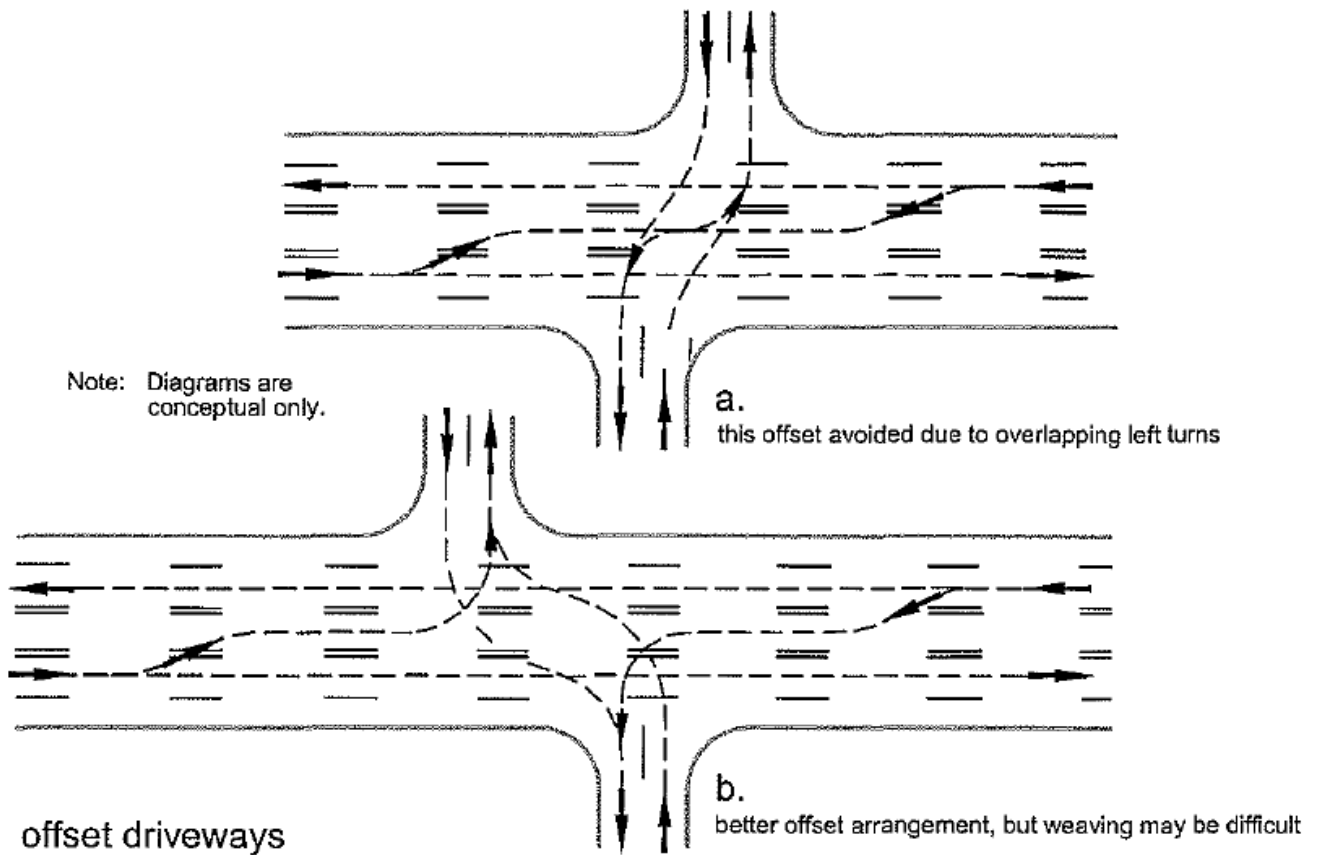


Image Source: TAC GDGCR (June 2017) Figure 8.9.3

6.3.4 Sight Distance

The proposed site accesses on Churchill Drive are located approximately 183 and 228 metres east of the centreline of Bayview Drive, respectively. The two site accesses would be aligned opposite existing driveways serving a commercial site.

The proposed site accesses have been reviewed to confirm sight distance and sight line availability and provisions. The assessment has been carried out based on the methodology contained in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR)¹¹. Sight distance requirements are considered for vehicles departing from the driveway (departure sight distance) and for vehicles approaching the driveway (approach sight distance). The following object heights were utilized in the field measurements:

- ▶ Driver Eye Height: 1.05 metres;
- ▶ Top of Car: 1.30 metres (for departure sight distance, height of approaching vehicle); and
- ▶ Vehicle Headlight or Tail/Brake Light: 0.60 metres (for approach sight distance, height of vehicle/target object).

The main measurements for departing traffic were taken from 5.0 metres back from the existing edge of pavement for vehicles exiting at the proposed site accesses, representing the position of a driver/vehicle performing a turning movement.

The main measurements for approaching traffic were taken from the centre of either travel lane on Churchill Drive, assuming a vehicle position perpendicular to the proposed site accesses.

For this assessment, a design speed of 60 km/h (10 km/h over the assumed statutory limit of 50 km/h) has been considered for Churchill Drive. **Table 6.4** summarizes the required sight distances for the design speed of 60 km/h.

¹¹ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, June 2017.



TABLE 6.4: REQUIRED SIGHT DISTANCE CRITERIA

Sight Distance Criteria	Sight Distance Requirement
	Design Speed (60 km/h)
Minimum Departure (Left Turn) Sight Distance ¹	130.0 m
Minimum Departure (Right Turn) Sight Distance ²	110.0 m
Minimum Stopping Sight Distance ³	85.0 m
<i>Notes:</i> ¹ TAC GDGCR Guide. June 2017. Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop ² TAC GDGCR Guide. June 2017. Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop ³ TAC GDGCR Guide. June 2017. Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles	

Departure Sight Distance Review

The departure sight distance represents the minimum distance required for a vehicle to safely enter the major roadway and complete a turning movement without significantly impeding traffic flow or providing the opportunity for conflict.

In design, the departure sight distance is measured from the standard driver eye height (1.05 metres) located on the proposed site accesses, from a position located 5.0 metres back from the travelled portion of the intersection roadway (i.e., edge of pavement) to a target top of car height of 1.30 metres above the roadway surface.

Table 6.5 and **Table 6.6** summarize the available and TAC GDGCR recommended sight distances for a departing left-turn and right-turn movement from Site Access (West) and Site Access (East), respectively.

TABLE 6.5: DEPARTURE SIGHT DISTANCE ANALYSIS SUMMARY - SITE ACCESS (WEST)

Departure Movement	Available Sight Distance (m)		TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
	Direction	Distance		
Left-Turn Movement	Looking right	> 160	130.0 ¹	Yes
	Looking left	> 160	130.0 ¹	Yes
Right-Turn Movement	Looking right	-	N/A	N/A
	Looking left	> 160	110.0 ²	Yes
<i>Notes:</i> ¹ TAC GDGCR Guide. June 2017. Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop				



² TAC GDGCR Guide. June 2017. Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop

**TABLE 6.6: DEPARTURE SIGHT DISTANCE ANALYSIS SUMMARY
- SITE ACCESS (EAST)**

Departure Movement	Available Sight Distance (m)		TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
	Direction	Distance		
Left-Turn Movement	Looking right	> 160	130.0 ¹	Yes
	Looking left	> 160	130.0 ¹	Yes
Right-Turn Movement	Looking right	-	N/A	N/A
	Looking left	> 160	110.0 ²	Yes
Notes: ¹ TAC GDGCR Guide. June 2017. Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop ² TAC GDGCR Guide. June 2017. Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop				

For right-turn and left-turn movements departing the proposed site accesses on Churchill Drive, the required TAC departure sight distances are met and satisfied for a design speed of 60 km/h.

Approach Sight Distance Review

For vehicles approaching the proposed site accesses, the minimum stopping sight distance is the distance required for the approaching vehicle to stop safely and avoid a collision. Stopping sight distance is the sum of the distance travelled by a motorist during the perception and reaction time and the braking distance. Stopping sight distance is measured from the standard driver eye height of 1.05 metres to a fixed object 0.60 metres off the surface of the roadway.

Table 6.7 and **Table 6.8** summarize the available and TAC GDGCR recommended sight distances along Churchill Drive for Site Access (West) and Site Access (East), respectively.

**TABLE 6.7: APPROACH SIGHT DISTANCE ANALYSIS SUMMARY -
SITE ACCESS (WEST)**

Approach Direction	Available Sight Distance (m)	TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
Eastbound	> 160	85.0 ¹	Yes
Westbound	> 160	85.0 ¹	Yes
Notes: ¹ TAC GDGCR Guide. June 2017. Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles			



**TABLE 6.8: APPROACH SIGHT DISTANCE ANALYSIS SUMMARY -
SITE ACCESS (EAST)**

Approach Direction	Available Sight Distance (m)	TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
Eastbound	> 160	85.0 ¹	Yes
Westbound	> 160	85.0 ¹	Yes
<i>Notes:</i> ¹ TAC GDGCR Guide. June 2017. Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles			

For eastbound and westbound vehicles approaching the proposed site accesses on Churchill Drive, the required TAC approach sight distances are met and satisfied for a design speed of 60 km/h.

Sight Distance Summary

With Churchill Drive being relatively flat and straight, the available sight distance to the east and west of the subject accesses are found to be greater than 160 metres and therefore exceeds the longest sight distance requirements for both the departure and approach.

It is noted that to the west of the subject accesses, the sight line would be to and beyond the signalized intersection of Bayview Drive and Churchill Drive/Concert Way. This adjacent signalized intersection assists with entering and exiting maneuvers at the subject access locations by providing gaps in eastbound traffic along Churchill Drive.

As part of the field assessment, sight triangles and sight line obstructions were assessed. Based upon our findings there are no significant sight line obstructions impacting the available sight distances as clear sight lines within the immediate proximity of Churchill Drive and the proposed site accesses are provided.

In summary, there are no sight line issues at the proposed access locations on Churchill.



7 Conclusions and Recommendations

7.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing conditions, the study area intersections are operating at good level of service and well within capacity during the weekday AM and PM peak hours;
- ▶ Under future background traffic conditions, the study area intersections operations would be slightly worse in comparison to existing conditions. All traffic movements are forecast to continue to operate at good level of service and well within capacity;
- ▶ With development of the proposed self-storage facility, it is forecast to generate 11 and 19 vehicular trips during the weekday AM and PM peak hours, respectively;
- ▶ Under future total traffic conditions, the operations at the study area intersections are similar to future background traffic conditions, due to the imperceptible amount of site-generated traffic. The development is not anticipated to result in any undue impacts on the surrounding transportation network;
- ▶ Auxiliary right-turn and left-turn lanes are not required on Churchill Drive to accommodate the site-generated traffic;
- ▶ The proposed vehicular parking and loading space provisions satisfy the City of Barrie Zoning By-law requirements;
- ▶ All anticipated design vehicles are found to access the site and circulate on-site without any conflicts; and
- ▶ The two site access connections with Churchill Drive satisfy the TAC GDGCR corner clearance and sight distance requirements.

7.2 Recommendations

The recommendations of this study are as follows:

- ▶ The City of Barrie should recognize the conclusions drawn above; and
- ▶ From a transportation perspective, the required planning applications to allow the proposed development should be approved.



Appendix A

Pre-Study Consultation



Adrian Soo

From: Donson Chan <Donson.Chan@barrie.ca>
Sent: September 2, 2022 2:17 PM
To: Adrian Soo
Subject: RE: Proposed Self-Storage Facility Development (447 Bayview Drive) - Traffic Impact Study - Pre-Study Consultation

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Adrian,

Staff have reviewed the proposed work plan and have no concerns. Please proceed with the traffic study in support for a SPA submission.

Thank you and have a wonderful weekend,

Donson Chan, P.Eng.
Transportation Engineer – Infrastructure and Growth Management, Development Services
The City of Barrie
Mobile 249-733-5355
Please consider the environment before printing this email.

From: Adrian Soo <asoo@ptsl.com>
Sent: Thursday, August 25, 2022 11:14 AM
To: Donson Chan <Donson.Chan@barrie.ca>
Subject: Proposed Self-Storage Facility Development (447 Bayview Drive) - Traffic Impact Study - Pre-Study Consultation

Hi Donson,

I would like to discuss and confirm the Terms of Reference (ToR) for a traffic study we are preparing in support for a Site Plan Application (SPA) for a proposed Self-Storage Facility 11,709.7 SM (126,042 SF) GFA in size at 447 Bayview Drive.

We would appreciate your comments as soon as possible as our client would like to turn this study around fairly quickly. For your context, Paradigm also completed the TIS for the adjacent development of 443 Bayview Avenue.

The study for 447 Bayview Avenue, we are proposing to be similar in scope as the adjacent site (443 Bayview Avenue).

