BURNSIDE

Transportation Study
Part Lot 30, Concession 1
Township of Zorra, Ontario

Wilhelm Excavating Limited
4163 Road 109, RR1
Stratford, Ontario

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Revision	Date	Description
0	April 5, 2024	Initial Submission to Wilhelm Excavating Limited
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2	November 18, 2024	Revised Final Submission to Wilhelm Excavating Limited

R.J. Burnside & Associates Limited

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Executive Summary

Background

R.J. Burnside & Associates Limited (Burnside) was retained by Wilhelm Excavating Limited to undertake a Transportation Study for a proposed 27.8 ha gravel extraction pit located on Part Lot 30, Concession 1 in the Township of Zorra. The property owner (Wilhelm Excavating Limited) is seeking approval to operate a gravel pit to extract up to 500,000 tonnes per year. The site is currently an open field utilized for agricultural purposes with an Agricultural Reserve classification in the Official Plan and an Open Space (OS) zoning in By-law No. 35-99. Access to the gravel pit is proposed via a single access on Oxford Road 28.

The Terms of Reference (TOR) for this study were circulated to the County of Oxford and the Township of Zorra for comment prior to undertaking this assignment. The Public Works Director for the Township indicated that access to the pit from 31st Line would not be allowed, due to the gravel surface, steep grades, and substandard vertical curves on this road. The County's Entrance Guidelines indicate that direct access to a County Road is not allowed if access is available from a Township Road. However, if access to a Township Road is unavailable, then the County will require a business / engineering justification case to be provided, for the consideration of the County's Director in granting approval for such access. This TIS provides an assessment of the traffic impacts of implementing direct access to the County Road for the subject gravel pit.

The review of the initial report submission, along with questions raised in the public meeting concerning this development application, identified concerns pertaining to the background traffic counts, potential impacts from increased truck traffic and the directional distribution of traffic from the proposed gravel pit. This revised report addresses these concerns based on the following additional study work:

- Completion of updated traffic volume counts (October 2024) to confirm background traffic/truck volumes, not impacted by half-load restrictions within the road network.
- Adjustment of the directional distribution of traffic from the gravel pit, based on further review of the market demands by the proponent.

Based on the analysis in this study, the main conclusions and recommendations are as follows:

- The property owner (Wilhelm Excavating Limited) is seeking approval to operate a gravel pit to extract up to 500,000 tonnes of granular per year. The haul route for gravel will be east and west along Oxford Road 28.
- Oxford County has plans to widen the paved shoulders along Oxford Road 28 between Oxford Road 6 and Oxford Road 109, to provide a cycling facility. The proposed timeline for implementation of this cycling facility is 2029 – 2033. There

are no other known or planned improvements within the study area by the 2034 study horizon year.

- Considering that an access to 31st Line is not achievable, consideration of direct access to Oxford Road 28 is recommended.
- A review of the truck volumes was conducted for the trips traveling through Harrington (i.e., southbound left turns, northbound right turns, eastbound through, and all west bound movements). The February 2024 counts had 16 a.m. truck trips and 21 p.m. truck trips for a total of 37 during the combined peak hours. Similarly, the October counts had 26 a.m. truck trips and 14 p.m. truck trips for a total of 40 during the combined peak hours. Therefore, it is concluded that based on reviewing the existing counts collected in February and October 2024, there was only a difference of three truck trips travelling through Harrington during the combined peak hours. It is forecasted that the gravel pit will generate approximately eight truck trips (total two-way) through Harrington at peak hours in the peak season.
- Oxford Road 28 (Road 96) is a County Road that is designed to arterial road standards, to accommodate the traffic volumes and traffic types forecasted.
- The operational plan for the gravel pit proposes that the access to Oxford Road 28 be located about 180 m west of the intersection of Oxford Road 28 / 31st Line, which meets the County's entrance spacing requirements. Consideration of relocating the access further to the east may be made to maximize the separation from houses located on the north side of Oxford Road 28, and to improve the sight distances to the west.
- The proposed gravel pit is forecasted to generate approximately 16 two-way trips per hour in both the a.m. and p.m. peak hours.
- Considering the anticipated market area for gravel from the proposed pit, the client has indicated that approximately 50% of the loads will travel east on Oxford Road 28.
- Under existing, future background and future total conditions, all movements at the intersection of Oxford Road 28 and 31st Line are forecast to operate with excess capacity at a LOS B or better and delays under 10.3 seconds. Existing queues and projected queues are forecasted to be within the available storage.
- Under future total conditions, all movements at the intersection of Oxford Road 28 and the proposed access are forecast to operate with excess capacity at a LOS B or better and delays under 10.7 seconds. Projected queues are, and will be, within the proposed storage.
- The sight distances available at the proposed access onto Oxford Road 28 meet the requirements set out in Oxford County's Entrance Guidelines and set out in the *Geometric Design Guide for Canadian Roads (Transportation Association of Canada, June 2017).*
- It is recommended that Truck Entrance signage be placed on Oxford Road 28 warning motorists of the gravel pit access.
- The traffic operations at the proposed access onto Oxford Road 28 are expected to have minimal impact on the existing traffic on this road.

- It is recommended that sight triangles be provided at the proposed site access to maintain visibility between vehicles approaching the intersection.
- It is recommended that an eastbound right turn taper (standard MTOD 305.070 – Commercial Entrance Truck / Resource Access) be considered at the proposed access to minimize shoulder maintenance and improve conditions for truck turning movements.
- Left turn lanes are not required on Oxford Road 28 at the proposed access.

In conclusion, this study has provided the technical justification to support the implementation of an access to Oxford Road 28 for the proposed gravel pit.

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1.0 Introduction

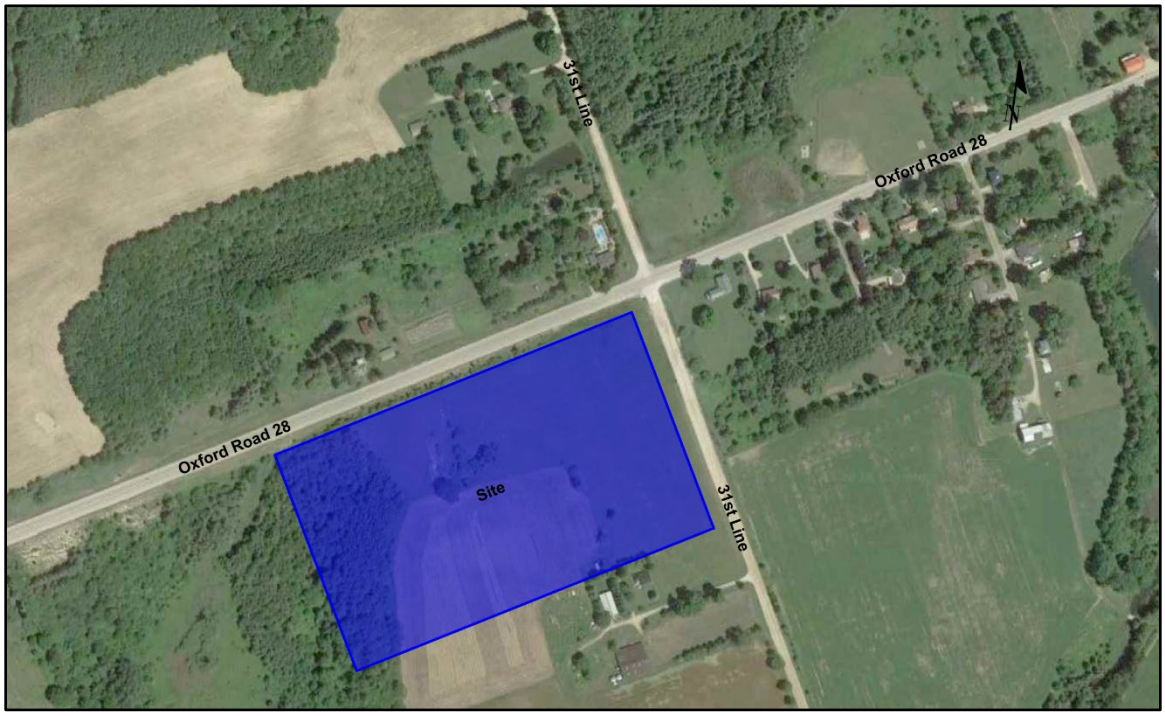
1.1 Background

R.J. Burnside & Associates Limited (Burnside) was retained by Wilhelm Excavating Limited to undertake a Transportation Study for a proposed 27.8 ha gravel extraction pit located on Part Lot 30, Concession 1 in the Township of Zorra. The property owner (Wilhelm Excavating Limited) is seeking approval to operate a gravel pit to extract up to 500,000 tonnes per year. The site is currently an open field used for agricultural purposes. Access to the gravel pit is proposed via a single access on Oxford Road 28. The purpose of this TIS is to provide an assessment of the traffic impacts of the proposed gravel pit. The location of the site is illustrated in Figure 1.

The review of the initial report submission, along with questions raised in the public meeting concerning this development application, identified concerns pertaining to the background traffic counts, potential impacts from increased truck traffic (i.e., particularly through Harrington) and the directional distribution of traffic from the proposed gravel pit. This revised report addresses these concerns based on the following additional study work:

- Completion of updated traffic volume counts (October 2024) to confirm background traffic/truck volumes, not impacted by half-load restrictions within the road network. The updated counts, including a comparison to the previous counts, is provided in more detail in Section 2.3.
- Adjustment of the directional distribution of traffic from the gravel pit, based on further review of the market demands by the proponent.

Figure 1: Site Location



1.2 Scope of Work

The following scope of work was confirmed with the Township of Zorra (Township) and the County of Oxford (County) before conducting this study.

Analysis Scenarios	• Existing Traffic Conditions • 2029 background and total traffic conditions • 2034 background and total traffic conditions
Analysis Periods	• Weekday a.m. peak hour (peak hour in 7:00 a.m. – 9:00 a.m. period) • Weekday p.m. peak hour (peak hour in 3:00 p.m. – 6:00 p.m. period)
Analysis Intersections (Study Area)	• Oxford Road 28 / 31st Line • Oxford Road 28 / Site Driveway

1.3 Intersection Analysis Methodology

Stop-controlled traffic operations were assessed for the study intersection and access using the software program Synchro 12, which employs methodology from the *Highway Capacity Manual* (HCM 2000, HCM 2010 and HCM 6th Edition), published by the Transportation Research Board National Research Council.

Synchro 12 can analyze signalized and unsignalized intersections in a road corridor or network, accounting for the spacing, interaction, queues, and operations between intersections. The analysis in this study utilizes the HCM 2000 methodology.

Analysis Methodology for Stop-Controlled Intersections

Stop-controlled intersection analysis considers two separate measures of performance:

- The capacity of the intersection's critical movements, which is based on a volume-to-capacity (v/c) ratio.
- The Level of Service (LOS) for the critical movements within the intersection. The link between LOS and delay (in seconds) for stop-controlled intersections is summarized below.

LOS	Control Delay per Vehicle (seconds)
A	– 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

2.0 Existing Site Conditions

2.1 Site Context

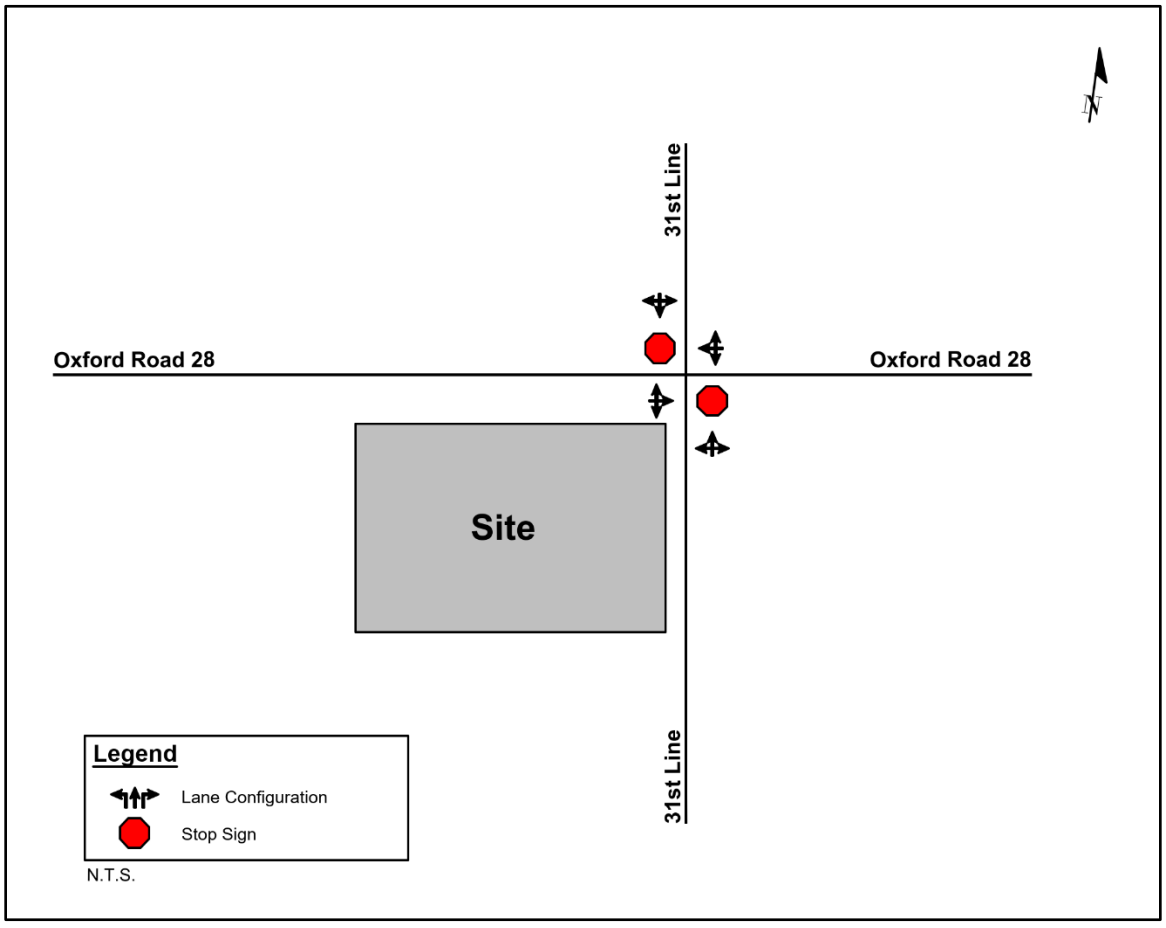
The subject site is currently utilized for agricultural purposes and is also surrounded by other agricultural land uses. The Settlement of Harrington is located along Oxford Road 28, immediately east of 31st Line.