Study Area: For the purposes of the SPA, the study area will be similar to the adjacent study which will include the intersection of Bayview Drive/Churchill Drive and the proposed access driveways. **(City to confirm this is satisfactory)**

Traffic Data: Paradigm will organize and collect a new intersection count at Bayview Drive/Churchill Drive and at the existing commercial site accesses on Churchill Drive that will be aligned opposite of the proposed driveways. **(City to confirm this is satisfactory)**

Traffic Forecasting: A 2028 horizon (representing a five-year horizon from anticipated build-out/occupancy in 2023) **(City to confirm this is satisfactory)**

The AM and PM peak hour traffic forecasts would include future background growth (growth factor of 1.0% annum to be applied to existing traffic volumes. The use of 1.0% per annum growth rate is consistent with what was utilized for the 443 Bayview Ave study. City staff previously indicated based on the EMME3 model there would be a growth rate of 1.0% per annum to a 2031 horizon year. **(City to confirm this is satisfactory)**

Other area background development traffic – the adjacent site generated traffic from 443 Bayview Avenue will be accounted and included as part of the traffic forecasts. Can you please advise or direct me to the appropriate City planning contact to confirm if any other area background developments are to be accounted within the traffic forecasts. **(City to confirm this is satisfactory)**

Analysis: The AM and PM peak hour operations of the study area intersections for existing, background, and total traffic conditions will be undertaken using Synchro software. The results of the analysis will be used to determine the need for improvements at the study area intersections. **(City to confirm this is satisfactory)**

Functional Review: The site plan will be reviewed to assess the design and operations related to the provided accesses, and internal traffic circulation for anticipated design vehicles. (i.e., AutoTURN assessment) **(City to confirm this is satisfactory)**

A review of the parking and loading provisions in comparison to the municipal requirements will also be detailed. It is anticipated based on the latest plan that all municipal requirements will be satisfied. **(City to confirm this is satisfactory)**

An access review will also be conducted, this will entail access spacing (i.e., corner clearance requirements), and a sight distance assessment to ensure the accesses are in compliance with the TAC Manual requirements. **(City to confirm this is satisfactory)**

I have attached a copy the of the latest site plan for your reference. (noting that the architect is making some minor adjustments, ie., barrier free spaces are not sized correctly to the ZBL requirements).

Upon completion of your review of our work plan, please feel free to e-mail or call to discuss further. Aforementioned, we would appreciate your comments as soon as possible as our client would like to turn this study around fairly quickly.

Regards,

Adrian Soo, P.Eng.
Senior Project Manager, Associate



Paradigm Transportation Solutions Limited

5A-150 Pinebush Road, Cambridge, ON N1R 8J8

p: 416.479.9684 x509

m: 647.637.4946

e: asoo@ptsl.com

w: www.ptsl.com

***** *Paradigm is now operating on a 4-day workweek. Our offices are closed Fridays.* *****

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Appendix B

Traffic Data





Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 asoo@ptsl.com

Count Name: Bayview Drive & Churchill Drive
Site Code: 220465
Start Date: 09/07/2022
Page No: 1

Turning Movement Data

Start Time	Concert Way Eastbound						Churchill Drive Westbound						Bayview Drive Northbound						Bayview Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	2	0	1	0	0	3	17	2	20	0	1	39	0	33	13	0	0	46	14	56	4	0	0	74	162
7:15 AM	1	1	1	0	0	3	24	3	16	0	0	43	0	48	12	0	1	60	25	75	5	0	0	105	211
7:30 AM	0	0	1	0	2	1	22	1	20	0	0	43	1	61	11	0	1	73	21	103	1	0	1	125	242
7:45 AM	4	0	2	0	2	6	16	1	24	0	0	41	3	94	23	0	0	120	35	88	9	0	0	132	299
Hourly Total	7	1	5	0	4	13	79	7	80	0	1	166	4	236	59	0	2	299	95	322	19	0	1	436	914
8:00 AM	0	1	0	0	2	1	16	2	19	0	0	37	2	64	21	0	0	87	22	91	4	0	1	117	242
8:15 AM	2	0	0	0	0	2	19	4	28	0	0	51	2	66	17	0	0	85	15	74	5	0	0	94	232
8:30 AM	4	0	2	0	0	6	28	0	17	0	1	45	1	81	11	0	1	93	19	73	3	0	0	95	239
8:45 AM	3	0	1	0	1	4	16	1	21	0	1	38	4	85	22	0	0	111	16	116	12	0	1	144	297
Hourly Total	9	1	3	0	3	13	79	7	85	0	2	171	9	296	71	0	1	376	72	354	24	0	2	450	1010
9:00 AM	3	2	1	0	4	6	12	1	15	0	0	28	1	77	11	0	1	89	12	116	8	0	0	136	259
9:15 AM	6	1	1	0	0	8	15	5	12	0	0	32	0	63	6	0	0	69	15	103	9	0	0	127	236
9:30 AM	5	2	0	0	1	7	17	4	18	0	0	39	2	78	10	0	0	90	9	111	15	0	1	135	271
9:45 AM	7	5	1	0	0	13	19	4	17	0	0	40	2	63	8	0	0	73	16	126	22	0	1	164	290
Hourly Total	21	10	3	0	5	34	63	14	62	0	0	139	5	281	35	0	1	321	52	456	54	0	2	562	1056
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	17	3	1	0	1	21	16	6	8	0	0	30	2	121	12	0	0	135	8	125	21	0	0	154	340
11:45 AM	19	4	6	0	2	29	13	7	14	0	0	34	6	123	14	0	0	143	12	129	31	0	0	172	378
Hourly Total	36	7	7	0	3	50	29	13	22	0	0	64	8	244	26	0	0	278	20	254	52	0	0	326	718
12:00 PM	16	4	5	0	4	25	27	9	19	0	0	55	6	117	15	0	0	138	12	172	21	0	2	205	423
12:15 PM	18	7	7	0	2	32	32	7	16	0	0	55	2	138	19	0	1	159	8	154	31	0	0	193	439
12:30 PM	26	2	6	0	0	34	24	12	17	0	1	53	3	139	18	0	0	160	16	129	18	0	0	163	410
12:45 PM	32	7	7	0	0	46	12	5	14	0	1	31	3	160	27	0	0	190	6	136	32	0	2	174	441
Hourly Total	92	20	25	0	6	137	95	33	66	0	2	194	14	554	79	0	1	647	42	591	102	0	4	735	1713
1:00 PM	19	11	6	0	0	36	10	8	19	0	0	37	4	117	21	0	0	142	24	146	25	0	0	195	410
1:15 PM	19	9	3	0	0	31	20	3	15	0	0	38	4	157	22	0	0	183	18	119	29	0	2	166	418
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	38	20	9	0	0	67	30	11	34	0	0	75	8	274	43	0	0	325	42	265	54	0	2	361	828
3:30 PM	17	7	3	0	3	27	11	3	33	0	0	47	3	150	15	0	0	168	20	135	24	0	0	179	421
3:45 PM	18	6	2	0	2	26	16	3	20	0	1	39	1	134	15	0	1	150	16	115	25	0	1	156	371
Hourly Total	35	13	5	0	5	53	27	6	53	0	1	86	4	284	30	0	1	318	36	250	49	0	1	335	792
4:00 PM	21	7	2	0	2	30	19	4	30	0	0	53	3	168	16	0	0	187	4	138	24	0	1	166	436
4:15 PM	24	7	2	0	1	33	10	11	19	0	0	40	2	148	12	0	1	162	22	148	24	0	1	194	429
4:30 PM	15	8	7	0	2	30	30	5	48	0	4	83	3	201	6	0	1	210	23	163	21	0	0	207	530
4:45 PM	18	6	5	0	2	29	20	8	34	0	0	62	1	169	13	0	0	183	28	146	30	0	0	204	478

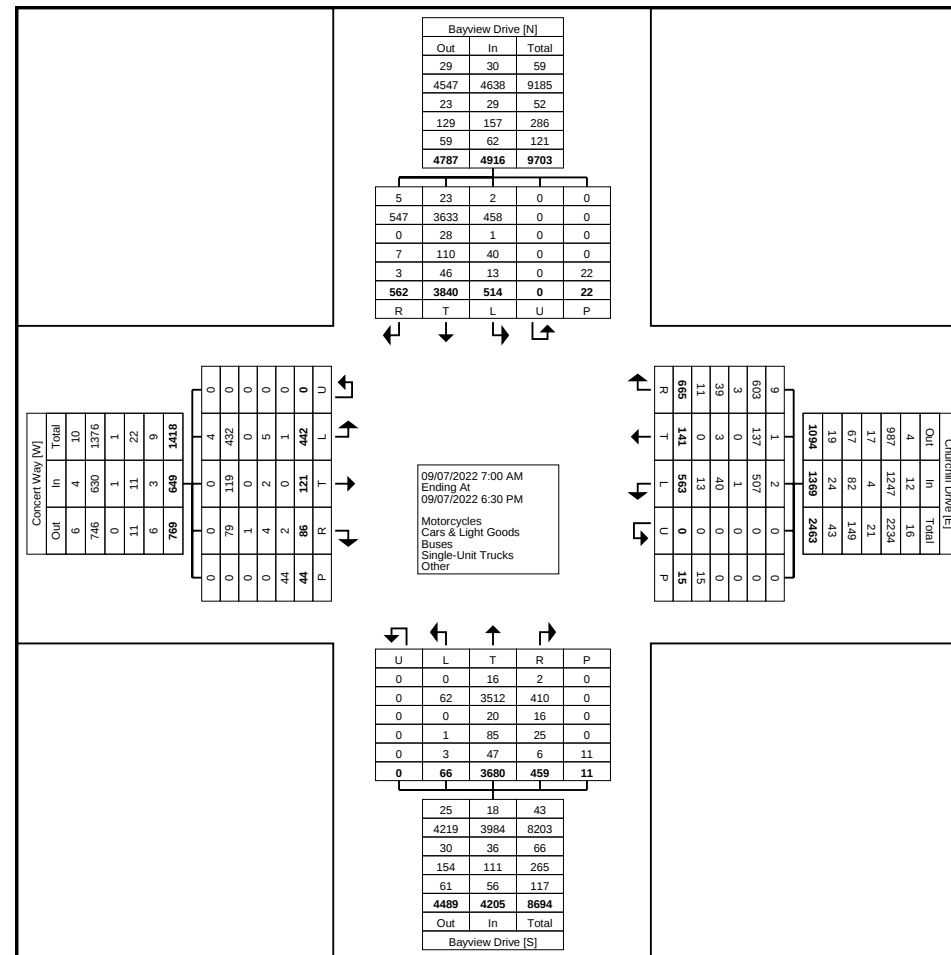
Hourly Total	78	28	16	0	7	122	79	28	131	0	4	238	9	686	47	0	2	742	77	595	99	0	2	771	1873
5:00 PM	27	5	0	0	2	32	28	5	52	0	2	85	2	181	9	0	2	192	21	155	13	0	0	189	498
5:15 PM	26	3	2	0	1	31	10	5	22	0	0	37	0	151	15	0	0	166	19	138	20	0	0	177	411
5:30 PM	20	4	3	0	1	27	16	5	19	0	2	40	1	157	12	0	1	170	13	128	15	0	1	156	393
5:45 PM	16	3	3	0	2	22	6	1	10	0	0	17	0	111	13	0	0	124	10	112	25	0	3	147	310
Hourly Total	89	15	8	0	6	112	60	16	103	0	4	179	3	600	49	0	3	652	63	533	73	0	4	669	1612
6:00 PM	17	5	3	0	5	25	11	3	13	0	0	27	2	97	11	0	0	110	8	113	17	0	3	138	300
6:15 PM	20	1	2	0	0	23	11	3	16	0	1	30	0	128	9	0	0	137	7	107	19	0	1	133	323
Grand Total	442	121	86	0	44	649	563	141	665	0	15	1369	66	3680	459	0	11	4205	514	3840	562	0	22	4916	11139
Approach %	68.1	18.6	13.3	0.0	-	-	41.1	10.3	48.6	0.0	-	-	1.6	87.5	10.9	0.0	-	-	10.5	78.1	11.4	0.0	-	-	-
Total %	4.0	1.1	0.8	0.0	-	5.8	5.1	1.3	6.0	0.0	-	12.3	0.6	33.0	4.1	0.0	-	37.8	4.6	34.5	5.0	0.0	-	44.1	-
Motorcycles	4	0	0	0	-	4	2	1	9	0	-	12	0	16	2	0	-	18	2	23	5	0	-	30	64
% Motorcycles	0.9	0.0	0.0	-	-	0.6	0.4	0.7	1.4	-	-	0.9	0.0	0.4	0.4	-	-	0.4	0.4	0.6	0.9	-	-	0.6	0.6
Cars & Light Goods	432	119	79	0	-	630	507	137	603	0	-	1247	62	3512	410	0	-	3984	458	3633	547	0	-	4638	10499
% Cars & Light Goods	97.7	98.3	91.9	-	-	97.1	90.1	97.2	90.7	-	-	91.1	93.9	95.4	89.3	-	-	94.7	89.1	94.6	97.3	-	-	94.3	94.3
Buses	0	0	1	0	-	1	1	0	3	0	-	4	0	20	16	0	-	36	1	28	0	0	-	29	70
% Buses	0.0	0.0	1.2	-	-	0.2	0.2	0.0	0.5	-	-	0.3	0.0	0.5	3.5	-	-	0.9	0.2	0.7	0.0	-	-	0.6	0.6
Single-Unit Trucks	5	2	4	0	-	11	40	3	39	0	-	82	1	85	25	0	-	111	40	110	7	0	-	157	361
% Single-Unit Trucks	1.1	1.7	4.7	-	-	1.7	7.1	2.1	5.9	-	-	6.0	1.5	2.3	5.4	-	-	2.6	7.8	2.9	1.2	-	-	3.2	3.2
Articulated Trucks	0	0	2	0	-	2	12	0	10	0	-	22	3	44	5	0	-	52	13	41	2	0	-	56	132
% Articulated Trucks	0.0	0.0	2.3	-	-	0.3	2.1	0.0	1.5	-	-	1.6	4.5	1.2	1.1	-	-	1.2	2.5	1.1	0.4	-	-	1.1	1.2
Bicycles on Road	1	0	0	0	-	1	1	0	1	0	-	2	0	3	1	0	-	4	0	5	1	0	-	6	13
% Bicycles on Road	0.2	0.0	0.0	-	-	0.2	0.2	0.0	0.2	-	-	0.1	0.0	0.1	0.2	-	-	0.1	0.0	0.1	0.2	-	-	0.1	0.1
Bicycles on Crosswalk	-	-	-	-	15	-	-	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-	6	-	-
% Bicycles on Crosswalk	-	-	-	-	34.1	-	-	-	-	-	26.7	-	-	-	-	-	9.1	-	-	-	-	-	27.3	-	-
Pedestrians	-	-	-	-	29	-	-	-	-	-	11	-	-	-	-	-	10	-	-	-	-	-	16	-	-
% Pedestrians	-	-	-	-	65.9	-	-	-	-	-	73.3	-	-	-	-	-	90.9	-	-	-	-	-	72.7	-	-



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5A-150 Pinebush Rd

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519-896-3163 asoo@ptsl.com

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Turning Movement Data Plot



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Turning Movement Peak Hour Data (8:45 AM)

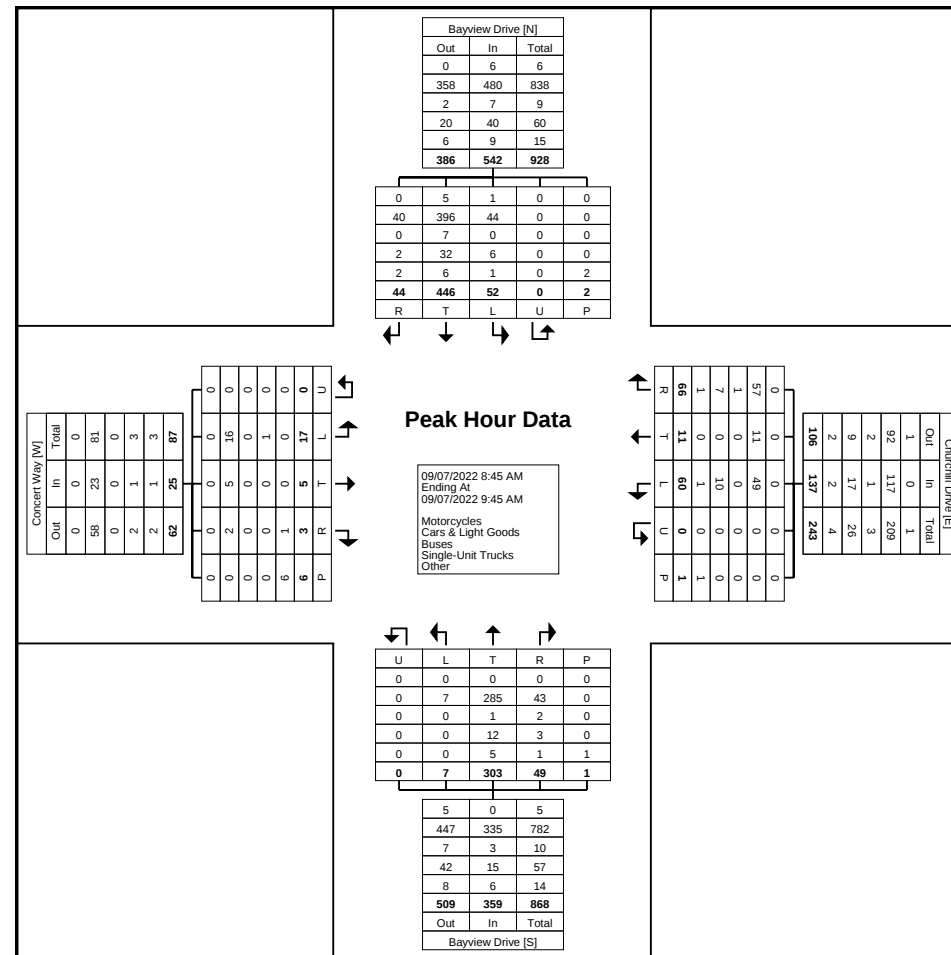
Start Time	Concert Way Eastbound						Churchill Drive Westbound						Bayview Drive Northbound						Bayview Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:45 AM	3	0	1	0	1	4	16	1	21	0	1	38	4	85	22	0	0	111	16	116	12	0	1	144	297
9:00 AM	3	2	1	0	4	6	12	1	15	0	0	28	1	77	11	0	1	89	12	116	8	0	0	136	259
9:15 AM	6	1	1	0	0	8	15	5	12	0	0	32	0	63	6	0	0	69	15	103	9	0	0	127	236
9:30 AM	5	2	0	0	1	7	17	4	18	0	0	39	2	78	10	0	0	90	9	111	15	0	1	135	271
Total	17	5	3	0	6	25	60	11	66	0	1	137	7	303	49	0	1	359	52	446	44	0	2	542	1063
Approach %	68.0	20.0	12.0	0.0	-	-	43.8	8.0	48.2	0.0	-	-	1.9	84.4	13.6	0.0	-	-	9.6	82.3	8.1	0.0	-	-	-
Total %	1.6	0.5	0.3	0.0	-	2.4	5.6	1.0	6.2	0.0	-	12.9	0.7	28.5	4.6	0.0	-	33.8	4.9	42.0	4.1	0.0	-	51.0	-
PHF	0.708	0.625	0.750	0.000	-	0.781	0.882	0.550	0.786	0.000	-	0.878	0.438	0.891	0.557	0.000	-	0.809	0.813	0.961	0.733	0.000	-	0.941	0.895
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1	5	0	0	-	6	6
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	1.9	1.1	0.0	-	-	1.1	0.6
Cars & Light Goods	16	5	2	0	-	23	49	11	57	0	-	117	7	285	43	0	-	335	44	396	40	0	-	480	955
% Cars & Light Goods	94.1	100.0	66.7	-	-	92.0	81.7	100.0	86.4	-	-	85.4	100.0	94.1	87.8	-	-	93.3	84.6	88.8	90.9	-	-	88.6	89.8
Buses	0	0	0	0	-	0	0	0	1	0	-	1	0	1	2	0	-	3	0	7	0	0	-	7	11
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	1.5	-	-	0.7	0.0	0.3	4.1	-	-	0.8	0.0	1.6	0.0	-	-	1.3	1.0
Single-Unit Trucks	1	0	0	0	-	1	10	0	7	0	-	17	0	12	3	0	-	15	6	32	2	0	-	40	73
% Single-Unit Trucks	5.9	0.0	0.0	-	-	4.0	16.7	0.0	10.6	-	-	12.4	0.0	4.0	6.1	-	-	4.2	11.5	7.2	4.5	-	-	7.4	6.9
Articulated Trucks	0	0	1	0	-	1	1	0	1	0	-	2	0	5	1	0	-	6	1	6	2	0	-	9	18
% Articulated Trucks	0.0	0.0	33.3	-	-	4.0	1.7	0.0	1.5	-	-	1.5	0.0	1.7	2.0	-	-	1.7	1.9	1.3	4.5	-	-	1.7	1.7
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	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	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	16.7	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	83.3	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



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5A-150 Pinebush Rd

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Turning Movement Peak Hour Data (12:00 PM)

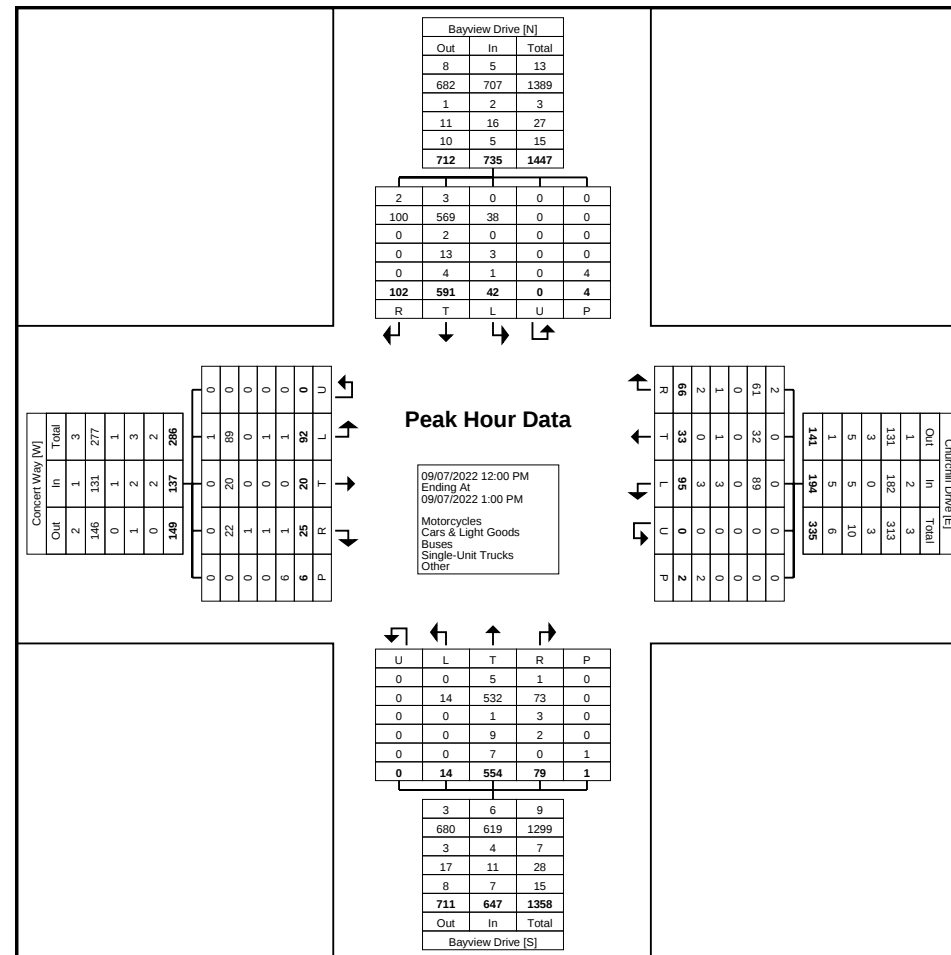
Start Time	Concert Way Eastbound						Churchill Drive Westbound						Bayview Drive Northbound						Bayview Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:00 PM	16	4	5	0	4	25	27	9	19	0	0	55	6	117	15	0	0	138	12	172	21	0	2	205	423
12:15 PM	18	7	7	0	2	32	32	7	16	0	0	55	2	138	19	0	1	159	8	154	31	0	0	193	439
12:30 PM	26	2	6	0	0	34	24	12	17	0	1	53	3	139	18	0	0	160	16	129	18	0	0	163	410
12:45 PM	32	7	7	0	0	46	12	5	14	0	1	31	3	160	27	0	0	190	6	136	32	0	2	174	441
Total	92	20	25	0	6	137	95	33	66	0	2	194	14	554	79	0	1	647	42	591	102	0	4	735	1713
Approach %	67.2	14.6	18.2	0.0	-	-	49.0	17.0	34.0	0.0	-	-	2.2	85.6	12.2	0.0	-	-	5.7	80.4	13.9	0.0	-	-	-
Total %	5.4	1.2	1.5	0.0	-	8.0	5.5	1.9	3.9	0.0	-	11.3	0.8	32.3	4.6	0.0	-	37.8	2.5	34.5	6.0	0.0	-	42.9	-
PHF	0.719	0.714	0.893	0.000	-	0.745	0.742	0.688	0.868	0.000	-	0.882	0.583	0.866	0.731	0.000	-	0.851	0.656	0.859	0.797	0.000	-	0.896	0.971
Motorcycles	1	0	0	0	-	1	0	0	2	0	-	2	0	5	1	0	-	6	0	3	2	0	-	5	14
% Motorcycles	1.1	0.0	0.0	-	-	0.7	0.0	0.0	3.0	-	-	1.0	0.0	0.9	1.3	-	-	0.9	0.0	0.5	2.0	-	-	0.7	0.8
Cars & Light Goods	89	20	22	0	-	131	89	32	61	0	-	182	14	532	73	0	-	619	38	569	100	0	-	707	1639
% Cars & Light Goods	96.7	100.0	88.0	-	-	95.6	93.7	97.0	92.4	-	-	93.8	100.0	96.0	92.4	-	-	95.7	90.5	96.3	98.0	-	-	96.2	95.7
Buses	0	0	1	0	-	1	0	0	0	0	-	0	0	1	3	0	-	4	0	2	0	0	-	2	7
% Buses	0.0	0.0	4.0	-	-	0.7	0.0	0.0	0.0	-	-	0.0	0.0	0.2	3.8	-	-	0.6	0.0	0.3	0.0	-	-	0.3	0.4
Single-Unit Trucks	1	0	1	0	-	2	3	1	1	0	-	5	0	9	2	0	-	11	3	13	0	0	-	16	34
% Single-Unit Trucks	1.1	0.0	4.0	-	-	1.5	3.2	3.0	1.5	-	-	2.6	0.0	1.6	2.5	-	-	1.7	7.1	2.2	0.0	-	-	2.2	2.0
Articulated Trucks	0	0	1	0	-	1	3	0	2	0	-	5	0	6	0	0	-	6	1	4	0	0	-	5	17
% Articulated Trucks	0.0	0.0	4.0	-	-	0.7	3.2	0.0	3.0	-	-	2.6	0.0	1.1	0.0	-	-	0.9	2.4	0.7	0.0	-	-	0.7	1.0
Bicycles on Road	1	0	0	0	-	1	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	2
% Bicycles on Road	1.1	0.0	0.0	-	-	0.7	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	-	-	0.2	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	16.7	-	-	-	-	-	0.0	-	-	-	-	-	100.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	5	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	83.3	-	-	-	-	-	100.0	-	-	-	-	-	0.0	-	-	-	-	-	100.0	-	-