2.2 Existing Road Network

The existing road network is described below and is illustrated in Figure 2, including existing traffic control.

Road 96 (Oxford Road 28)	Oxford Road 28 is an east-west arterial road under the jurisdiction of Oxford County. The roadway has a two-lane rural cross-section with a posted speed limit of 60 km/h east of the 31st Line and 80 km/h commencing immediately west of the 31st Line.
31st Line	31st Line is a north-south local gravel road under the jurisdiction of the Township of Zorra. The roadway has a two-lane rural cross-section with an assumed (unposted) speed limit of 80 km/h. The road has a half-load limit from February 15 to April 30.

Figure 2: Existing Road Network



2.3 Existing Traffic Volumes

Turning Movement Counts (TMC) were conducted by Ontario Traffic Inc. (OTI) on behalf of Burnside at the intersection of Oxford Road 28 and 31st Line. As mentioned earlier in the report, the review of the initial report submission and comments at a public open house led the property owner to undertake an additional set of traffic counts to confirm traffic and truck volumes. The initial set of traffic counts were taken on Wednesday, February 21, 2024, with the second set taken on Tuesday October 29, 2024. Both sets of traffic counts were conducted in the morning from 7:00 a.m. to 9:00 a.m. and in the afternoon from 3:00 p.m. to 6:00 p.m.

The existing 2024 traffic volumes collected are illustrated in Figure 3 for February and Figure 4 for October, with both sets provided in Appendix A.

Figure 3: Existing Traffic Volumes (February 2024)

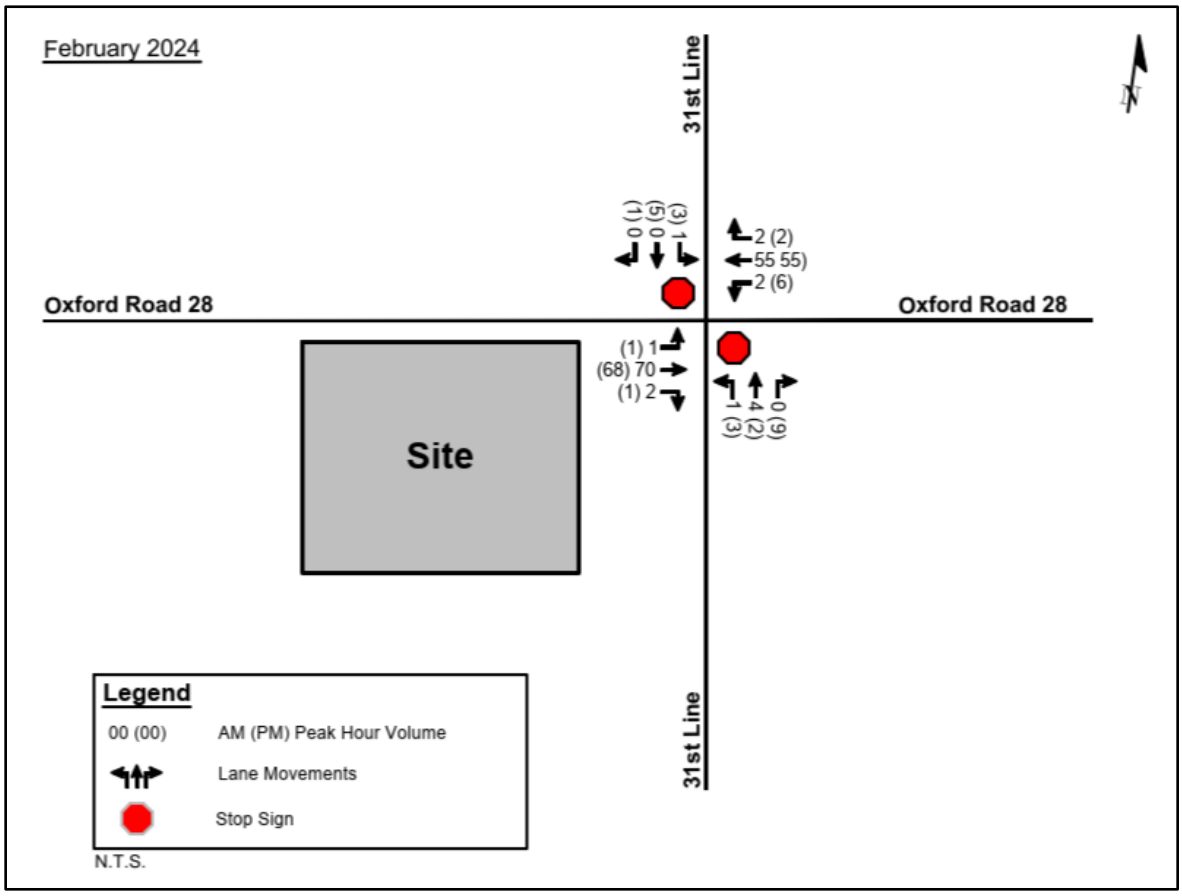
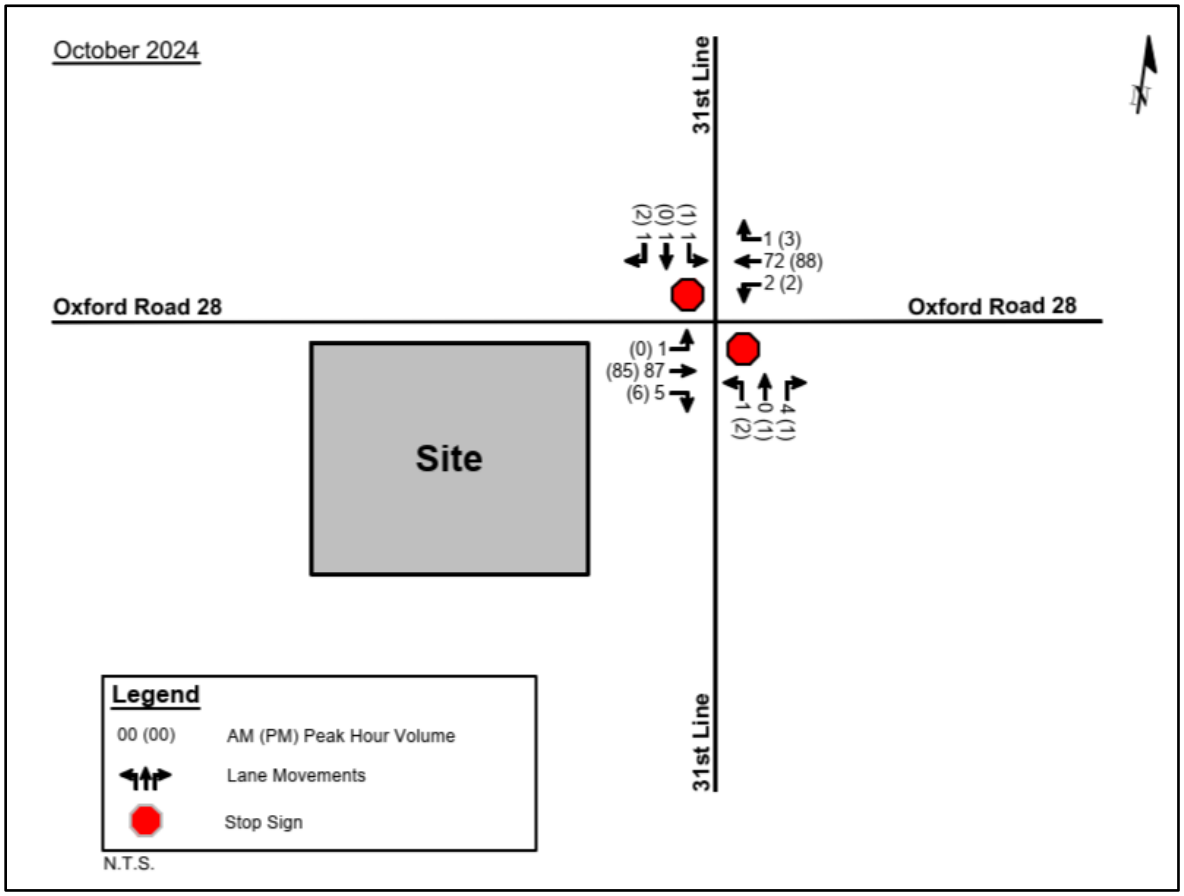


Figure 4: Existing Traffic Volumes (October 2024)



Based on the comparison of the February and October 2024 counts in Table 1 and Table 2, it has been concluded that the October counts had higher overall traffic volumes, including higher truck volumes recorded. It should be noted that seasonal half load restrictions were in place for the Township roads in the study area during the February counts and this may have been reflected in the truck volumes, although County Road 28 does not have load restrictions. Based on the comparison, the October counts have been carried through the revised analysis, as the higher traffic volumes will provide a conservative assumption regarding traffic operations and delays.

Table 1: Traffic Volume Comparison

Movement	February AM	October AM	February PM	October PM
Southbound	1	3	9	3
Northbound	5	5	14	4
Westbound	59	75	63	93
Eastbound	73	93	70	91
Intersection Total	138	176	156	191

Table 2: Truck Traffic Volume Comparison

Movement	February AM	October AM	February PM	October PM
Southbound	0	1	0	0
Northbound	0	1	2	0
Westbound	7	13	9	5
Eastbound	9	17	11	10
Intersection Total	16	32	22	15

Another concern expressed, at the public meeting regarding the proposed gravel pit, was the existing and potential increased volume of trucks traveling through Harrington. A review of the truck volumes was conducted for the trips traveling through Harrington (i.e., southbound left turns, northbound right turns, eastbound through, and all west bound movements). The February counts had 16 a.m. truck trips and 21 p.m. truck trips for a total of 37 during the combined peak hours. Similarly, the October counts had 26 a.m. truck trips and 14 p.m. truck trips for a total of 40 during the combined peak hours. Therefore, it is concluded that based on reviewing the existing counts collected in February and October, there was only a difference of three truck trips during the combined peak hours.

It is forecasted that the directional split will be 50/50 for truck trips generated from the proposed gravel pit. The resulting truck trips travelling through Harrington is forecasted to be eight per peak hour for a total of 16 during the combined peak hours.

As outlined above in Section 2.2, Oxford Road 28 is a County arterial road. As per the County of Oxford's Official Plan, a County Road is a major road which serves moderate to high volumes of inter-municipal and long distance traffic movements between Provincial Highways and Township Roads. County Roads are also designed geometrically and structurally with the intention of serving moderate to high traffic volumes as well as truck traffic. Through the community of Harrington, Oxford Road 28 has a reduced speed limit (60 km/h) and a small number of rural residential lots along the south side of the road. A baseball diamond and a few sporadic houses are located along the north side of the road, however, most of the area is rural open space. Minimal direct driveway accesses or public road accesses are located along Oxford Road 28 within Harrington, minimizing the potential for access conflicts from traffic on the County Road. Based on the above, it is concluded that Oxford Road 28 can safely accommodate the additional truck volumes from the proposed pit.