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Turning Movement Peak Hour Data (4:15 PM)

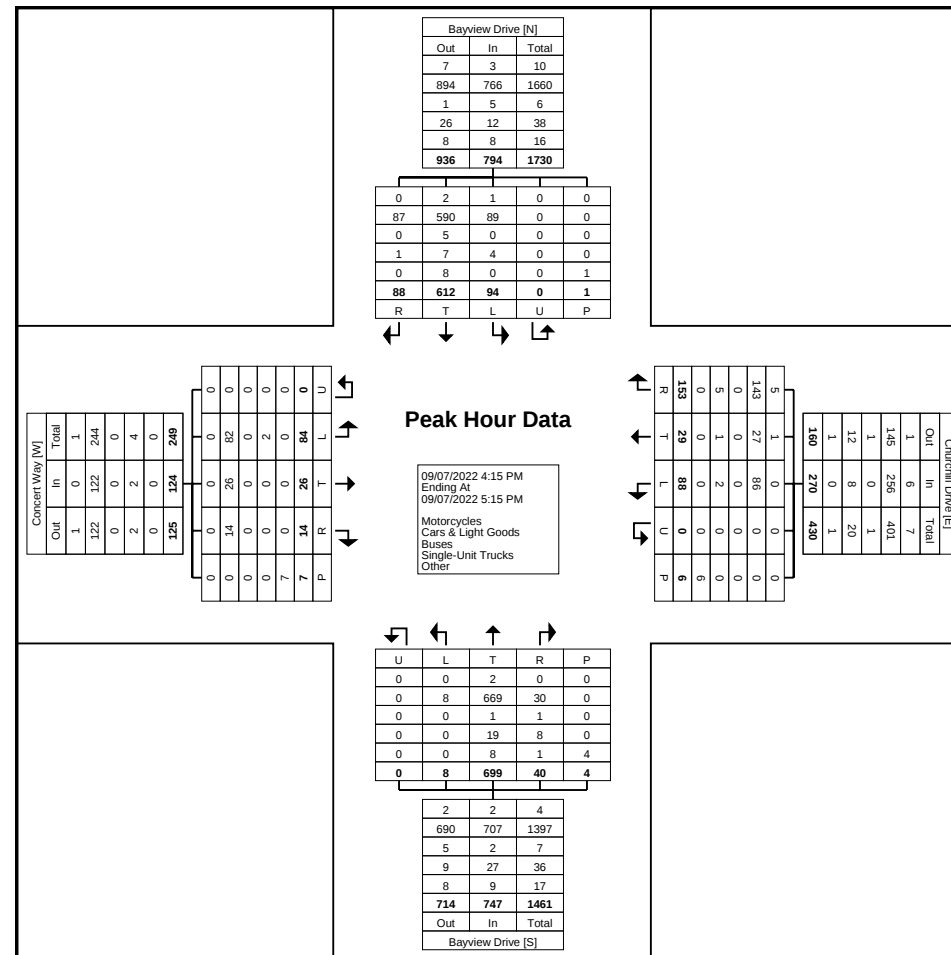
Start Time	Concert Way Eastbound						Churchill Drive Westbound						Bayview Drive Northbound						Bayview Drive Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	24	7	2	0	1	33	10	11	19	0	0	40	2	148	12	0	1	162	22	148	24	0	1	194	429
4:30 PM	15	8	7	0	2	30	30	5	48	0	4	83	3	201	6	0	1	210	23	163	21	0	0	207	530
4:45 PM	18	6	5	0	2	29	20	8	34	0	0	62	1	169	13	0	0	183	28	146	30	0	0	204	478
5:00 PM	27	5	0	0	2	32	28	5	52	0	2	85	2	181	9	0	2	192	21	155	13	0	0	189	498
Total	84	26	14	0	7	124	88	29	153	0	6	270	8	699	40	0	4	747	94	612	88	0	1	794	1935
Approach %	67.7	21.0	11.3	0.0	-	-	32.6	10.7	56.7	0.0	-	-	1.1	93.6	5.4	0.0	-	-	11.8	77.1	11.1	0.0	-	-	-
Total %	4.3	1.3	0.7	0.0	-	6.4	4.5	1.5	7.9	0.0	-	14.0	0.4	36.1	2.1	0.0	-	38.6	4.9	31.6	4.5	0.0	-	41.0	-
PHF	0.778	0.813	0.500	0.000	-	0.939	0.733	0.659	0.736	0.000	-	0.794	0.667	0.869	0.769	0.000	-	0.889	0.839	0.939	0.733	0.000	-	0.959	0.913
Motorcycles	0	0	0	0	-	0	0	1	5	0	-	6	0	2	0	0	-	2	1	2	0	0	-	3	11
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	3.4	3.3	-	-	2.2	0.0	0.3	0.0	-	-	0.3	1.1	0.3	0.0	-	-	0.4	0.6
Cars & Light Goods	82	26	14	0	-	122	86	27	143	0	-	256	8	669	30	0	-	707	89	590	87	0	-	766	1851
% Cars & Light Goods	97.6	100.0	100.0	-	-	98.4	97.7	93.1	93.5	-	-	94.8	100.0	95.7	75.0	-	-	94.6	94.7	96.4	98.9	-	-	96.5	95.7
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	1	0	-	2	0	5	0	0	-	5	7
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	2.5	-	-	0.3	0.0	0.8	0.0	-	-	0.6	0.4
Single-Unit Trucks	2	0	0	0	-	2	2	1	5	0	-	8	0	19	8	0	-	27	4	7	1	0	-	12	49
% Single-Unit Trucks	2.4	0.0	0.0	-	-	1.6	2.3	3.4	3.3	-	-	3.0	0.0	2.7	20.0	-	-	3.6	4.3	1.1	1.1	-	-	1.5	2.5
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	7	1	0	-	8	0	6	0	0	-	6	14
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.0	2.5	-	-	1.1	0.0	1.0	0.0	-	-	0.8	0.7
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	2	0	0	-	2	3
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	-	-	0.1	0.0	0.3	0.0	-	-	0.3	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	33.3	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	7	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	66.7	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 asoo@ptsl.com

Count Name: Bayview Drive & Churchill Drive
Site Code: 220465
Start Date: 09/07/2022
Page No: 9



March 8, 2018

File: T07-SI

Dear Mr. Soo,

RE: Traffic Signal Timings – Bayview Drive and Churchill Drive

With respect to your inquiry on February 23, 2018, the above intersection traffic signal timings are as follows:

Roadway	Direction	Vehicular Indications				Pedestrian Indications	
		Minimum Green	Maximum Green	Amber	All Red	Walk	Flashing Don't Walk
Bayview Drive (Main Street)	Advanced Northbound/ Southbound Left Turn	7	12	3	1	N/A	N/A
Bayview Drive (Main Street)	Northbound/ Southbound	44	44	4	2	26	18
Churchill Drive (Side Street)	Advanced Eastbound/ Westbound Left Turn	7	12	3	1	N/A	N/A
Churchill Drive (Side Street)	Eastbound/ Westbound	10	30	4	2	8	12

NOTE: All times are recorded in seconds, based on full demand.

The side street phases are actuated; meaning a vehicle or pedestrian must be present on the side street before the side street is given a green indication. Actuation at this intersection occurs in two ways: first, for vehicles a loop detector is imbedded into the roadway at the painted stop bar; and secondly, pushbuttons are located on each corner for pedestrians to activate their movement. Vehicle presence only on the side street would result in a possible green time of between the minimum and maximum times noted above, depending on demand.

Pedestrian “Walk” and “Flashing Don’t Walk” times on the side street as noted would be used in the event that the pedestrian push button was activated. Should there be no demand on the actuated phases; the signals would rest in a green indication for the main street.

Should you require any further information please feel free to contact me at (705) 739-4220 ext. 5178.

Yours truly,

A handwritten signature in blue ink that reads "J. MacDonald".

Justin MacDonald, C.E.T.
Senior Transportation Operations Technologist

Appendix C

Existing Traffic Operations Report



Queues

1: Bayview Drive & Concert Way/Churchill Drive

Base Year AM Peak Hour

220465 - Bayview Drive & Churchill Drive

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	19	6	3	67	85	8	391	58	545
v/c Ratio	0.10	0.02	0.01	0.35	0.29	0.01	0.16	0.09	0.23
Control Delay	25.0	23.6	0.0	30.4	11.5	4.3	4.0	4.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	23.6	0.0	30.4	11.5	4.3	4.0	4.8	4.4
Queue Length 50th (m)	2.2	0.7	0.0	7.9	1.3	0.3	7.5	2.2	11.7
Queue Length 95th (m)	7.5	3.6	0.0	18.7	12.3	1.7	14.0	6.6	20.5
Internal Link Dist (m)	171.4			109.1			258.0		
Turn Bay Length (m)	27.0		44.0	19.0		10.0		10.0	
Base Capacity (vph)	567	858	562	547	699	619	2407	637	2358
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.01	0.01	0.12	0.12	0.01	0.16	0.09	0.23
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

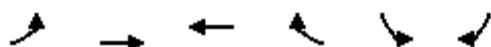
Base Year AM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	5	3	60	11	66	7	303	49	52	446	44
Future Volume (vph)	17	5	3	60	11	66	7	303	49	52	446	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1900	1199	1528	1460		1803	3300		1597	3236	
Flt Permitted	0.70	1.00	1.00	0.75	1.00		0.45	1.00		0.52	1.00	
Satd. Flow (perm)	1256	1900	1199	1213	1460		851	3300		875	3236	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	19	6	3	67	12	73	8	337	54	58	496	49
RTOR Reduction (vph)	0	0	3	0	64	0	0	9	0	0	5	0
Lane Group Flow (vph)	19	6	0	67	21	0	8	382	0	58	540	0
Confl. Peds. (#/hr)	2		1	1		2	6		1	1		6
Heavy Vehicles (%)	6%	0%	33%	18%	0%	14%	0%	6%	12%	13%	10%	9%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	8.6	8.6	8.6	8.6	8.6		47.1	47.1		47.1	47.1	
Effective Green, g (s)	8.6	8.6	8.6	8.6	8.6		47.1	47.1		47.1	47.1	
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13		0.70	0.70		0.70	0.70	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	159	241	152	154	185		592	2295		608	2251	
v/s Ratio Prot		0.00			0.01			0.12			c0.17	
v/s Ratio Perm	0.02		0.00	c0.06			0.01			0.07		
v/c Ratio	0.12	0.02	0.00	0.44	0.11		0.01	0.17		0.10	0.24	
Uniform Delay, d1	26.2	25.9	25.8	27.3	26.2		3.2	3.5		3.4	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.0	0.0	2.0	0.3		0.0	0.2		0.3	0.3	
Delay (s)	26.5	25.9	25.8	29.3	26.5		3.2	3.7		3.7	4.0	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		26.3			27.7			3.7			4.0	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.5			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			67.7			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			68.6%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Churchill Drive & Existing Driveway

Base Year AM Peak Hour
220465 - Bayview Drive & Churchill Drive

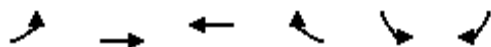


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	96	132	5	5	5
Future Volume (Veh/h)	10	96	132	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	104	143	5	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		133				
pX, platoon unblocked						
vC, conflicting volume	148				272	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	148				272	146
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1434				712	902
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	115	148	10			
Volume Left	11	0	5			
Volume Right	0	5	5			
cSH	1434	1700	796			
Volume to Capacity	0.01	0.09	0.01			
Queue Length 95th (m)	0.2	0.0	0.3			
Control Delay (s)	0.8	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.8	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		23.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Churchill Drive & Existing Driveway

Base Year AM Peak Hour
220465 - Bayview Drive & Churchill Drive



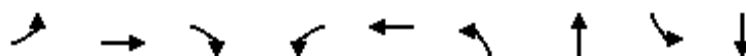
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	96	132	5	5	5
Future Volume (Veh/h)	5	96	132	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	104	143	5	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		210				
pX, platoon unblocked						
vC, conflicting volume	148				260	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	148				260	146
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1434				727	902
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	109	148	10			
Volume Left	5	0	5			
Volume Right	0	5	5			
cSH	1434	1700	805			
Volume to Capacity	0.00	0.09	0.01			
Queue Length 95th (m)	0.1	0.0	0.3			
Control Delay (s)	0.4	0.0	9.5			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	9.5			
Approach LOS			A			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			19.1%	ICU Level of Service		A
Analysis Period (min)			15			

Queues

1: Bayview Drive & Concert Way/Churchill Drive

Base Year PM Peak Hour

220465 - Bayview Drive & Churchill Drive



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	92	29	15	97	200	9	812	103	770
v/c Ratio	0.49	0.09	0.05	0.41	0.50	0.02	0.37	0.26	0.34
Control Delay	35.0	23.7	3.1	30.4	13.0	5.1	6.2	7.7	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	23.7	3.1	30.4	13.0	5.1	6.2	7.7	5.9
Queue Length 50th (m)	11.2	3.3	0.0	11.6	6.1	0.3	20.4	4.6	18.3
Queue Length 95th (m)	24.7	9.7	1.8	24.7	23.1	2.1	37.2	14.3	33.9
Internal Link Dist (m)	171.4			109.1			258.0		204.2
Turn Bay Length (m)	27.0		44.0	19.0		10.0		10.0	
Base Capacity (vph)	476	841	724	605	787	435	2212	395	2244
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.03	0.02	0.16	0.25	0.02	0.37	0.26	0.34
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

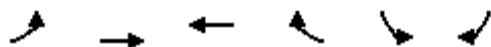
Base Year PM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	26	14	88	29	153	8	699	40	94	612	88
Future Volume (vph)	84	26	14	88	29	153	8	699	40	94	612	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1900	1589	1763	1595		1803	3401		1733	3440	
Flt Permitted	0.58	1.00	1.00	0.74	1.00		0.35	1.00		0.33	1.00	
Satd. Flow (perm)	1076	1900	1589	1370	1595		669	3401		610	3440	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	92	29	15	97	32	168	9	768	44	103	673	97
RTOR Reduction (vph)	0	0	12	0	122	0	0	4	0	0	9	0
Lane Group Flow (vph)	92	29	3	97	78	0	9	808	0	103	761	0
Confl. Peds. (#/hr)	1		4	4		1	7		6	6		7
Heavy Vehicles (%)	2%	0%	0%	2%	3%	3%	0%	4%	25%	4%	3%	1%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	11.7	11.7	11.7	11.7	11.7		44.0	44.0		44.0	44.0	
Effective Green, g (s)	11.7	11.7	11.7	11.7	11.7		44.0	44.0		44.0	44.0	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17		0.65	0.65		0.65	0.65	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	185	328	274	236	275		434	2210		396	2235	
v/s Ratio Prot		0.02			0.05			c0.24			0.22	
v/s Ratio Perm	c0.09		0.00	0.07			0.01			0.17		
v/c Ratio	0.50	0.09	0.01	0.41	0.29		0.02	0.37		0.26	0.34	
Uniform Delay, d1	25.3	23.5	23.2	24.9	24.4		4.2	5.4		5.0	5.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.1	0.0	1.2	0.6		0.1	0.5		1.6	0.4	
Delay (s)	27.4	23.6	23.2	26.1	24.9		4.3	5.9		6.6	5.7	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		26.2			25.3			5.9			5.8	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay	9.9			HCM 2000 Level of Service					A			
HCM 2000 Volume to Capacity ratio	0.39											
Actuated Cycle Length (s)	67.7			Sum of lost time (s)					12.0			
Intersection Capacity Utilization	112.7%			ICU Level of Service					H			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Churchill Drive & Existing Driveway

Base Year PM Peak Hour
220465 - Bayview Drive & Churchill Drive

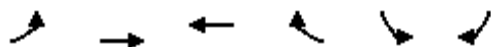


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	155	260	0	5	10
Future Volume (Veh/h)	5	155	260	0	5	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	168	283	0	5	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		133				
pX, platoon unblocked						
vC, conflicting volume	283				461	283
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	283				461	283
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1279				556	756
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	173	283	16			
Volume Left	5	0	5			
Volume Right	0	0	11			
cSH	1279	1700	680			
Volume to Capacity	0.00	0.17	0.02			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.3	0.0	10.4			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			23.7%		ICU Level of Service	
Analysis Period (min)			15		A	

HCM Unsignalized Intersection Capacity Analysis

3: Churchill Drive & Existing Driveway

Base Year PM Peak Hour
220465 - Bayview Drive & Churchill Drive



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	160	255	0	5	5
Future Volume (Veh/h)	0	160	255	0	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	174	277	0	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		210				
pX, platoon unblocked						
vC, conflicting volume	277				451	277
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	277				451	277
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1286				566	762
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	174	277	10			
Volume Left	0	0	5			
Volume Right	0	0	5			
cSH	1286	1700	650			
Volume to Capacity	0.00	0.16	0.02			
Queue Length 95th (m)	0.0	0.0	0.4			
Control Delay (s)	0.0	0.0	10.6			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		23.4%		ICU Level of Service		A
Analysis Period (min)		15				