3.0 Future Background Conditions

3.1 Future Road Improvements

Oxford County's 2021 Cycling Master Plan identifies Oxford Road 28, between Oxford Road 6 and Oxford Road 119, as part of the Township of Zorra Loop, which is identified as part of the County's Primary Cycling Network and as a designated cycling facility. The Master Plan notes that the road currently has a pavement width of at least 8.7 m, which can accommodate a 1.0 m paved shoulder on each side. However, as part of the Primary Network, the Master Plan recommends that the paved shoulders be widened to a minimum of 1.5 m operating space, with at least a 0.5 m buffer on each side of the road. The proposed timeline for implementing the designated cycling facility along Oxford Road 28 is 2029 – 2033.

Other than the identified planned cycling facility, there are no other known or planned improvements within the study area by the 2034 horizon year, as confirmed by the Township and County staff.

3.2 Background Traffic Growth

Future background traffic consists of existing traffic plus traffic growth per annum up to the selected horizon year. For this study, a five-year (2029) and ten-year (2034) horizon period have been selected.

A growth rate of 2.0%, compounded annually to 2029 and 2034 was applied to all movements on Oxford Road 28 and 31st Line, as recommended in the consultation with the County to confirm the Terms of Reference.

3.3 Background Traffic Volumes

Background traffic volumes consist of the addition of traffic growth per annum (up to horizon years) to existing traffic volumes. The resulting background traffic volumes are illustrated in Figure 5 for 2029 and Figure 6 for 2034.

Figure 5: 2029 Background Traffic Volumes

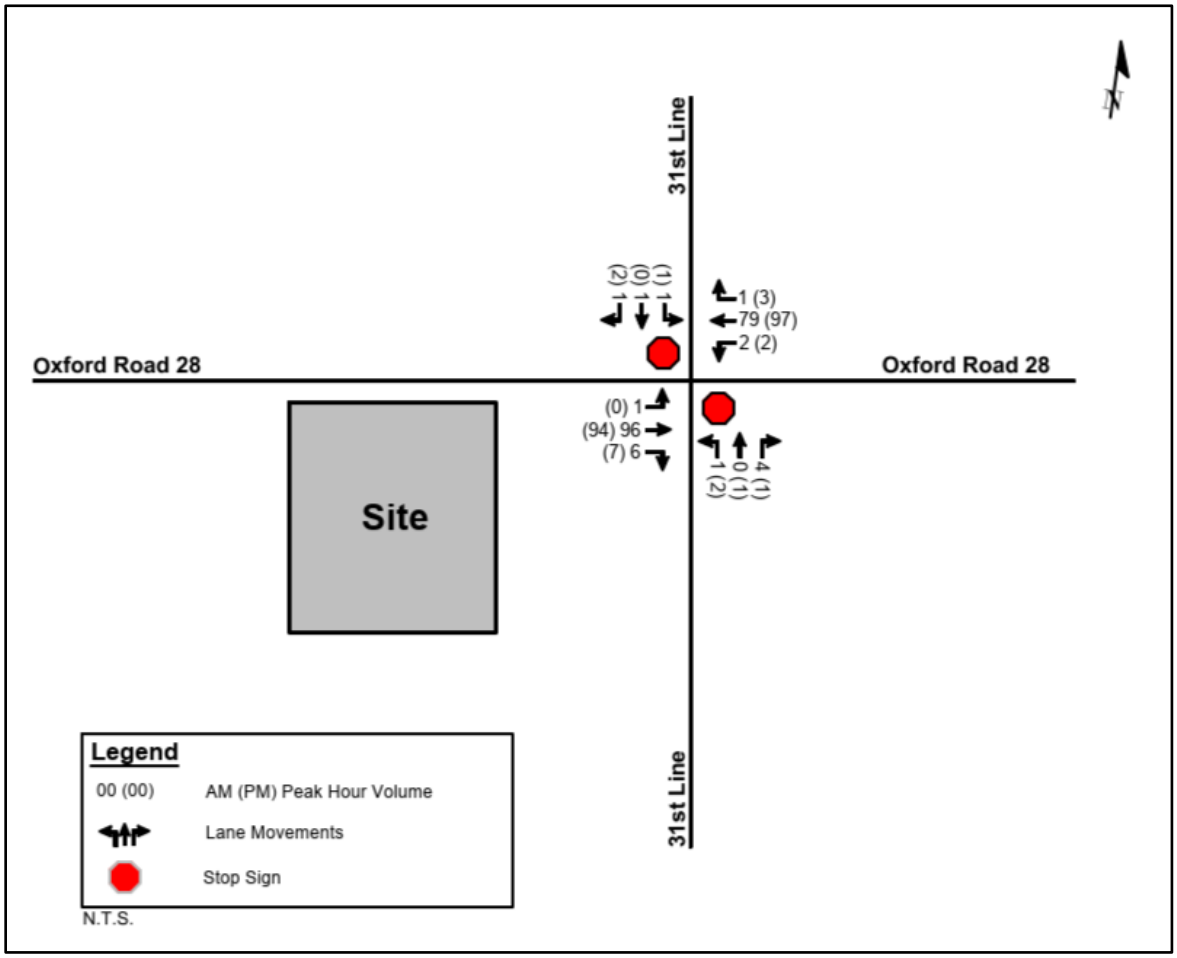
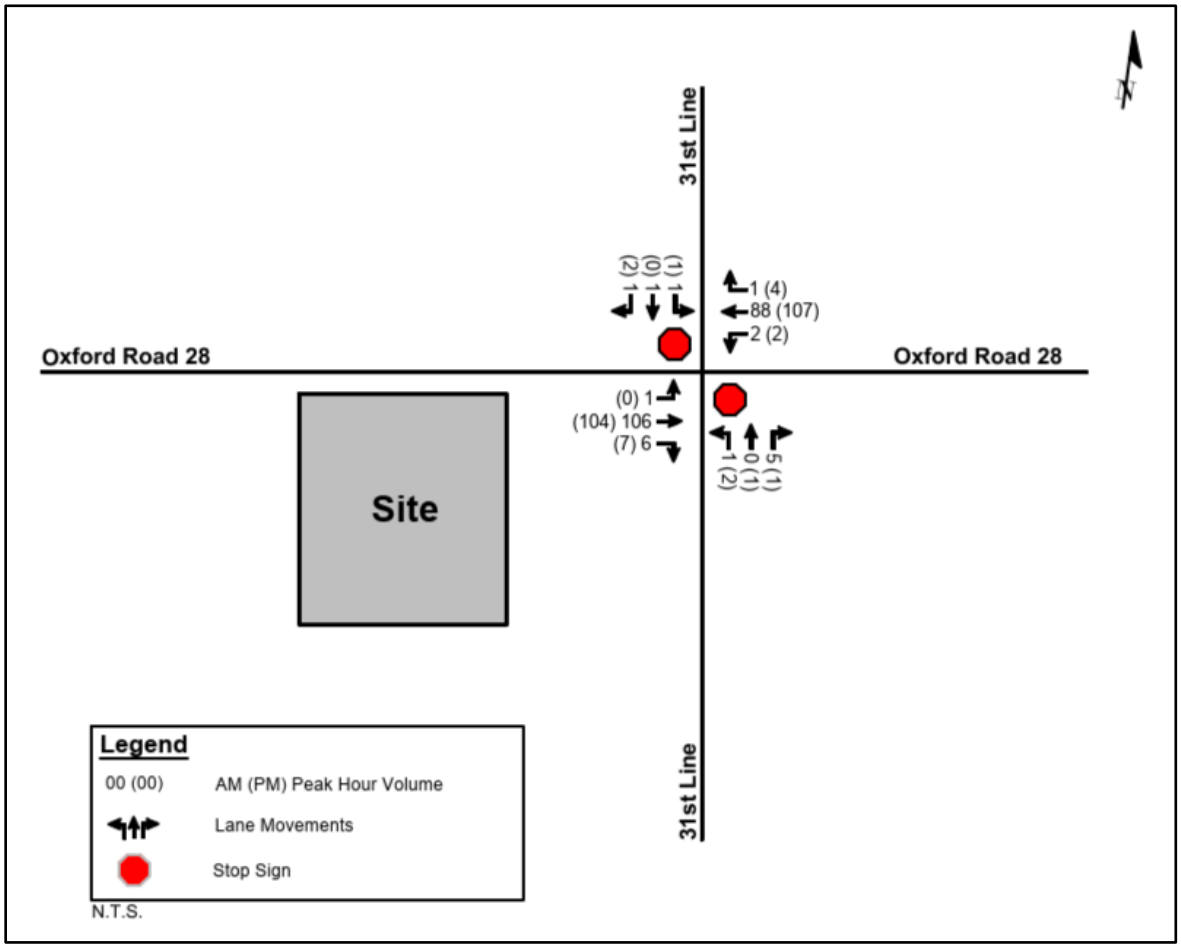


Figure 6: 2034 Background Traffic Volumes



4.0 Proposed Development

4.1 Site Plan and Driveway Access

The gravel extraction pit is proposed at Part Lot 30, Concession 1 in the Township of Zorra. According to the preliminary operational plan, the proposed gravel pit will consist of 22.5 extractable hectares with an annual extraction limit of 500,000 tonnes. The site is an open field utilized for agricultural purposes with an Agricultural Reserve classification in the Official Plan and an Open Space (OS) zoning in By-law No. 35-99. Figure 7 below illustrates the preliminary operational plan dated January 8, 2023.

Access to the gravel pit is proposed to be provided via a single access point from Oxford Road 28. The preliminary operational plan proposes that this access be located about 180 m to the west of 31st Line (centreline to centreline), which is the assumed location considered in the analysis in this TIS. However, the applicant has suggested that consideration may be given to locating this access further to the east (i.e., to about 130 m to the west of 31st Line), to minimize impacts on the existing houses on the opposite side of the road. Such a relocation also improves sight distances to the west.

The Terms of Reference (TOR) for this study was circulated to the County of Oxford and the Township of Zorra for comment prior to undertaking this assignment.

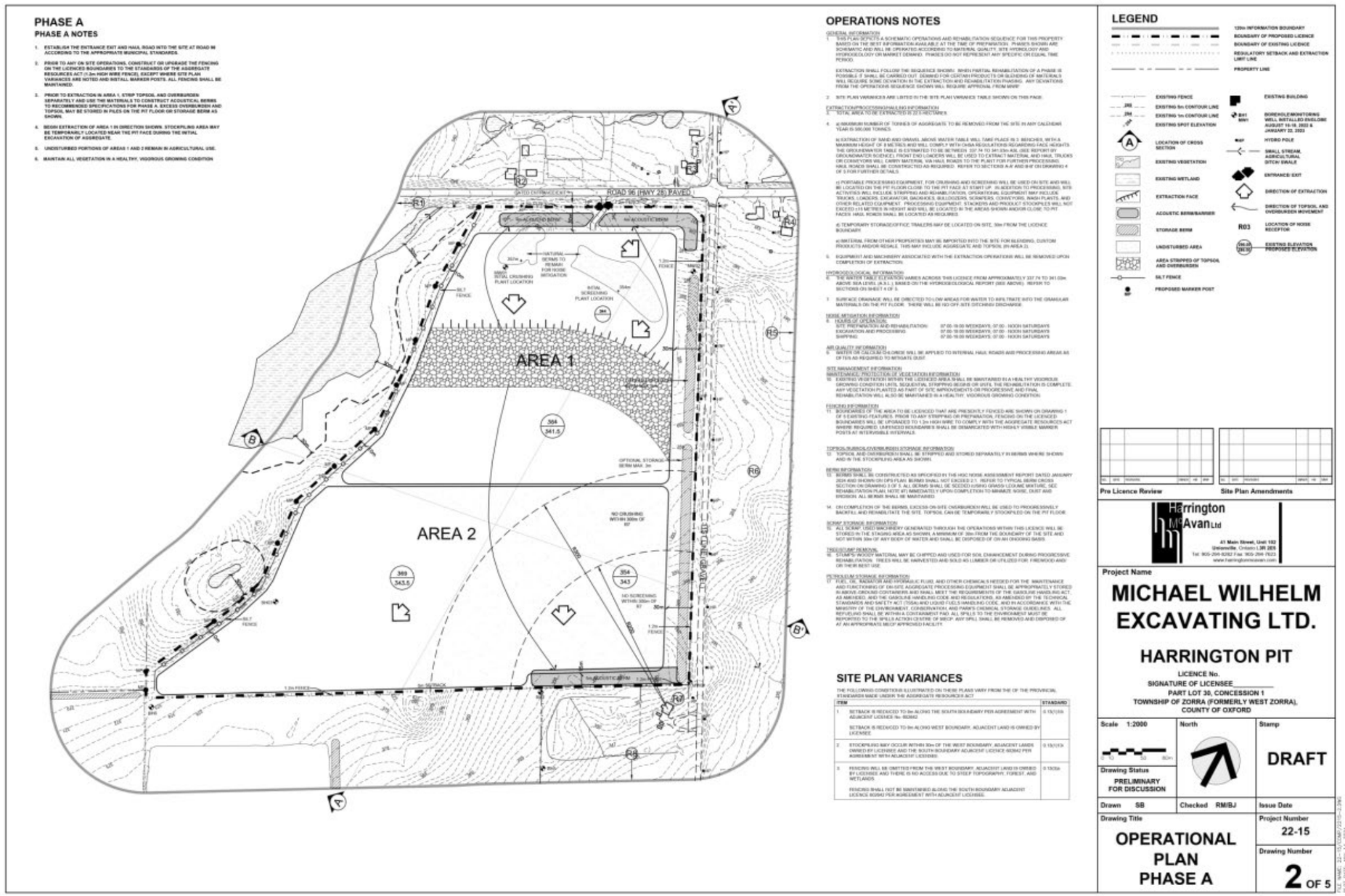
The Public Works Director for the Township indicated that access to the pit from 31st Line would not be allowed, due to the gravel surface, steep grades, and substandard vertical curves on this road. We concur that the existing 31st Line does not provide an acceptable haul route for traffic from the proposed gravel pit and that a direct access to Oxford Road 28, properly located and designed, should be considered as the preferred access.