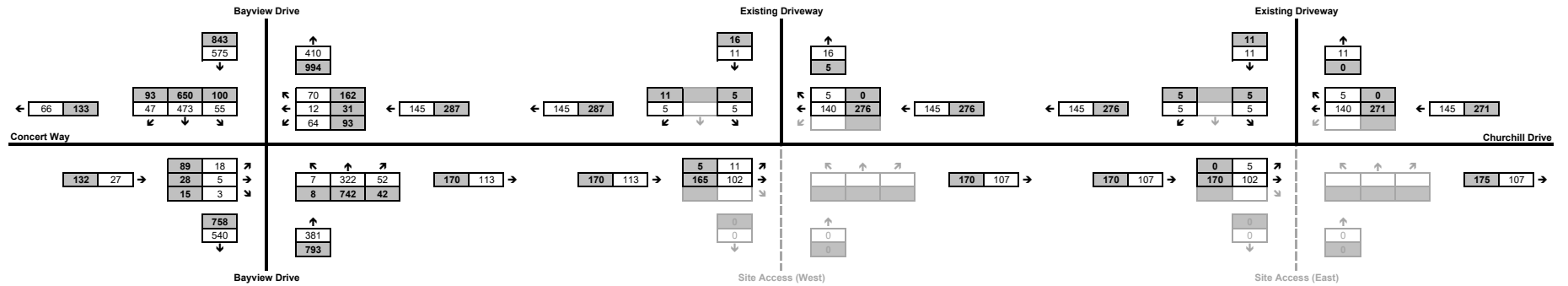
Appendix D

Background Traffic Forecast Components

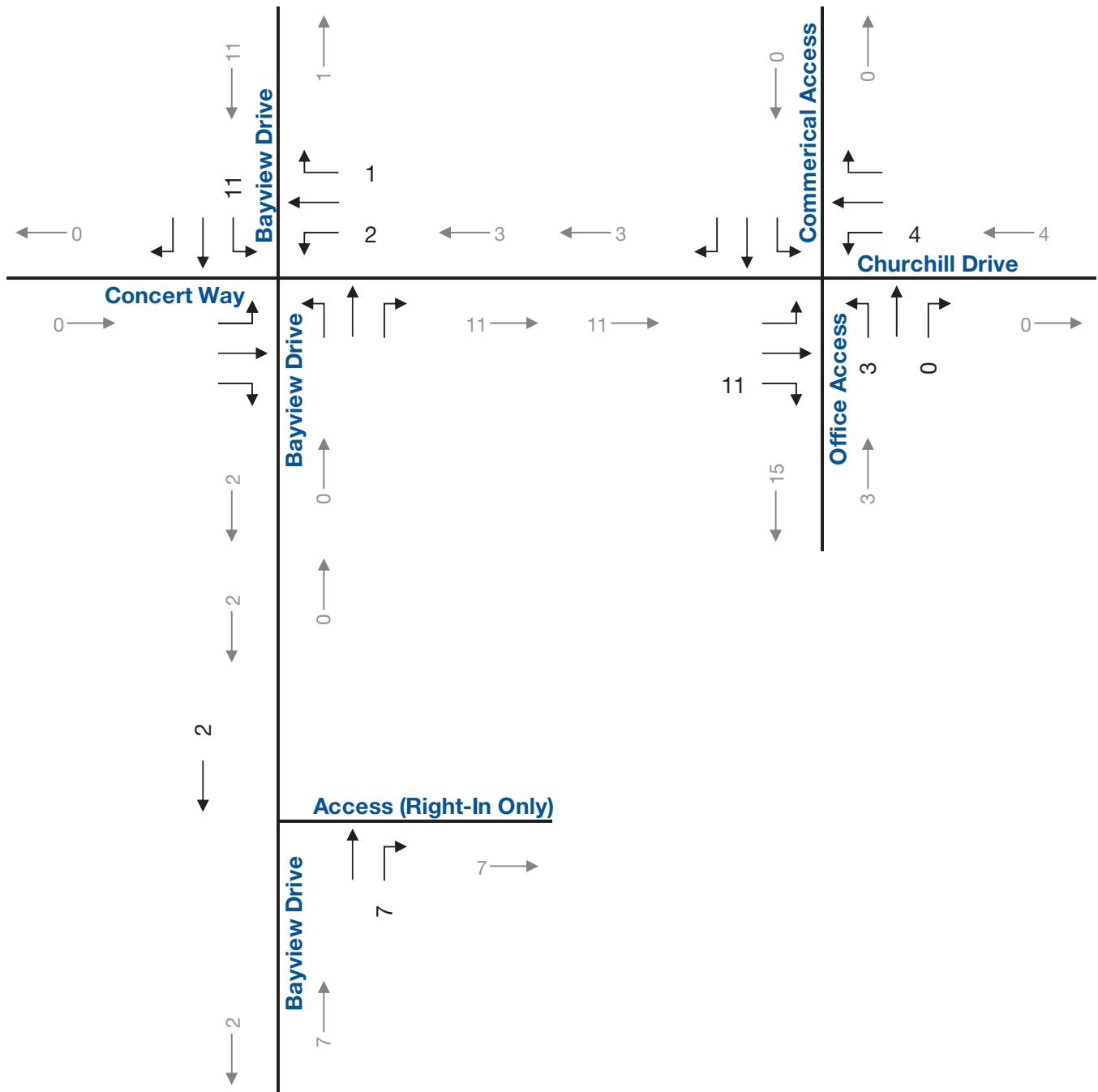


Future Background Growth 2028

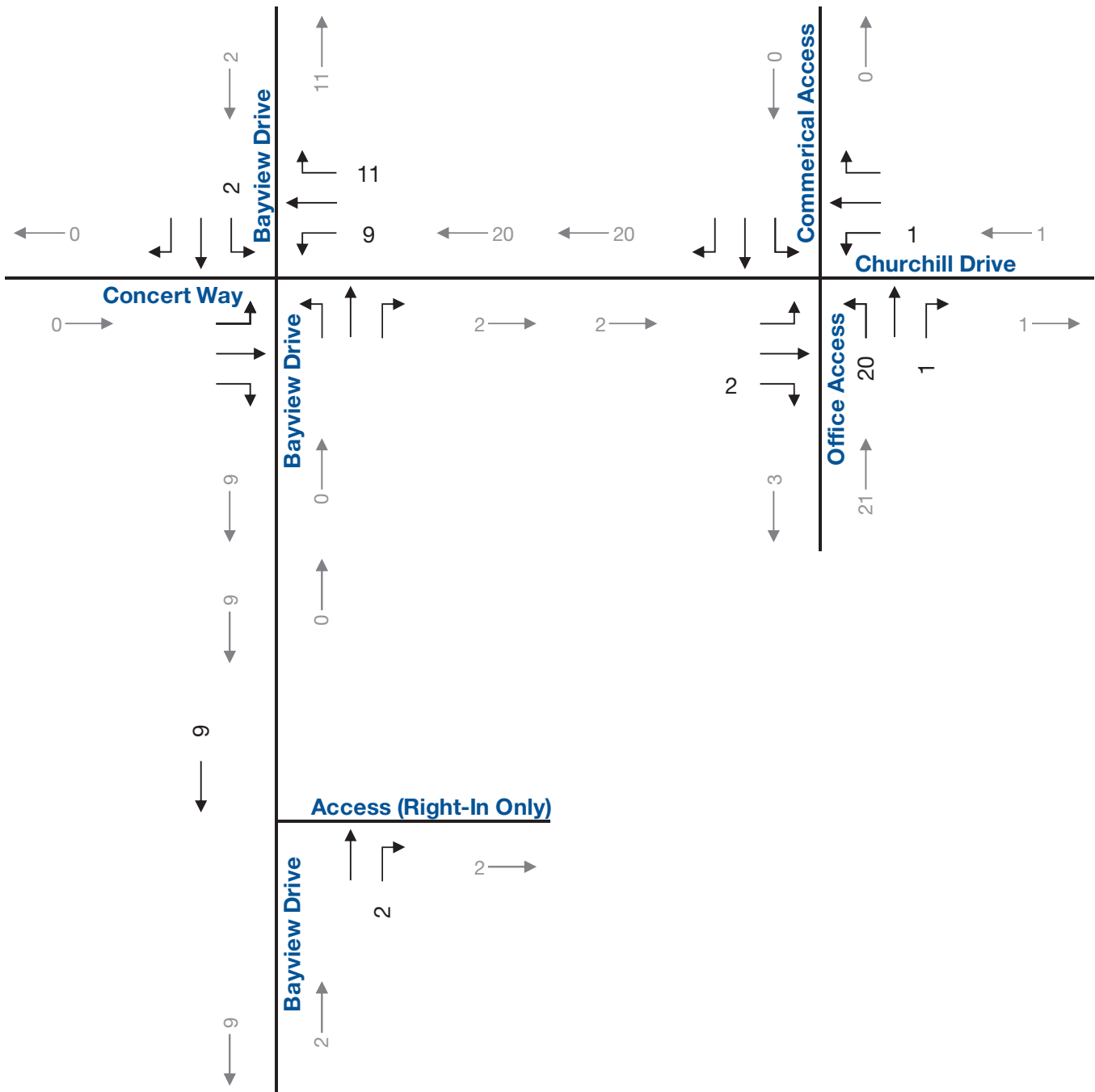
Growth Rate 1%
Year 6



AM Peak Hour



PM Peak Hour



Site Traffic PM Peak Hour

Appendix E

Future Background Traffic Operations Report

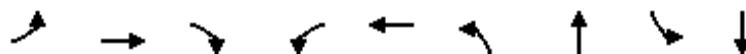


Queues

2028 Background AM Peak Hour

1: Bayview Drive & Concert Way/Churchill Drive

220465 - Bayview Drive & Churchill Drive



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	6	3	73	92	8	416	73	578
v/c Ratio	0.10	0.02	0.01	0.37	0.30	0.01	0.17	0.12	0.25
Control Delay	24.9	23.4	0.0	30.9	11.4	4.4	4.1	5.2	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.9	23.4	0.0	30.9	11.4	4.4	4.1	5.2	4.6
Queue Length 50th (m)	2.3	0.7	0.0	8.6	1.5	0.3	8.1	2.8	12.6
Queue Length 95th (m)	7.8	3.6	0.0	20.1	12.7	1.7	15.2	8.3	22.4
Internal Link Dist (m)		171.4			109.1		258.0		204.2
Turn Bay Length (m)	27.0		44.0	19.0		10.0		10.0	
Base Capacity (vph)	561	855	560	546	700	597	2401	619	2353
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.01	0.01	0.13	0.13	0.01	0.17	0.12	0.25
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

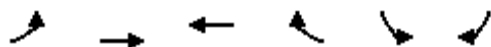
2028 Background AM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	5	3	66	12	71	7	322	52	66	473	47
Future Volume (vph)	18	5	3	66	12	71	7	322	52	66	473	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1900	1199	1528	1460		1803	3299		1597	3236	
Flt Permitted	0.70	1.00	1.00	0.75	1.00		0.43	1.00		0.51	1.00	
Satd. Flow (perm)	1248	1900	1199	1213	1460		824	3299		855	3236	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	20	6	3	73	13	79	8	358	58	73	526	52
RTOR Reduction (vph)	0	0	3	0	69	0	0	9	0	0	5	0
Lane Group Flow (vph)	20	6	0	73	23	0	8	407	0	73	573	0
Confl. Peds. (#/hr)	2		1	1		2	6		1	1		6
Heavy Vehicles (%)	6%	0%	33%	18%	0%	14%	0%	6%	12%	13%	10%	9%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	8.7	8.7	8.7	8.7	8.7		47.1	47.1		47.1	47.1	
Effective Green, g (s)	8.7	8.7	8.7	8.7	8.7		47.1	47.1		47.1	47.1	
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13		0.69	0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	160	243	153	155	187		572	2291		593	2248	
v/s Ratio Prot		0.00			0.02			0.12			c0.18	
v/s Ratio Perm	0.02		0.00	c0.06			0.01			0.09		
v/c Ratio	0.12	0.02	0.00	0.47	0.12		0.01	0.18		0.12	0.25	
Uniform Delay, d1	26.2	25.8	25.8	27.4	26.2		3.2	3.6		3.5	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.0	0.0	2.3	0.3		0.0	0.2		0.4	0.3	
Delay (s)	26.5	25.9	25.8	29.7	26.5		3.2	3.8		3.9	4.1	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		26.3			27.9			3.8			4.1	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.6			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			67.8			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			75.6%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Churchill Drive & Existing Driveway

2028 Background AM Peak Hour
220465 - Bayview Drive & Churchill Drive

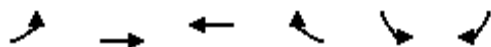


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	102	144	5	5	5
Future Volume (Veh/h)	11	102	144	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	111	157	5	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		133				
pX, platoon unblocked						
vC, conflicting volume	162				294	160
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	162				294	160
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1417				691	886
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	123	162	10			
Volume Left	12	0	5			
Volume Right	0	5	5			
cSH	1417	1700	776			
Volume to Capacity	0.01	0.10	0.01			
Queue Length 95th (m)	0.2	0.0	0.3			
Control Delay (s)	0.8	0.0	9.7			
Lane LOS	A		A			
Approach Delay (s)	0.8	0.0	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		24.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Churchill Drive & Existing Driveway

2028 Background AM Peak Hour
220465 - Bayview Drive & Churchill Drive



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	102	144	5	5	5
Future Volume (Veh/h)	5	102	144	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	111	157	5	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		210				
pX, platoon unblocked						
vC, conflicting volume	162				280	160
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	162				280	160
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1417				707	886
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	116	162	10			
Volume Left	5	0	5			
Volume Right	0	5	5			
cSH	1417	1700	786			
Volume to Capacity	0.00	0.10	0.01			
Queue Length 95th (m)	0.1	0.0	0.3			
Control Delay (s)	0.4	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.4	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			19.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues

2028 Background PM Peak Hour

1: Bayview Drive & Concert Way/Churchill Drive

220465 - Bayview Drive & Churchill Drive

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	98	31	16	112	224	9	861	112	816
v/c Ratio	0.58	0.09	0.05	0.46	0.58	0.02	0.39	0.30	0.37
Control Delay	40.0	23.6	3.4	31.7	17.9	5.4	6.6	8.7	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.0	23.6	3.4	31.7	17.9	5.4	6.6	8.7	6.2
Queue Length 50th (m)	12.1	3.5	0.0	13.6	11.2	0.4	22.6	5.3	20.4
Queue Length 95th (m)	26.6	10.0	2.0	27.9	30.5	2.1	41.2	16.9	37.5
Internal Link Dist (m)	171.4			109.1			258.0		204.2
Turn Bay Length (m)	27.0			44.0	19.0			10.0	10.0
Base Capacity (vph)	424	837	721	602	774	407	2203	369	2234
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.04	0.02	0.19	0.29	0.02	0.39	0.30	0.37
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

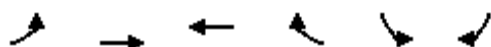
2028 Background PM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	28	15	102	31	173	8	742	42	102	650	93
Future Volume (vph)	89	28	15	102	31	173	8	742	42	102	650	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1900	1589	1763	1592		1803	3402		1733	3441	
Flt Permitted	0.52	1.00	1.00	0.74	1.00		0.33	1.00		0.31	1.00	
Satd. Flow (perm)	962	1900	1589	1367	1592		630	3402		572	3441	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	98	31	16	112	34	190	9	815	46	112	714	102
RTOR Reduction (vph)	0	0	13	0	106	0	0	4	0	0	10	0
Lane Group Flow (vph)	98	31	3	112	118	0	9	857	0	112	806	0
Confl. Peds. (#/hr)	1		4	4		1	7		6	6		7
Heavy Vehicles (%)	2%	0%	0%	2%	3%	3%	0%	4%	25%	4%	3%	1%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	12.0	12.0	12.0	12.0	12.0		44.1	44.1		44.1	44.1	
Effective Green, g (s)	12.0	12.0	12.0	12.0	12.0		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.65	0.65		0.65	0.65	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	334	280	240	280		407	2203		370	2228	
v/s Ratio Prot		0.02			0.07			0.25			0.23	
v/s Ratio Perm	0.10		0.00	0.08			0.01			0.20		
v/c Ratio	0.58	0.09	0.01	0.47	0.42		0.02	0.39		0.30	0.36	
Uniform Delay, d1	25.7	23.5	23.1	25.2	25.0		4.3	5.7		5.3	5.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	0.1	0.0	1.4	1.0		0.1	0.5		2.1	0.5	
Delay (s)	30.5	23.6	23.2	26.6	26.0		4.4	6.2		7.4	6.0	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		28.2			26.2			6.2			6.1	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay	10.5			HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio	0.43											
Actuated Cycle Length (s)	68.1			Sum of lost time (s)					12.0			
Intersection Capacity Utilization	114.2%			ICU Level of Service					H			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Churchill Drive & Existing Driveway

2028 Background PM Peak Hour
220465 - Bayview Drive & Churchill Drive

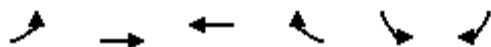


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	166	277	0	5	11
Future Volume (Veh/h)	5	166	277	0	5	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	180	301	0	5	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		133				
pX, platoon unblocked						
vC, conflicting volume	301				491	301
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301				491	301
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	98
cM capacity (veh/h)	1260				535	739
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	185	301	17			
Volume Left	5	0	5			
Volume Right	0	0	12			
cSH	1260	1700	664			
Volume to Capacity	0.00	0.18	0.03			
Queue Length 95th (m)	0.1	0.0	0.6			
Control Delay (s)	0.2	0.0	10.6			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			24.6%		ICU Level of Service	
Analysis Period (min)			15			
			A			

HCM Unsignalized Intersection Capacity Analysis

3: Churchill Drive & Existing Driveway

2028 Background PM Peak Hour
220465 - Bayview Drive & Churchill Drive



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	
Traffic Volume (veh/h)	0	171	272	0	5	5
Future Volume (Veh/h)	0	171	272	0	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	186	296	0	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		210				
pX, platoon unblocked						
vC, conflicting volume	296				482	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	296				482	296
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1265				543	743
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	186	296	10			
Volume Left	0	0	5			
Volume Right	0	0	5			
cSH	1265	1700	628			
Volume to Capacity	0.00	0.17	0.02			
Queue Length 95th (m)	0.0	0.0	0.4			
Control Delay (s)	0.0	0.0	10.8			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.8			
Approach LOS			B			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		24.3%		ICU Level of Service		A
Analysis Period (min)		15				

Appendix F

Future Total Traffic Operations Report



Queues

1: Bayview Drive & Concert Way/Churchill Drive

2028 Total AM Peak Hour

220465 - Bayview Drive & Churchill Drive

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	6	3	76	94	8	418	77	578
v/c Ratio	0.10	0.02	0.01	0.38	0.31	0.01	0.17	0.12	0.25
Control Delay	24.8	23.2	0.0	31.1	11.2	4.6	4.1	5.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	23.2	0.0	31.1	11.2	4.6	4.1	5.3	4.6
Queue Length 50th (m)	2.3	0.7	0.0	9.0	1.5	0.3	8.2	3.0	12.6
Queue Length 95th (m)	7.8	3.6	0.0	20.6	12.8	1.7	15.5	8.8	22.6
Internal Link Dist (m)	171.4			109.1			258.0		
Turn Bay Length (m)	27.0		44.0	19.0		10.0		10.0	
Base Capacity (vph)	559	854	559	545	700	596	2394	617	2349
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.01	0.01	0.14	0.13	0.01	0.17	0.12	0.25
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

2028 Total AM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	5	3	68	12	73	7	322	54	69	473	47
Future Volume (vph)	18	5	3	68	12	73	7	322	54	69	473	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1900	1199	1528	1459		1803	3296		1597	3236	
Flt Permitted	0.70	1.00	1.00	0.75	1.00		0.43	1.00		0.51	1.00	
Satd. Flow (perm)	1246	1900	1199	1213	1459		824	3296		853	3236	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	20	6	3	76	13	81	8	358	60	77	526	52
RTOR Reduction (vph)	0	0	3	0	70	0	0	10	0	0	6	0
Lane Group Flow (vph)	20	6	0	76	24	0	8	408	0	77	572	0
Confl. Peds. (#/hr)	2		1	1		2	6		1	1		6
Heavy Vehicles (%)	6%	0%	33%	18%	0%	14%	0%	6%	12%	13%	10%	9%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	8.9	8.9	8.9	8.9	8.9		47.1	47.1		47.1	47.1	
Effective Green, g (s)	8.9	8.9	8.9	8.9	8.9		47.1	47.1		47.1	47.1	
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13		0.69	0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	163	248	156	158	190		570	2282		590	2241	
v/s Ratio Prot		0.00			0.02			0.12			c0.18	
v/s Ratio Perm	0.02		0.00	c0.06			0.01			0.09		
v/c Ratio	0.12	0.02	0.00	0.48	0.12		0.01	0.18		0.13	0.26	
Uniform Delay, d1	26.1	25.8	25.7	27.4	26.1		3.2	3.7		3.5	3.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.0	0.0	2.3	0.3		0.0	0.2		0.5	0.3	
Delay (s)	26.4	25.8	25.7	29.7	26.4		3.3	3.8		4.0	4.2	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		26.2			27.9			3.8			4.2	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.7			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			68.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			78.2%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Site Access (West)/Existing Driveway & Churchill Drive

2028 Total AM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	107	0	0	149	5	0	0	0	5	0	5
Future Volume (Veh/h)	11	107	0	0	149	5	0	0	0	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	116	0	0	162	5	0	0	0	5	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)	133											
pX, platoon unblocked												
vC, conflicting volume	167			116			310	307	116	304	304	164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			116			310	307	116	304	304	164
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	99	100	99
cM capacity (veh/h)	1411			1473			635	602	936	644	604	880
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	128	167	0	10								
Volume Left	12	0	0	5								
Volume Right	0	5	0	5								
cSH	1411	1473	1700	744								
Volume to Capacity	0.01	0.00	0.00	0.01								
Queue Length 95th (m)	0.2	0.0	0.0	0.3								
Control Delay (s)	0.8	0.0	0.0	9.9								
Lane LOS	A		A	A								
Approach Delay (s)	0.8	0.0	0.0	9.9								
Approach LOS			A	A								
Intersection Summary												
Average Delay	0.6											
Intersection Capacity Utilization	24.8%			ICU Level of Service						A		
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis 3: Site Access (East)/Existing Driveway & Churchill Drive

2028 Total AM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	102	5	1	144	5	4	0	1	5	0	5
Future Volume (Veh/h)	5	102	5	1	144	5	4	0	1	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	111	5	1	157	5	4	0	1	5	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)	210											
pX, platoon unblocked												
vC, conflicting volume	162			116			290	288	114	286	288	160
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162			116			290	288	114	286	288	160
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	99	100	99
cM capacity (veh/h)	1417			1473			656	620	939	663	620	886
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	121	163	5	10								
Volume Left	5	1	4	5								
Volume Right	5	5	1	5								
cSH	1417	1473	698	759								
Volume to Capacity	0.00	0.00	0.01	0.01								
Queue Length 95th (m)	0.1	0.0	0.2	0.3								
Control Delay (s)	0.3	0.1	10.2	9.8								
Lane LOS	A	A	B	A								
Approach Delay (s)	0.3	0.1	10.2	9.8								
Approach LOS			B	A								
Intersection Summary												
Average Delay			0.7									
Intersection Capacity Utilization			19.1%		ICU Level of Service				A			
Analysis Period (min)			15									

Queues

1: Bayview Drive & Concert Way/Churchill Drive

2028 Total PM Peak Hour

220465 - Bayview Drive & Churchill Drive

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	98	31	16	116	231	9	866	116	816
v/c Ratio	0.58	0.09	0.05	0.47	0.59	0.02	0.40	0.32	0.37
Control Delay	39.9	23.4	3.3	31.5	18.2	5.6	6.8	9.3	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	23.4	3.3	31.5	18.2	5.6	6.8	9.3	6.4
Queue Length 50th (m)	12.2	3.5	0.0	14.1	12.1	0.4	23.3	5.7	20.8
Queue Length 95th (m)	26.7	10.0	2.0	28.5	31.8	2.2	43.1	18.2	38.9
Internal Link Dist (m)	171.4			109.1			258.0		
Turn Bay Length (m)	27.0		44.0	19.0		10.0		10.0	
Base Capacity (vph)	410	833	717	599	769	403	2186	363	2222
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.04	0.02	0.19	0.30	0.02	0.40	0.32	0.37
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Bayview Drive & Concert Way/Churchill Drive

2028 Total PM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	28	15	106	31	179	8	742	46	106	650	93
Future Volume (vph)	89	28	15	106	31	179	8	742	46	106	650	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1900	1589	1763	1591		1803	3395		1733	3441	
Flt Permitted	0.50	1.00	1.00	0.74	1.00		0.33	1.00		0.31	1.00	
Satd. Flow (perm)	936	1900	1589	1367	1591		628	3395		566	3441	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	98	31	16	116	34	197	9	815	51	116	714	102
RTOR Reduction (vph)	0	0	13	0	106	0	0	4	0	0	10	0
Lane Group Flow (vph)	98	31	3	116	125	0	9	862	0	116	806	0
Confl. Peds. (#/hr)	1		4	4		1	7		6	6		7
Heavy Vehicles (%)	2%	0%	0%	2%	3%	3%	0%	4%	25%	4%	3%	1%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	12.4	12.4	12.4	12.4	12.4		44.1	44.1		44.1	44.1	
Effective Green, g (s)	12.4	12.4	12.4	12.4	12.4		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.64	0.64		0.64	0.64	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	343	287	247	288		404	2185		364	2215	
v/s Ratio Prot		0.02			0.08			0.25			0.23	
v/s Ratio Perm	0.10		0.00	0.08			0.01			0.20		
v/c Ratio	0.58	0.09	0.01	0.47	0.44		0.02	0.39		0.32	0.36	
Uniform Delay, d1	25.7	23.4	23.0	25.1	24.9		4.4	5.8		5.5	5.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	0.1	0.0	1.4	1.1		0.1	0.5		2.3	0.5	
Delay (s)	30.4	23.5	23.0	26.5	26.0		4.5	6.4		7.8	6.1	
Level of Service	C	C	C	C	C		A	A		A	A	
Approach Delay (s)		28.1			26.2			6.3			6.3	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay	10.7			HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio	0.43											
Actuated Cycle Length (s)	68.5			Sum of lost time (s)					12.0			
Intersection Capacity Utilization	114.6%			ICU Level of Service					H			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Site Access (West)/Existing Driveway & Churchill Drive

2028 Total PM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	173	0	0	286	0	0	0	0	5	0	11
Future Volume (Veh/h)	5	173	0	0	286	0	0	0	0	5	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	188	0	0	311	0	0	0	0	5	0	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	133											
pX, platoon unblocked												
vC, conflicting volume	311			188			521	509	188	509	509	311
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	311			188			521	509	188	509	509	311
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	98
cM capacity (veh/h)	1249			1386			457	465	854	473	465	729
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	193	311	0	17								
Volume Left	5	0	0	5								
Volume Right	0	0	0	12								
cSH	1249	1386	1700	629								
Volume to Capacity	0.00	0.00	0.00	0.03								
Queue Length 95th (m)	0.1	0.0	0.0	0.7								
Control Delay (s)	0.2	0.0	0.0	10.9								
Lane LOS	A		A	B								
Approach Delay (s)	0.2	0.0	0.0	10.9								
Approach LOS			A	B								
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			25.1%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Site Access (East)/Existing Driveway & Churchill Drive

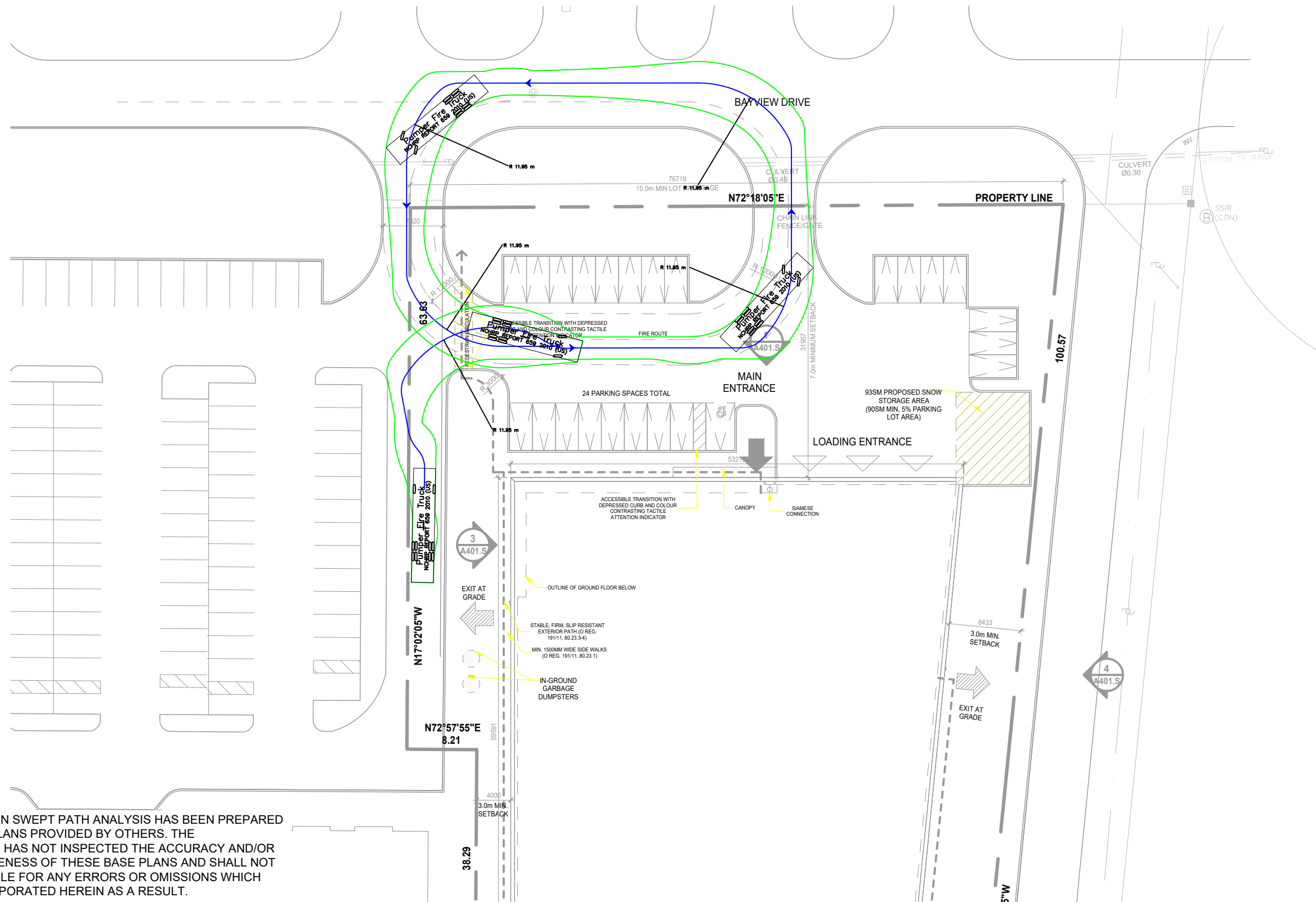
2028 Total PM Peak Hour
220465 - Bayview Drive & Churchill Drive

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	171	8	1	272	0	9	0	1	5	0	5
Future Volume (Veh/h)	0	171	8	1	272	0	9	0	1	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	186	9	1	296	0	10	0	1	5	0	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	296			195			494	488	190	490	493	296
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	296			195			494	488	190	490	493	296
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	100	100	99	100	99
cM capacity (veh/h)	1265			1378			482	479	851	488	477	743
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	195	297	11	10								
Volume Left	0	1	10	5								
Volume Right	9	0	1	5								
cSH	1265	1378	502	589								
Volume to Capacity	0.00	0.00	0.02	0.02								
Queue Length 95th (m)	0.0	0.0	0.5	0.4								
Control Delay (s)	0.0	0.0	12.3	11.2								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.0	12.3	11.2								
Approach LOS			B	B								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			25.1%		ICU Level of Service				A			
Analysis Period (min)			15									