The County's *Guidelines for Entrances to the County Road System – Tiered Access Control Standards ("Guideline") (November 2010)* indicates that direct access to County Roads is not allowed if access is available from a Township Road. However, if access to a Township Road is unavailable, then the County will require a business/engineering justification case to be provided for the consideration of the County's Director in granting approval for such access. This TIS provides an assessment of the traffic impacts of implementing direct access to the County Road for the subject gravel pit. Section four of the Oxford County Entrance Guidelines were reviewed for the requirements of entrance location. The criteria that apply to the proposed development are outlined below.

- Entrances will not be permitted with the sight triangle at any intersection. Sight triangles are defined as being 9 m x 9 m measured along the street line from the point of intersection of the street lines.
  - The proposed access location does not obscure the sight lines at the adjacent intersection.

- Entrances should not be located within 20 m (center to center) of another same-side entrance in areas outside Settlements with rural cross-sections.
  - There are no other accesses within 20 m of the proposed access on the south side of the road.
- The spacing of entrances to adjacent intersections should meet the TAC Guide, Figure 3.2.8.2 “Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections”. The spacing requirement is 170 m for an 80 km/h speed limit.
  - The proposed spacing from the intersection of Oxford Road 28 and 31st Line is approximately 180 m, which therefore exceeds the Minimum Corner Clearance criteria. However, it is noted that this corner clearance requirement relates to intersections that have traffic controls on the major road and therefore should not apply (i.e., the County Road 28 approaches are uncontrolled at the adjacent intersection).
- Where the minimum sight distance requirements, taken from the TAC Guide, Figure 2.3.3.4 “Sight Distance for Turning Movements from Stop”, are not met (minimum 300 m for a 90 km/hr design speed for an 80 km/hr speed limit). The TAC sight distance criteria allow vehicles to turn right or left from the access without being overtaken by a vehicle approaching the intersection and reducing speed from the design speed to a minimum of 85% of design speed.
  - The available sight distance at the proposed entrance is approximately 425 m for a right turn maneuver and over 450 m for a left turn maneuver, which satisfies the minimum 300 m requirement. See Section 7.0 of this report for the analysis of sight distances.

Figure 7: Proposed Operational Plan - Phase A



4.2 Trip Generation

Trips generated from the subject site were estimated based on proposed operational data obtained from the client. The operational data that was considered as part of the trip generation includes the following:

- Annual extraction limit of 500,000 tonnes
- Trucks expected to utilize the pit include triaxles (22 tonnes) and dump trailers (40 tonnes)
- 11 operating hours per day (7 a.m. to 6 p.m.)
- 265 operational days per year
- Peak period of May to October

It was confirmed with the client that the gravel pit will see most of the extracted gravel during the peak operating season of May to October. Therefore, for this study, it has been assumed that 75% of the annual extraction limit will occur in the peak season with the remaining 25% of the annual extraction occurring during the off-peak season.

A summary of the truck trip estimates, based on the worst-case scenario of meeting the annual extraction limit, is provided in Table 3.

Table 3: Proposed Trip Generation

Analysis Period	Tonnage Limit	Operating Days	Tonnage per Day	Average Tonnage per Load	Loads per Day	Loads per Hour
Peak Season	375,000	133	2,820	31	90.95	8.27 (i.e., 16 two-way trips per hour)
Off-peak Season	125,000	132	947	31	30.55	2.78 (i.e., 6 two-way trips per hour)

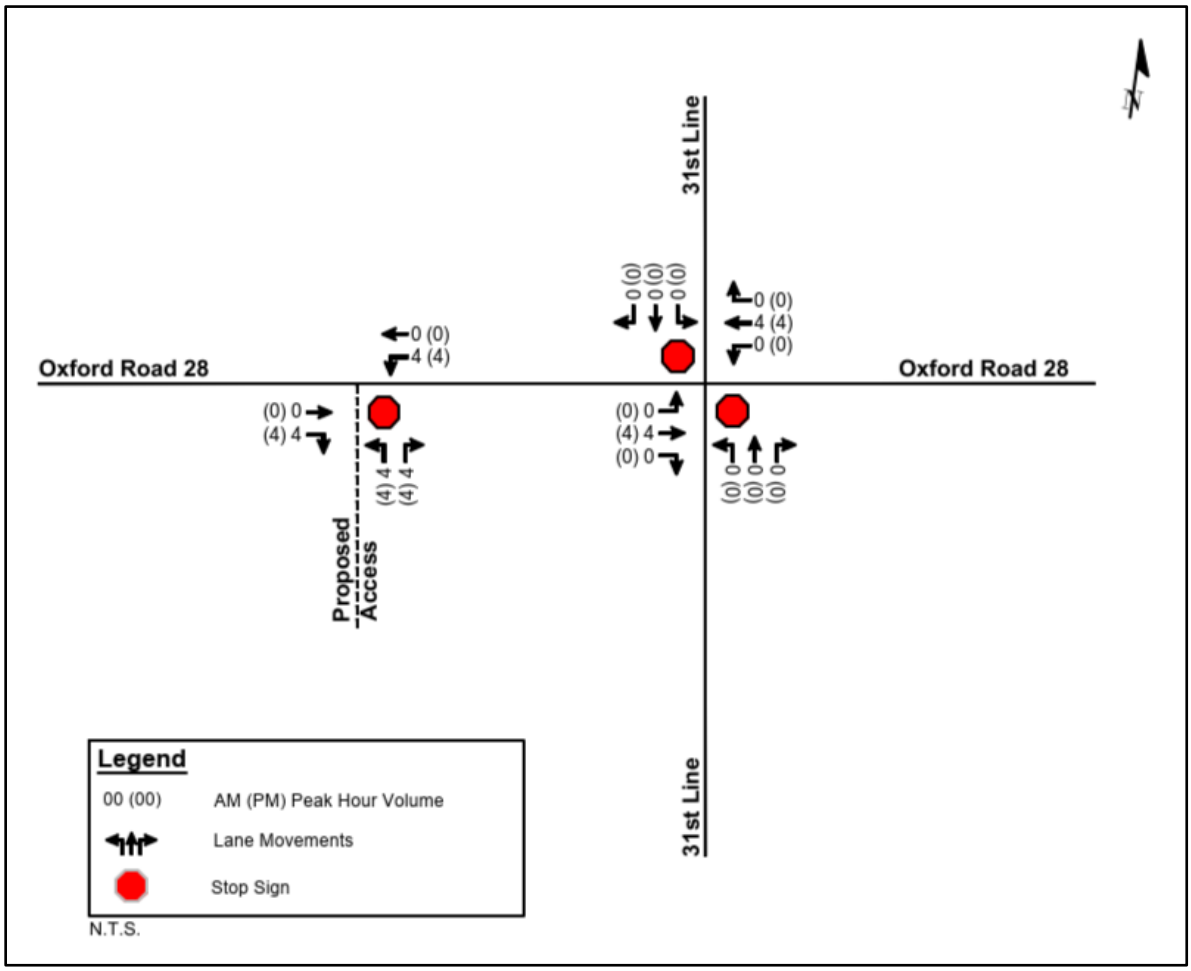
4.3 Trip Distribution & Assignment

Trip distribution and assignment were based on the expected origin and destination obtained from the client. Considering the anticipated market area for gravel from the proposed pit, the client indicated that approximately 80% of the loads will travel east on Oxford Road 28. However, based on the client's updated review of the market it is expected that only 50% of the proposed trips will travel east on Oxford Road 28. The estimated distribution of site trips is summarized in Table 4 and illustrated in Figure 8.

Table 4: Trip Distribution

To / From	Via	Distribution (%)
North	31st Line	0
South	31st Line	0
West	Road 96 (Oxford Road 28)	50
East	Road 96 (Oxford Road 28)	50
	Total	100

Figure 8: Site Traffic Volumes



5.0 Total Traffic Conditions

Total traffic volumes consist of background traffic volumes plus the addition of the proposed site trips. The resulting total traffic volumes are shown in Figure 9 for 2029 and Figure 10 for 2034.

Figure 9: 2029 Total Traffic Volumes

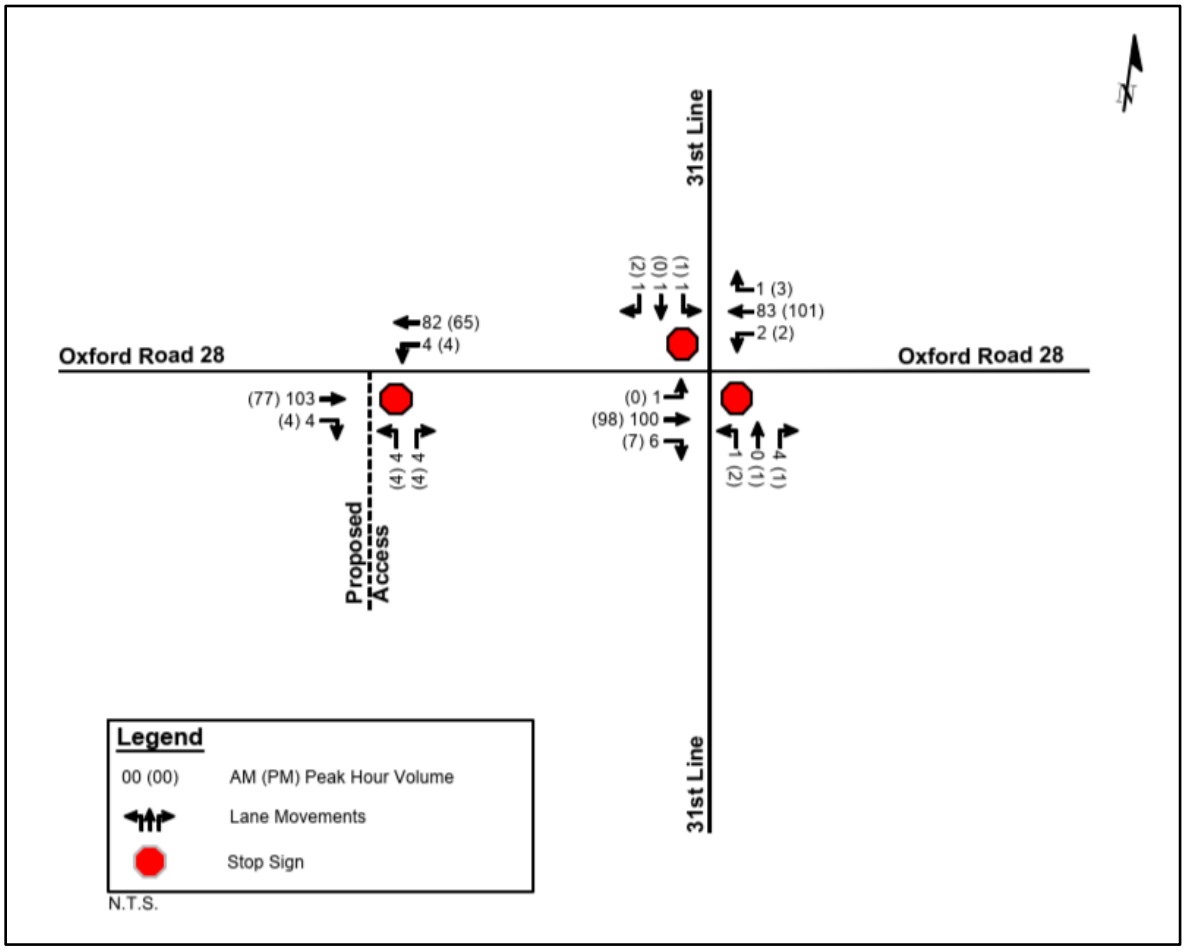
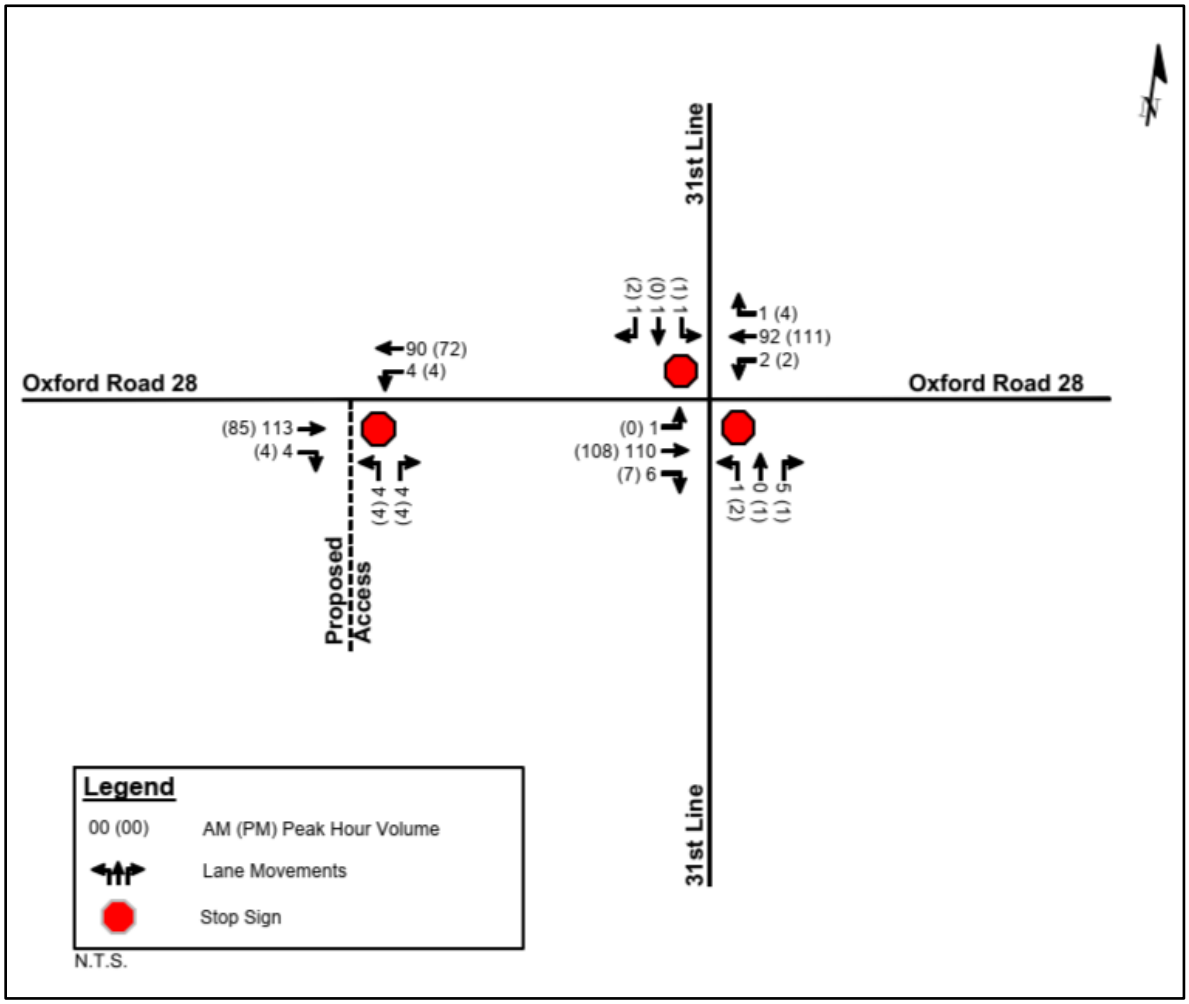


Figure 10: 2034 Total Traffic Volumes



6.0 Traffic Operations Analysis

Traffic operations analysis was conducted under existing, future background and future total conditions for the weekday a.m. and p.m. peak hours at all study intersections. Queueing was reviewed using Synchro's 95th percentile queue. Comparisons of the existing storage and projected queues are also summarized. Detailed Synchro reports for existing, future background and future total conditions are provided in Appendix B, C and D respectively.

6.1 Oxford Road 28 / 31st Line

Existing, future background and future total traffic operations of the Oxford Road 28 and 31st Line intersection is summarized in Table 5.

Table 5: Operational Analysis for Oxford Road 28 / 31st Line

Movement	Existing Storage / Link Distance (m)	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour		
		v/c	LOS (delay, sec.)	95th Queue (m)	v/c	LOS (delay, sec.)	95th Queue (m)
Existing Conditions (2024)							
EBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.2)	0.0	0.00	A (0.1)	0.0
NBLTR	100 +	0.01	A (9.2)	0.2	0.01	A (9.7)	0.1
SBLTR	100 +	0.00	A (9.9)	0.1	0.00	A (9.2)	0.1
Future Background Conditions (5-year horizon, 2029)							
EBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.2)	0.0	0.00	A (0.1)	0.0
NBLTR	100 +	0.01	A (9.3)	0.2	0.01	A (9.9)	0.1
SBLTR	100 +	0.00	B (10.0)	0.1	0.00	A (9.3)	0.1
Future Background Conditions (10-year horizon, 2034)							
EBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.1)	0.0
NBLTR	100 +	0.01	A (9.3)	0.2	0.01	B (10.0)	0.1
SBLTR	100 +	0.00	B (10.2)	0.1	0.00	A (9.4)	0.1
Future Total Conditions (5-year horizon, 2029)							
EBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.2)	0.0	0.00	A (0.1)	0.0
NBLTR	100 +	0.01	A (9.3)	0.2	0.01	A (9.9)	0.1
SBLTR	100 +	0.00	B (10.1)	0.1	0.00	A (9.3)	0.1

Movement	Existing Storage / Link Distance (m)	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour		
		v/c	LOS (delay, sec.)	95th Queue (m)	v/c	LOS (delay, sec.)	95th Queue (m)
Future Total Conditions (10-year horizon, 2034)							
EBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.1)	0.0	0.00	A (0.1)	0.1
NBLTR	100 +	0.01	A (9.4)	0.2	0.01	B (10.1)	0.1
SBLTR	100 +	0.00	B (10.3)	0.1	0.00	A (9.4)	0.1

Under existing, future background and future total conditions, all movements are forecast to operate with excess capacity at a LOS B or better and delays under 10.3 seconds. Existing queues and projected queues are forecasted to be within the available storage.

6.2 Oxford Road 28 / Site Driveway

Future total traffic operations of the proposed access are summarized in Table 6.

Table 6: Operational Analysis for Oxford Road 28 / Proposed Access

Movement	Existing Storage / Link Distance (m)	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour		
		v/c	LOS (delay, sec.)	95th Queue (m)	v/c	LOS (delay, sec.)	95th Queue (m)
Future Total Conditions (5-year horizon, 2029)							
EBLTR	100 +	0.07	A (0.0)	0.0	0.05	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.3)	0.2	0.00	A (0.5)	0.1
NBLTR	20 +	0.01	A (9.3)	0.3	0.01	B (10.2)	0.3
Future Total Conditions (10-year horizon, 2034)							
EBLTR	100 +	0.07	A (0.0)	0.0	0.06	A (0.0)	0.0
WBLTR	100 +	0.00	A (0.4)	0.1	0.00	A (0.4)	0.1
NBLTR	20 +	0.01	B (10.7)	0.3	0.01	B (10.3)	0.3

Under future total conditions, all movements at the intersection of Oxford Road 28 and the proposed access are forecast to operate with excess capacity with a LOS B or better and delays under 10.7 seconds. Projected queues are and will be within the proposed storage.

7.0 Geometric Conditions

7.1 Sightlines

7.1.1 Intersection Sight Distance

Considering that the proposed access will generate large trucks entering onto Oxford Road 28, a review of intersection sight distances (ISD) has been completed. The ISD requirements have been based on TAC's *Geometric Design Guide for Canadian Roads (June 2017) (GDGCR),* resulting in the following recommendations:

- Left turn from a stop (looking east) – 13.8 second time gap for a combination truck (WB 19 and WB 20), with adjustment of acceleration time for 2% upgrade – 100 km/h design speed – 320 m ISD.
- Crossing maneuver from a stop (looking west) – 12.6 second time gap for a combination truck (WB 19 and WB 20), with adjustment of acceleration time for 2% upgrade – 100 km/h design speed – 350 m ISD.
- Right turn from a stop (looking west) – 9.45 second time gap for a combination truck (WB 19 and WB 20), with adjustment of acceleration time for 2% downgrade – 100 km/h design speed – 265 m ISD.

The available ISD at the proposed site access has been determined from available GIS data, is shown in Appendix G and summarized as follows:

- Looking east – ISD greater than 450 m
- Looking west – 425 m ISD

The available ISDs are based on a truck driver's eye of 1.8 m and an object height of 1.08 m. These criteria are considered to be conservative since the driver's eye for large trucks is typically 2.3 m and the top of cars being viewed is typically 1.33 m (TAC GDGCR, June 2017). The ISD allows trucks exiting the site to choose appropriate gaps to enter Oxford Road 28, while most drivers on the County Road should not need to reduce speed to less than 85% of their initial speed.

It is noted that the County's entrance guideline only requires 300 m sight distance and therefore this requirement is also met by available sight distances at the access. However, the County's criteria are based on the 1999 TAC criteria, without adjustment for vehicle type and road grades.

7.1.2 Stopping Sight Distance and Decision Sight Distance

Proposed entrances to Oxford County roads should meet Stopping Sight Distances (SSD) and Decision Sight Distances (DSD) for vehicles travelling along Oxford Road 28. The minimum ISD set out in the *Guidelines for Entrances for the County Road System – Tiered Access Control (By-law 5222-2010) generally meet the DSD requirements,*

although the point of reference, eye height and object height are different. The DSD allows for speed/path/direction change on rural roadways to avoid collisions at accesses. The DSD is significantly more conservative than the SSD, with the required SSD being 170 m for a 95 km/h design speed, based on an 80 km/h posted speed, and the required DSD being 300 m at these speeds.

The available DSD at the proposed site access has been determined from available GIS data, is shown in Appendix G and summarized as follows:

- Westbound traffic – DSD greater than 450 m
- Eastbound traffic – 425 m DSD

The DSDs are based on driver eye height of 1.05 m and object height of 0.38 m (i.e., taillight).

Based on the above analysis, it is concluded that the available sight distance at the proposed site access location significantly exceeds the required SSD and DSD.

7.1.3 Sight Triangles

As noted previously the proposed access location will not impact the sight lines and sight triangles from adjacent intersections. It is also recommended that approach sight triangles be provided at the proposed site access, to maintain an area free of obstructions that might block an approaching driver's view of potentially conflicting vehicles. It is suggested that 9 m x 9 m sight triangles be provided, as defined in the County's Entrance Guideline.

7.2 Turn Lane Considerations

Right Turn Tapers

From a traffic volume perspective, a right turn taper is not required to accommodate the minimal right turn volumes at the site access (i.e., 2 vph). However, the provision of a right turn taper or a fully paved shoulder on the approach to the access may be considered, to facilitate truck turning movements and minimize shoulder maintenance. *MTOD 305.070 Communal Entrance Truck/Resource Access* may be considered to implement a 75 m taper at the proposed access. Expansion of paved shoulders on Oxford Road 28, to accommodate a planned future cycling facility, will also assist turning movements at the proposed access.

Left Turn Lanes

The warrants for a left turn lane at the site access have been reviewed based on nomographs provided in the *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, April 2020 (Ministry of Transportation of Ontario).* Since the left turn

warrant nomographs are based on car traffic, the left turn truck volumes have been converted to equivalent cars, using a factor of 2.0. The warrant analysis is shown in Appendix H and the results are summarized in Table 7.

Table 7: Left Turn Warrant Analysis – Oxford Road 28 at Site Access

Movement	Peak Period	Advancing Volume (vph)	Opposing Volume (vph)	Left Turn Volume (vph)	Left Turn Storage Warrant
2029 Future Total WB Left	a.m.	86	107	8	Not Required
	p.m.	69	81	8	Not Required
2034 Future Total WB Left	a.m.	94	117	8	Not Required
	p.m.	76	89	8	Not Required

Based on the above analysis, it is concluded that a left turn lane is not warranted at the Oxford Road 28 / Site access intersection under 2029 and 2034 total traffic conditions.