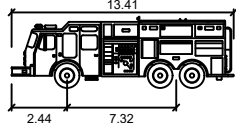
Appendix G

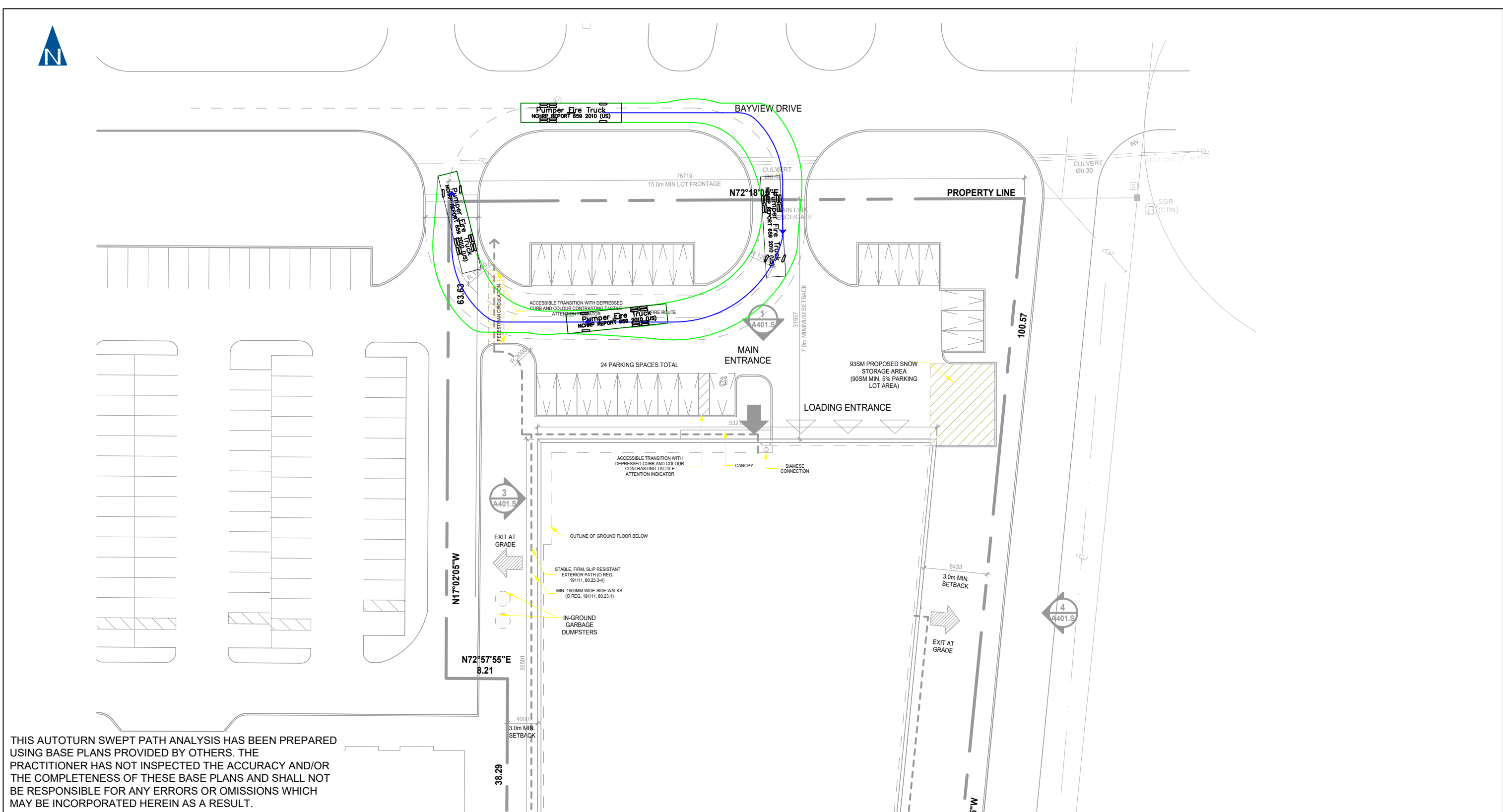
AutoTURN Vehicle Turning Diagrams





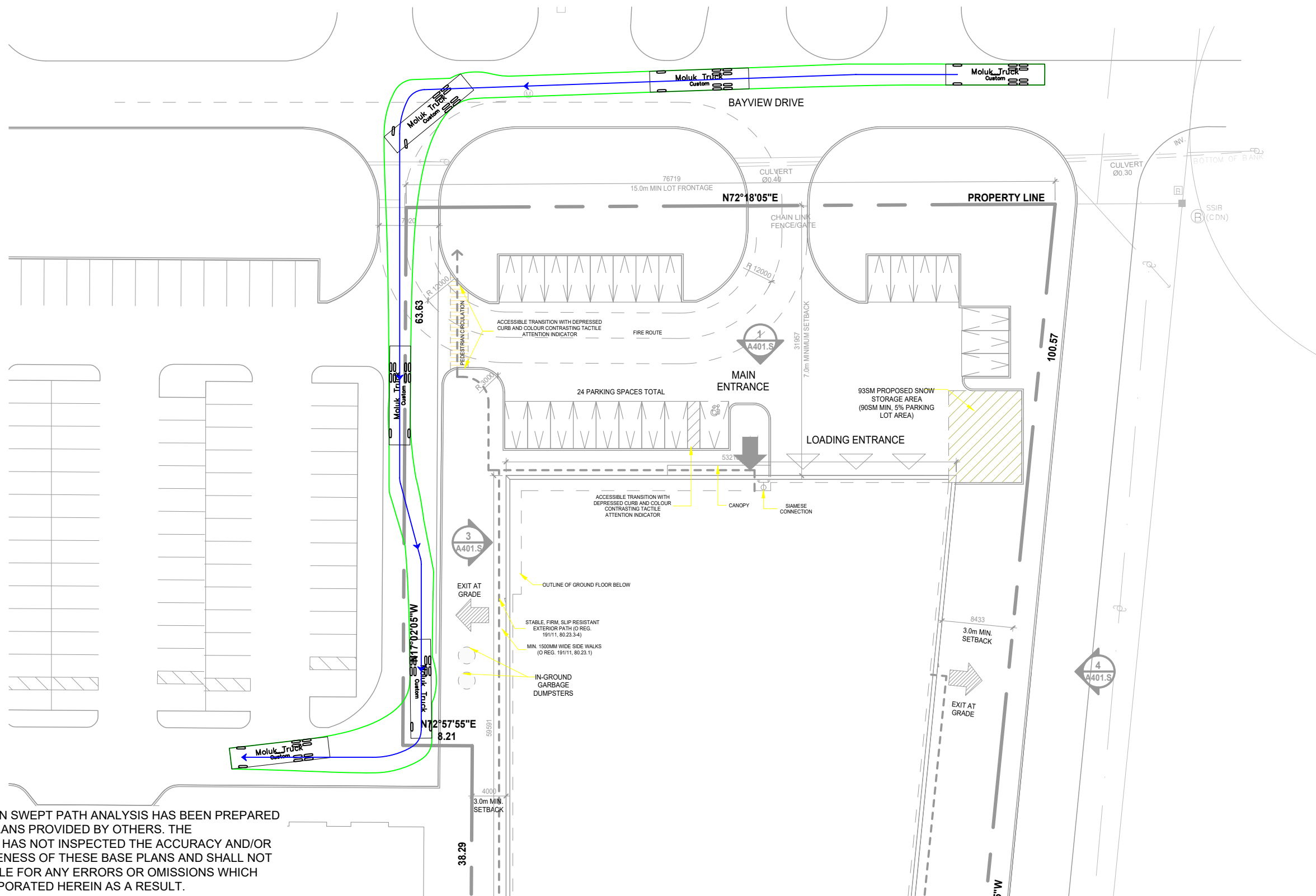
THIS AUTOTURN SWEEP PATH ANALYSIS HAS BEEN PREPARED USING BASE PLANS PROVIDED BY OTHERS. THE PRACTITIONER HAS NOT INSPECTED THE ACCURACY AND/OR THE COMPLETENESS OF THESE BASE PLANS AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

				DESIGN VEHICLE:  Pumper Fire Truck meters : 2.59 : 2.59 : 6.0 : 37.8	AUTOTURN ASSESSMENT 447 BAYVIEW DRIVE BARRIE, ON				
						PROJECT NO.: 220465	DATE: AUGUST 2022	SCALE: 1:500	DRAWING NO.: 001
						DRAWN: MB	DESIGN: MB	CHECK: AA	
NO.	DATE	INITIAL	REVISION DETAIL						



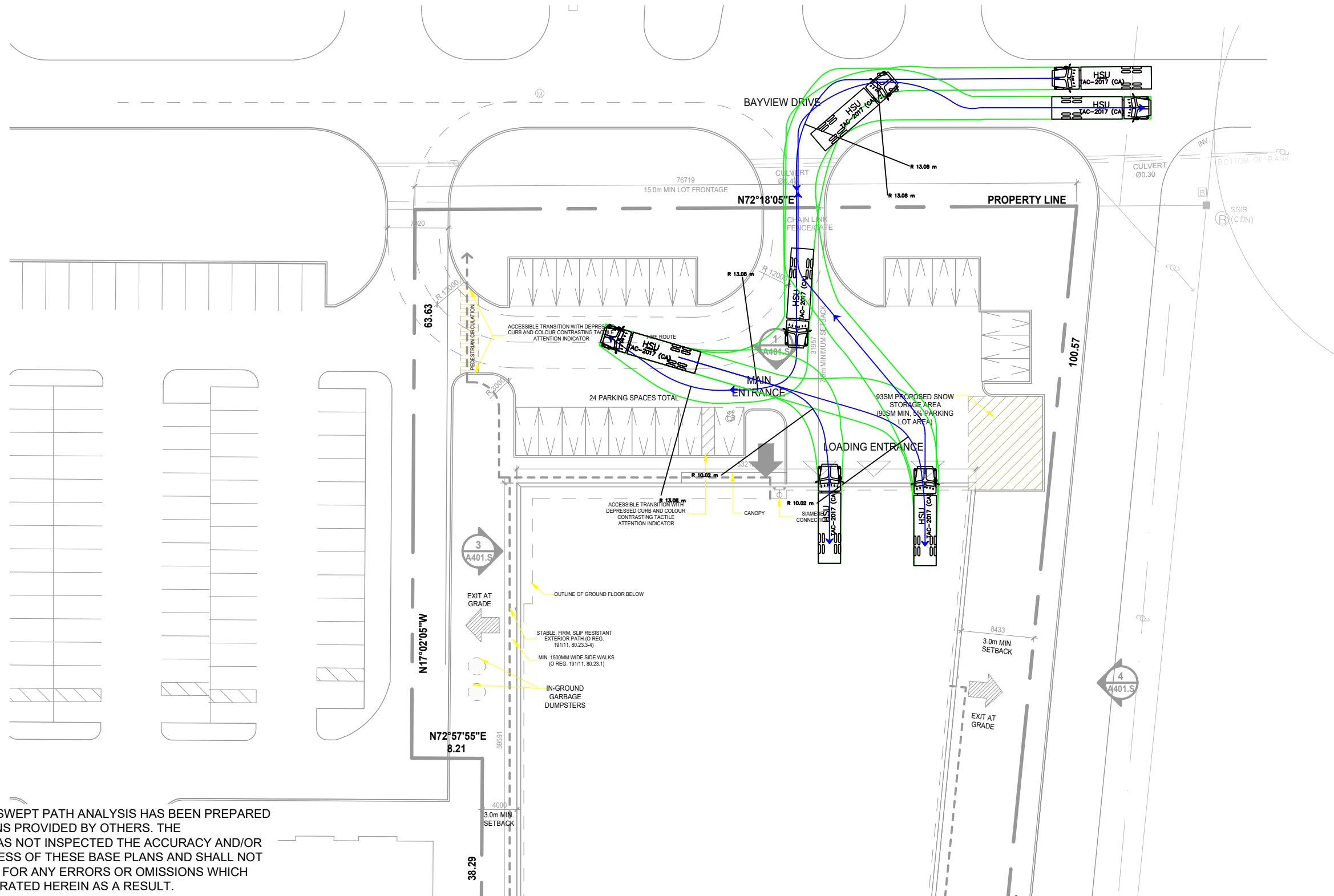
NO.	DATE	INITIAL	REVISION DETAIL

002



NO.	DATE	INITIAL	REVISION DETAIL

002



NO.	DATE	INITIAL	REVISION DETAIL



PROJECT NO.: 220465	DATE: AUGUST 2022	SCALE: 1:500	DRAWING NO.: 004
DRAWN: MB	DESIGN: MB	CHECK: AA	