7.3 Haul Route

The proposed development is forecasted to generate peak traffic of eight trucks in and eight trucks out during the peak periods. Oxford Road 28 will provide the haul route for traffic from the pit, with this traffic being evenly split to/from the east and west. The preferred access from the pit to the County Road is via direct access, rather than through the Township local road, considering the unsuitable conditions along the Township Road. The analysis provided in this study has confirmed that safe direct access can be provided for trucks entering/exiting Oxford Road 28, with relatively minimal impact to the traffic on this road. Oxford Road 28 (Road 96) is a County Road that is designed to arterial road standards, to accommodate the traffic volumes and traffic types forecasted. However, to further enhance traffic safety in this area, the following measures may be considered:

- It is recommended that Truck Entrance signage (i.e., Wc-108L, Wc-108R and Wc-8t) be placed on Oxford Road 28 in proximity to the site access. Signage placement should meet the requirements of Book 6 of the Ontario Traffic Manual.
- Consideration may be made to implementing a right turn taper at the proposed access, as per standard MTOD 305.070 – Commercial Entrance Truck/Resource Access.
- Approach sight triangles should be provided at the proposed access to maintain visibility between traffic approaching the access intersection.

8.0 Conclusions and Recommendations

Based on the analysis in this study, the main conclusions and recommendations are as follows:

- The property owner (Wilhelm Excavating Limited) is seeking approval to operate a gravel pit to extract up to 500,000 tonnes of granular per year. The haul route for gravel will be east and west along Oxford Road 28.
- Oxford County has plans to widen the paved shoulders along Oxford Road 28 between Oxford Road 6 and Oxford Road 109, to provide a cycling facility. The proposed timeline for implementation of this cycling facility is 2029 – 2033. There are no other known or planned improvements within the study area by the 2034 study horizon year.
- Considering that an access to 31st Line is not achievable, consideration of direct access to the County Road is recommended.
- The operational plan for the gravel pit proposes that the access to Oxford Road 28 to be located about 180 m west of the intersection of Oxford Road 28 / 31st Line, which meets the County's entrance spacing requirements. Consideration of relocating the access further to the east may be made to maximize the separation from houses located on the north side of Oxford Road 28 and to improve the sight distances to the west.
- A review of the truck volumes was conducted for the trips traveling through Harrington (i.e., southbound left turns, northbound right turns, eastbound through, and all west bound movements). The February 2024 counts had 16 a.m. truck trips and 21 p.m. truck trips for a total of 37 during the combined peak hours. Similarly, the October counts had 26 a.m. truck trips and 14 p.m. truck trips for a total of 40 during the combined peak hours. Therefore, it is concluded that based on reviewing the existing counts collected in February and October 2024, there was only a difference of three truck trips travelling through Harrington during the combined peak hours.It is forecasted that the gravel pit will generate approximately eight truck trips (total two-way) through Harrington at peak hours in the peak season.
- Oxford Road 28 (Road 96) is a County Road that is designed to arterial road standards, to accommodate the traffic volumes and traffic types forecasted.
- Considering the anticipated market area for gravel from the proposed pit, the client has indicated that approximately 50% of the loads will travel east on Oxford Road 28.
- Under existing, future background and future total conditions, all movements at the intersection of Oxford Road 28 and 31st Line are forecast to operate with excess capacity at a LOS B or better and delays under 10.3 seconds. Existing queues and projected queues are forecasted to be within the available storage.
- Under future total conditions, all movements at the intersection of Oxford Road 28 and the proposed access are forecast to operate with excess capacity at a LOS B or better and delays under 10.7 seconds. Projected queues are, and will be, within the proposed storage.

- The sight distances available at the proposed access onto Oxford Road 28 meet the requirements set out in Oxford County's Entrance Guidelines and set out in the *Geometric Design Guide for Canadian Roads (Transportation Association of Canada, June 2017).*
- It is recommended that Truck Entrance signage be placed on Oxford Road 28 warning motorists of the gravel pit access.
- The traffic operations at the proposed access onto Oxford Road 28 are expected to have minimal impact on the existing traffic on this road.
- It is recommended that sight triangles be provided at the proposed site access to maintain visibility between vehicles approaching the intersection.
- It is recommended that an eastbound right turn taper (standard MTOD 305.070 – Commercial Entrance Truck / Resource Access) be considered at the proposed access to minimize shoulder maintenance and improve conditions for truck turning movements.
- Left turn lanes are not required on Oxford Road 28 at the proposed access.

In conclusion this study has provided the technical justification to support the implementation of an access to Oxford Road 28 for the proposed gravel pit.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Existing Traffic Counts

Ontario Traffic Inc.
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Peak Hour Diagram

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

Intersection: Rd 96 (Oxford Rd 28) & 31st Line
Site Code: 2406600001
Count Date: Feb 21, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Rd 96 (Oxford Rd 28) runs E/W

North Approach

	Out	In	Total
Cars	1	6	7
Trucks	0	1	1
Bicycles	0	0	0
	1	**7**	**8**

31st Line

Bicycles	0	0	0	0
Trucks	0	0	0	0
Cars	0	0	1	0
Totals	**0**	**0**	**1**	**0**

East Approach

	Out	In	Total
Cars	52	62	114
Trucks	7	9	16
Bicycles	0	0	0
	59	**71**	**130**

Rd 96 (Oxford Rd 28)

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	0	1	**1**
0	9	61	**70**
0	0	2	**2**

Peds: 0

Peds: 0

Peds: 0

Rd 96 (Oxford Rd 28)

Totals	Cars	Trucks	Bicycles
0	0	0	0
2	1	1	0
55	49	6	0
2	2	0	0

West Approach

	Out	In	Total
Cars	64	50	114
Trucks	9	6	15
Bicycles	0	0	0
	73	**56**	**129**

31st Line

Totals	**1**	**4**	**0**	**0**
Cars	1	4	0	0
Trucks	0	0	0	0
Bicycles	0	0	0	0

South Approach

	Out	In	Total
Cars	5	4	9
Trucks	0	0	0
Bicycles	0	0	0
	5	**4**	**9**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Rd 96 (Oxford Rd 28) & 31st Line
Site Code: 2406600001
Count Date: Feb 21, 2024
Period: 07:00 - 09:00

Peak Hour Data (07:00 - 08:00)

Start Time	North Approach 31st Line						South Approach 31st Line						East Approach Rd 96 (Oxford Rd 28)						West Approach Rd 96 (Oxford Rd 28)						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
07:00	0	0	0	0	0	0	0	1	0	0	0	1	0	9	0	0	0	9	1	14	1	0	0	16	26
07:15	0	0	0	0	0	0	0	0	0	0	0	0	1	14	1	0	0	16	0	18	0	0	0	18	34
07:30	1	0	0	0	0	1	1	2	0	0	0	3	0	23	1	0	0	24	0	26	0	0	0	26	54
07:45	0	0	0	0	0	0	0	1	0	0	0	1	1	9	0	0	0	10	0	12	1	0	0	13	24
Grand Total	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**4**	**0**	**0**	**0**	**5**	**2**	**55**	**2**	**0**	**0**	**59**	**1**	**70**	**2**	**0**	**0**	**73**	**138**
Approach %	100	0	0	0		-	20	80	0	0		-	3.4	93.2	3.4	0		-	1.4	95.9	2.7	0		-	
Totals %	0.7	0	0	0		0.7	0.7	2.9	0	0		3.6	1.4	39.9	1.4	0		42.8	0.7	50.7	1.4	0		52.9	
PHF	**0.25**	**0**	**0**	**0**		**0.25**	**0.25**	**0.5**	**0**	**0**		**0.42**	**0.5**	**0.6**	**0.5**	**0**		**0.61**	**0.25**	**0.67**	**0.5**	**0**		**0.7**	**0.64**
Cars	1	0	0	0		1	1	4	0	0		5	2	49	1	0		52	1	61	2	0		64	122
% Cars	100	0	0	0		100	100	100	0	0		100	100	89.1	50	0		88.1	100	87.1	100	0		87.7	88.4
Trucks	0	0	0	0		0	0	0	0	0		0	0	6	1	0		7	0	9	0	0		9	16
% Trucks	0	0	0	0		0	0	0	0	0		0	0	10.9	50	0		11.9	0	12.9	0	0		12.3	11.6
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:15:00
To: 16:15:00

Intersection: Rd 96 (Oxford Rd 28) & 31st Line
Site Code: 2406600001
Count Date: Feb 21, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Rd 96 (Oxford Rd 28) runs E/W

North Approach

	Out	In	Total
Cars	9	3	12
Trucks	0	2	2
Bicycles	0	0	0
	9	**5**	**14**

31st Line

Bicycles	0	0	0	0
Trucks	0	0	0	0
Cars	1	5	3	0
Totals	**1**	**5**	**3**	**0**

East Approach

	Out	In	Total
Cars	54	68	122
Trucks	9	12	21
Bicycles	0	0	0
	63	**80**	**143**

Rd 96 (Oxford Rd 28)

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	1	0	**1**
0	10	58	**68**
0	0	1	**1**

Peds: 0

Peds: 0

Peds: 0

Rd 96 (Oxford Rd 28)

Totals	Cars	Trucks	Bicycles
0	0	0	0
2	1	1	0
55	47	8	0
6	6	0	0

West Approach

	Out	In	Total
Cars	59	51	110
Trucks	11	8	19
Bicycles	0	0	0
	70	**59**	**129**

31st Line

Totals	**3**	**2**	**9**	**0**
Cars	3	2	7	0
Trucks	0	0	2	0
Bicycles	0	0	0	0

South Approach

	Out	In	Total
Cars	12	12	24
Trucks	2	0	2
Bicycles	0	0	0
	14	**12**	**26**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
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Peak Hour Summary

Intersection: Rd 96 (Oxford Rd 28) & 31st Line
Site Code: 2406600001
Count Date: Feb 21, 2024
Period: 15:00 - 18:00

Peak Hour Data (15:15 - 16:15)

Start Time	North Approach 31st Line						South Approach 31st Line						East Approach Rd 96 (Oxford Rd 28)						West Approach Rd 96 (Oxford Rd 28)						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
15:15	0	3	0	0	0	3	1	2	2	0	0	5	4	14	1	0	0	19	0	10	0	0	0	10	37
15:30	1	1	0	0	0	2	0	0	5	0	0	5	0	16	0	0	0	16	1	22	1	0	0	24	47
15:45	1	0	0	0	0	1	0	0	2	0	0	2	2	11	1	0	0	14	0	19	0	0	0	19	36
16:00	1	1	1	0	0	3	2	0	0	0	0	2	0	14	0	0	0	14	0	17	0	0	0	17	36
Grand Total	**3**	**5**	**1**	**0**	**0**	**9**	**3**	**2**	**9**	**0**	**0**	**14**	**6**	**55**	**2**	**0**	**0**	**63**	**1**	**68**	**1**	**0**	**0**	**70**	**156**
Approach %	33.3	55.6	11.1	0		-	21.4	14.3	64.3	0		-	9.5	87.3	3.2	0		-	1.4	97.1	1.4	0		-	
Totals %	1.9	3.2	0.6	0		5.8	1.9	1.3	5.8	0		9	3.8	35.3	1.3	0		40.4	0.6	43.6	0.6	0		44.9	
PHF	**0.75**	**0.42**	**0.25**	**0**		**0.75**	**0.38**	**0.25**	**0.45**	**0**		**0.7**	**0.38**	**0.86**	**0.5**	**0**		**0.83**	**0.25**	**0.77**	**0.25**	**0**		**0.73**	**0.83**
Cars	3	5	1	0		9	3	2	7	0		12	6	47	1	0		54	0	58	1	0		59	134
% Cars	100	100	100	0		100	100	100	77.8	0		85.7	100	85.5	50	0		85.7	0	85.3	100	0		84.3	85.9
Trucks	0	0	0	0		0	0	0	2	0		2	0	8	1	0		9	1	10	0	0		11	22
% Trucks	0	0	0	0		0	0	0	22.2	0		14.3	0	14.5	50	0		14.3	100	14.7	0	0		15.7	14.1
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

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Specified Period		One Hour Peak	
From:	07:00:00	From:	07:15:00
To:	09:00:00	To:	08:15:00

Intersection: Road 96 (Oxford Rd 28) & 31st Line
Site Code: 2446200001
Count Date: Oct 29, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Road 96 (Oxford Rd 28) runs E/W

North Approach

	Out	In	Total
Cars	2	0	2
Trucks	1	2	3
Bicycles	0	0	0
	3	**2**	**5**

31st Line

Bicycles	0	0	0	0
Trucks	1	0	0	0
Cars	0	1	1	0
Totals	**1**	**1**	**1**	**0**

East Approach

	Out	In	Total
Cars	62	79	141
Trucks	13	13	26
Bicycles	0	0	0
	75	**92**	**167**

Peds: 0

Road 96 (Oxford Rd 28)

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	1	0	**1**
0	12	75	**87**
0	4	1	**5**

Peds: 0

Peds: 0

Road 96 (Oxford Rd 28)

Totals	Cars	Trucks	Bicycles
0	0	0	0
1	0	1	0
72	60	12	0
2	2	0	0

Peds: 0

West Approach

	Out	In	Total
Cars	76	61	137
Trucks	17	13	30
Bicycles	0	0	0
	93	**74**	**167**

Totals	**1**	**0**	**4**	**0**
Cars	1	0	3	0
Trucks	0	0	1	0
Bicycles	0	0	0	0

31st Line

South Approach

	Out	In	Total
Cars	4	4	8
Trucks	1	4	5
Bicycles	0	0	0
	5	**8**	**13**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
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Peak Hour Summary

Intersection: Road 96 (Oxford Rd 28) & 31st Line
Site Code: 2446200001
Count Date: Oct 29, 2024
Period: 07:00 - 09:00

Peak Hour Data (07:15 - 08:15)

Start Time	North Approach 31st Line						South Approach 31st Line						East Approach Road 96 (Oxford Rd 28)						West Approach Road 96 (Oxford Rd 28)						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	20	0	20	0	0	0	20	40
07:30	1	1	0	0	0	2	0	0	0	0	0	0	0	17	0	0	0	17	1	17	1	0	0	19	38
07:45	0	0	1	0	0	1	1	0	1	0	0	2	0	18	1	0	0	19	0	21	2	0	0	23	45
08:00	0	0	0	0	0	0	0	0	3	0	0	3	2	17	0	0	0	19	0	29	2	0	0	31	53
Grand Total	**1**	**1**	**1**	**0**	**0**	**3**	**1**	**0**	**4**	**0**	**0**	**5**	**2**	**72**	**1**	**0**	**0**	**75**	**1**	**87**	**5**	**0**	**0**	**93**	**176**
Approach %	33.3	33.3	33.3	0		-	20	0	80	0		-	2.7	96	1.3	0		-	1.1	93.5	5.4	0		-	
Totals %	0.6	0.6	0.6	0		1.7	0.6	0	2.3	0		2.8	1.1	40.9	0.6	0		42.6	0.6	49.4	2.8	0		52.8	
PHF	**0.25**	**0.25**	**0.25**	**0**		**0.38**	**0.25**	**0**	**0.33**	**0**		**0.42**	**0.25**	**0.9**	**0.25**	**0**		**0.94**	**0.25**	**0.75**	**0.63**	**0**		**0.75**	**0.83**
Cars	1	1	0	0		2	1	0	3	0		4	2	60	0	0		62	0	75	1	0		76	144
% Cars	100	100	0	0		66.7	100	0	75	0		80	100	83.3	0	0		82.7	0	86.2	20	0		81.7	81.8
Trucks	0	0	1	0		1	0	0	1	0		1	0	12	1	0		13	1	12	4	0		17	32
% Trucks	0	0	100	0		33.3	0	0	25	0		20	0	16.7	100	0		17.3	100	13.8	80	0		18.3	18.2
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Intersection: Road 96 (Oxford Rd 28) & 31st Line
Site Code: 2446200001
Count Date: Oct 29, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Road 96 (Oxford Rd 28) runs E/W

North Approach

	Out	In	Total
Cars	3	4	7
Trucks	0	0	0
Bicycles	0	0	0
	3	**4**	**7**

31st Line

Bicycles	0	0	0	0
Trucks	0	0	0	0
Cars	2	0	1	0
Totals	**2**	**0**	**1**	**0**

East Approach

	Out	In	Total
Cars	88	78	166
Trucks	5	9	14
Bicycles	0	0	0
	93	**87**	**180**

Road 96 (Oxford Rd 28)

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	0	0	**0**
0	9	76	**85**
0	1	5	**6**

Peds: 1

Peds: 0

Peds: 0

Peds: 0

Road 96 (Oxford Rd 28)

Totals	Cars	Trucks	Bicycles
0	0	0	0
3	3	0	0
88	83	5	0
2	2	0	0

West Approach

	Out	In	Total
Cars	81	87	168
Trucks	10	5	15
Bicycles	0	0	0
	91	**92**	**183**

31st Line

Totals	**2**	**1**	**1**	**0**
Cars	2	1	1	0
Trucks	0	0	0	0
Bicycles	0	0	0	0

South Approach

	Out	In	Total
Cars	4	7	11
Trucks	0	1	1
Bicycles	0	0	0
	4	**8**	**12**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Road 96 (Oxford Rd 28) & 31st Line
Site Code: 2446200001
Count Date: Oct 29, 2024
Period: 15:00 - 18:00

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

Start Time	North Approach 31st Line						South Approach 31st Line						East Approach Road 96 (Oxford Rd 28)						West Approach Road 96 (Oxford Rd 28)						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
16:30	1	0	1	0	0	2	0	0	0	0	0	0	1	20	1	0	0	22	0	20	0	0	0	20	44
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	17	2	0	0	19	0	16	4	0	0	20	39
17:00	0	0	0	0	1	0	2	1	0	0	0	3	1	27	0	0	0	28	0	25	2	0	0	27	58
17:15	0	0	1	0	0	1	0	0	1	0	0	1	0	24	0	0	0	24	0	24	0	0	0	24	50
Grand Total	**1**	**0**	**2**	**0**	**1**	**3**	**2**	**1**	**1**	**0**	**0**	**4**	**2**	**88**	**3**	**0**	**0**	**93**	**0**	**85**	**6**	**0**	**0**	**91**	**191**
Approach %	33.3	0	66.7	0		-	50	25	25	0		-	2.2	94.6	3.2	0		-	0	93.4	6.6	0		-	
Totals %	0.5	0	1	0		1.6	1	0.5	0.5	0		2.1	1	46.1	1.6	0		48.7	0	44.5	3.1	0		47.6	
PHF	**0.25**	**0**	**0.5**	**0**		**0.38**	**0.25**	**0.25**	**0.25**	**0**		**0.33**	**0.5**	**0.81**	**0.38**	**0**		**0.83**	**0**	**0.85**	**0.38**	**0**		**0.84**	**0.82**
Cars	1	0	2	0		3	2	1	1	0		4	2	83	3	0		88	0	76	5	0		81	176
% Cars	100	0	100	0		100	100	100	100	0		100	100	94.3	100	0		94.6	0	89.4	83.3	0		89	92.1
Trucks	0	0	0	0		0	0	0	0	0		0	0	5	0	0		5	0	9	1	0		10	15
% Trucks	0	0	0	0		0	0	0	0	0		0	0	5.7	0	0		5.4	0	10.6	16.7	0		11	7.9
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					1	-					0	-					0	-					0	-	1
% Peds					100	-					0	-					0	-					0	-	

BURNSIDE

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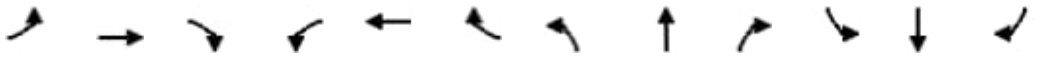
Appendix B

Existing Conditions Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	87	5	2	72	1	1	0	4	1	1	1
Future Volume (Veh/h)	1	87	5	2	72	1	1	0	4	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	105	6	2	87	1	1	0	5	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	88			111			203	202	108	207	205	88
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			111			203	202	108	207	205	88
tC, single (s)	5.1			4.1			7.1	6.5	6.4	7.1	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.2			3.5	4.0	3.5	3.5	4.0	4.2
p0 queue free %	100			100			100	100	99	100	100	100
cM capacity (veh/h)	1065			1492			756	696	887	750	694	757

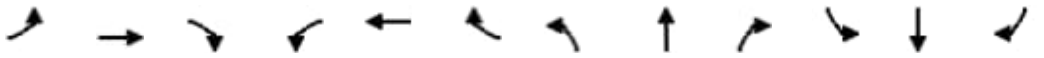
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	112	90	6	3
Volume Left	1	2	1	1
Volume Right	6	1	5	1
cSH	1065	1492	862	732
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s/veh)	0.1	0.2	9.2	9.9
Lane LOS	A	A	A	A
Approach Delay (s/veh)	0.1	0.2	9.2	9.9
Approach LOS			A	A

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	15.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	93	0	0	74	0	0
Future Volume (Veh/h)	93	0	0	74	0	0
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)	101	0	0	80	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			101		181	101
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			101		181	101
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		100	100
cM capacity (veh/h)			1504		813	960

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	101	80	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1504	1700
Volume to Capacity	0.06	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	8.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	85	6	2	88	3	2	1	1	1	0	2
Future Volume (Veh/h)	0	85	6	2	88	3	2	1	1	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	104	7	2	107	4	2	1	1	1	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	111			111			223	223	108	222	224	109
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	111			111			223	223	108	222	224	109
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	100	100	100
cM capacity (veh/h)	1492			1492			735	679	952	736	678	950

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	111	113	4	3
Volume Left	0	2	2	1
Volume Right	7	4	1	2
cSH	1492	1492	763	866
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.1	0.1
Control Delay (s/veh)	0.0	0.1	9.7	9.2
Lane LOS		A	A	A
Approach Delay (s/veh)	0.0	0.1	9.7	9.2
Approach LOS			A	A

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	16.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	70	0	0	59	0	0
Future Volume (Veh/h)	70	0	0	59	0	0
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)	76	0	0	64	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			76		140	76
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			76		140	76
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		100	100
cM capacity (veh/h)			1536		858	991

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	76	64	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1536	1700
Volume to Capacity	0.04	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.0%	ICU Level of Service	A
Analysis Period (min)	15		

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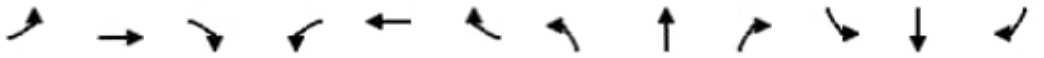
Appendix C

2029 Background Conditions Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	96	6	2	79	1	1	0	4	1	1	1
Future Volume (Veh/h)	1	96	6	2	79	1	1	0	4	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	116	7	2	95	1	1	0	5	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96			123			223	222	120	226	225	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96			123			223	222	120	226	225	96
tC, single (s)	5.1			4.1			7.1	6.5	6.4	7.1	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.2			3.5	4.0	3.5	3.5	4.0	4.2
p0 queue free %	100			100			100	100	99	100	100	100
cM capacity (veh/h)	1056			1477			734	679	874	728	676	748

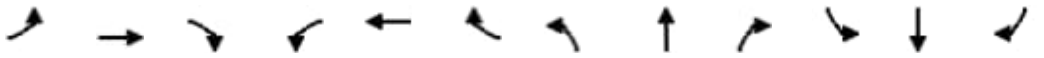
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	124	98	6	3
Volume Left	1	2	1	1
Volume Right	7	1	5	1
cSH	1056	1477	847	716
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s/veh)	0.1	0.2	9.3	10.0
Lane LOS	A	A	A	B
Approach Delay (s/veh)	0.1	0.2	9.3	10.0
Approach LOS			A	B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	15.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	103	0	0	82	0	0
Future Volume (Veh/h)	103	0	0	82	0	0
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)	112	0	0	89	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			112		201	112
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			112		201	112
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		100	100
cM capacity (veh/h)			1490		792	947

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	112	89	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1490	1700
Volume to Capacity	0.07	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	8.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	94	7	2	97	3	2	1	1	1	0	2
Future Volume (Veh/h)	0	94	7	2	97	3	2	1	1	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	115	9	2	118	4	2	1	1	1	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	122			124			246	246	120	245	248	120
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	122			124			246	246	120	245	248	120
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	100	100	100
cM capacity (veh/h)	1478			1475			710	659	938	711	657	937

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	124	124	4	3
Volume Left	0	2	2	1
Volume Right	9	4	1	2
cSH	1478	1475	741	847
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.1	0.1
Control Delay (s/veh)	0.0	0.1	9.9	9.3
Lane LOS		A	A	A
Approach Delay (s/veh)	0.0	0.1	9.9	9.3
Approach LOS			A	A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	77	0	0	65	0	0
Future Volume (Veh/h)	77	0	0	65	0	0
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)	84	0	0	71	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			84		155	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			84		155	84
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		100	100
cM capacity (veh/h)			1526		841	981

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	84	71	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1526	1700
Volume to Capacity	0.05	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.4%	ICU Level of Service	A
Analysis Period (min)	15		

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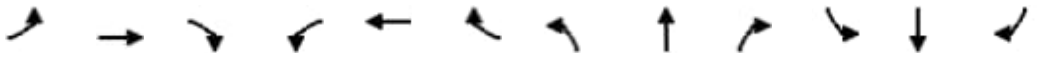
Appendix D

2034 Background Conditions Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	106	6	2	88	1	1	0	5	1	1	1
Future Volume (Veh/h)	1	106	6	2	88	1	1	0	5	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	128	7	2	106	1	1	0	6	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	107			135			246	245	132	250	248	107
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	107			135			246	245	132	250	248	107
tC, single (s)	5.1			4.1			7.1	6.5	6.4	7.1	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.2			3.5	4.0	3.5	3.5	4.0	4.2
p0 queue free %	100			100			100	100	99	100	100	100
cM capacity (veh/h)	1045			1462			709	659	860	701	657	737

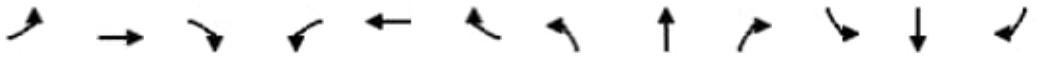
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	136	109	7	3
Volume Left	1	2	1	1
Volume Right	7	1	6	1
cSH	1045	1462	835	697
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s/veh)	0.1	0.1	9.3	10.2
Lane LOS	A	A	A	B
Approach Delay (s/veh)	0.1	0.1	9.3	10.2
Approach LOS			A	B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	16.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	113	0	0	90	0	0
Future Volume (Veh/h)	113	0	0	90	0	0
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)	123	0	0	98	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			123		221	123
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			123		221	123
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		100	100
cM capacity (veh/h)			1477		772	933

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	123	98	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1477	1700
Volume to Capacity	0.07	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	104	7	2	107	4	2	1	1	1	0	2
Future Volume (Veh/h)	0	104	7	2	107	4	2	1	1	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	127	9	2	130	5	2	1	1	1	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	135			136			270	271	132	270	273	133
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	135			136			270	271	132	270	273	133
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	100	100	100
cM capacity (veh/h)	1462			1461			684	639	923	685	637	922

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	136	137	4	3
Volume Left	0	2	2	1
Volume Right	9	5	1	2
cSH	1462	1461	718	827
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.1	0.1
Control Delay (s/veh)	0.0	0.1	10.0	9.4
Lane LOS		A	B	A
Approach Delay (s/veh)	0.0	0.1	10.0	9.4
Approach LOS			B	A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	85	0	0	72	0	0
Future Volume (Veh/h)	85	0	0	72	0	0
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)	92	0	0	78	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			92		170	92
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			92		170	92
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		100	100
cM capacity (veh/h)			1515		825	971

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	92	78	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1515	1700
Volume to Capacity	0.05	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s/veh)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s/veh)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.8%	ICU Level of Service	A
Analysis Period (min)	15		

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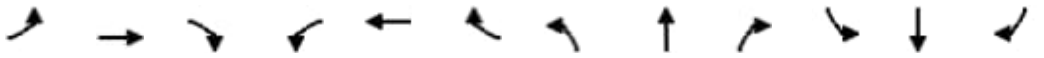
Appendix E

2029 Future Total Conditions Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	100	6	2	83	1	1	0	4	1	1	1
Future Volume (Veh/h)	1	100	6	2	83	1	1	0	4	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	120	7	2	100	1	1	0	5	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	101			127			232	231	124	235	234	101
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			127			232	231	124	235	234	101
tC, single (s)	5.1			4.1			7.1	6.5	6.4	7.1	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.2			3.5	4.0	3.5	3.5	4.0	4.2
p0 queue free %	100			100			100	100	99	100	100	100
cM capacity (veh/h)	1051			1472			725	671	869	718	669	743

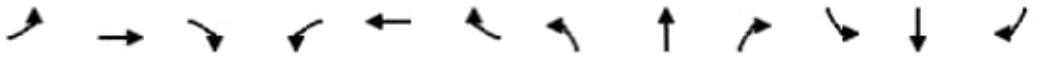
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	128	103	6	3
Volume Left	1	2	1	1
Volume Right	7	1	5	1
cSH	1051	1472	841	709
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s/veh)	0.1	0.2	9.3	10.1
Lane LOS	A	A	A	B
Approach Delay (s/veh)	0.1	0.2	9.3	10.1
Approach LOS			A	B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	16.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	103	4	4	82	4	4
Future Volume (Veh/h)	103	4	4	82	4	4
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)	112	4	4	89	4	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			116		211	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			116		211	114
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	100
cM capacity (veh/h)			1485		780	944

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	116	93	8
Volume Left	0	4	4
Volume Right	4	0	4
cSH	1700	1485	854
Volume to Capacity	0.07	0.00	0.01
Queue Length 95th (m)	0.0	0.1	0.2
Control Delay (s/veh)	0.0	0.3	9.3
Lane LOS		A	A
Approach Delay (s/veh)	0.0	0.3	9.3
Approach LOS			A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	98	7	2	101	3	2	1	1	1	0	2
Future Volume (Veh/h)	0	98	7	2	101	3	2	1	1	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	120	9	2	123	4	2	1	1	1	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	127			129			256	256	125	255	258	125
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	127			129			256	256	125	255	258	125
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	100	100	100
cM capacity (veh/h)	1472			1469			700	651	932	700	649	931

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	129	129	4	3
Volume Left	0	2	2	1
Volume Right	9	4	1	2
cSH	1472	1469	731	839
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.1	0.1
Control Delay (s/veh)	0.0	0.1	9.9	9.3
Lane LOS		A	A	A
Approach Delay (s/veh)	0.0	0.1	9.9	9.3
Approach LOS			A	A

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	17.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	77	4	4	65	4	4
Future Volume (Veh/h)	77	4	4	65	4	4
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)	84	4	4	71	4	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			88		165	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			88		165	86
tC, single (s)			5.1		7.4	7.2
tC, 2 stage (s)						
tF (s)			3.1		4.4	4.2
p0 queue free %			100		99	99
cM capacity (veh/h)			1065		641	759

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	88	75	8
Volume Left	0	4	4
Volume Right	4	0	4
cSH	1700	1065	695
Volume to Capacity	0.05	0.00	0.01
Queue Length 95th (m)	0.0	0.1	0.3
Control Delay (s/veh)	0.0	0.5	10.2
Lane LOS		A	B
Approach Delay (s/veh)	0.0	0.5	10.2
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	16.7%	ICU Level of Service	A
Analysis Period (min)	15		

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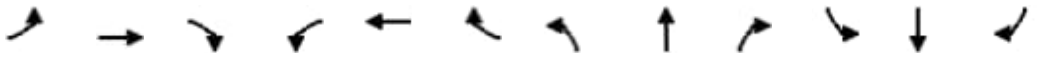
Appendix F

2034 Future Total Conditions Synchro Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	110	6	2	92	1	1	0	5	1	1	1
Future Volume (Veh/h)	1	110	6	2	92	1	1	0	5	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	133	7	2	111	1	1	0	6	1	1	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	112			140			256	255	137	260	258	112
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	112			140			256	255	137	260	258	112
tC, single (s)	5.1			4.1			7.1	6.5	6.4	7.1	6.5	7.2
tC, 2 stage (s)												
tF (s)	3.1			2.2			3.5	4.0	3.5	3.5	4.0	4.2
p0 queue free %	100			100			100	100	99	100	100	100
cM capacity (veh/h)	1039			1456			699	651	854	691	649	731

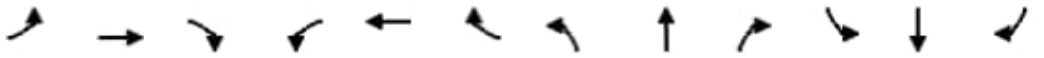
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	114	7	3
Volume Left	1	2	1	1
Volume Right	7	1	6	1
cSH	1039	1456	828	689
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s/veh)	0.1	0.1	9.4	10.3
Lane LOS	A	A	A	B
Approach Delay (s/veh)	0.1	0.1	9.4	10.3
Approach LOS			A	B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	16.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	113	4	4	90	4	4
Future Volume (Veh/h)	113	4	4	90	4	4
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)	123	4	4	98	4	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			127		231	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			127		231	125
tC, single (s)			5.1		7.4	7.2
tC, 2 stage (s)						
tF (s)			3.1		4.4	4.2
p0 queue free %			100		99	99
cM capacity (veh/h)			1024		582	717

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	127	102	8
Volume Left	0	4	4
Volume Right	4	0	4
cSH	1700	1024	643
Volume to Capacity	0.07	0.00	0.01
Queue Length 95th (m)	0.0	0.1	0.3
Control Delay (s/veh)	0.0	0.4	10.7
Lane LOS		A	B
Approach Delay (s/veh)	0.0	0.4	10.7
Approach LOS			B

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		18.0%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	108	7	2	111	4	2	1	1	1	0	2
Future Volume (Veh/h)	0	108	7	2	111	4	2	1	1	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	0	132	9	2	135	5	2	1	1	1	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	140			141			280	281	137	280	283	138
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	140			141			280	281	137	280	283	138
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	100	100	100
cM capacity (veh/h)	1456			1455			674	630	917	675	629	916

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	142	4	3
Volume Left	0	2	2	1
Volume Right	9	5	1	2
cSH	1456	1455	709	819
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.1	0.1
Control Delay (s/veh)	0.0	0.1	10.1	9.4
Lane LOS		A	B	A
Approach Delay (s/veh)	0.0	0.1	10.1	9.4
Approach LOS			B	A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	85	4	4	72	4	4
Future Volume (Veh/h)	85	4	4	72	4	4
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)	92	4	4	78	4	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			96		180	94
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			96		180	94
tC, single (s)			5.1		7.4	7.2
tC, 2 stage (s)						
tF (s)			3.1		4.4	4.2
p0 queue free %			100		99	99
cM capacity (veh/h)			1056		627	750

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	96	82	8
Volume Left	0	4	4
Volume Right	4	0	4
cSH	1700	1056	683
Volume to Capacity	0.06	0.00	0.01
Queue Length 95th (m)	0.0	0.1	0.3
Control Delay (s/veh)	0.0	0.4	10.3
Lane LOS		A	B
Approach Delay (s/veh)	0.0	0.4	10.3
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	17.1%	ICU Level of Service	A
Analysis Period (min)	15		

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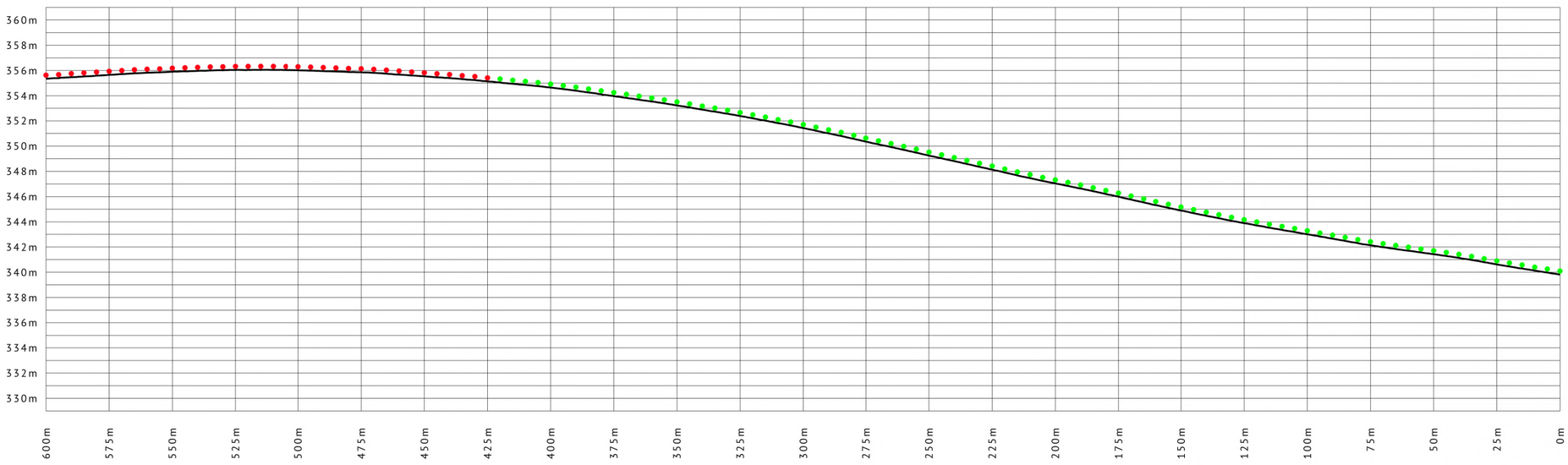
Appendix G

Sightline Analysis Figure

Profile West of Observer (5x Vertical Exaggeration)



This Line of Sight Analysis was conducted using LiDAR derived elevation data.

The observer is located 4.4m back from the edge of the travel lane where the subject access location is expected to be. The point of observation is 1.8m above ground height.

The targets are located along the center of the travel lanes at a 5.0m spacing and represent an object that is 0.6m in height. On both the plan and profile the targets are represented as green and red dots. Green dots denote that the target is visible to the observer. Red dots denote that the target is not visible to the observer.

The profile only represents the analysis along the road west of the observer. Line of sight along the road east of the observer is unobstructed well beyond 500m.

Based on the analysis, the observer has visibility of a target out to 420m.

The image in the plan drawing represents the general ground conditions in 2020.

Observer Location (1.8m Height and 4.4m Back from Edge of Travel Lane)

Target (0.6m height) is Not Visible

Target (0.6m height) is Visible

Road 96 Oxford County
Line of Sight Analysis: Observer at Site Access Point

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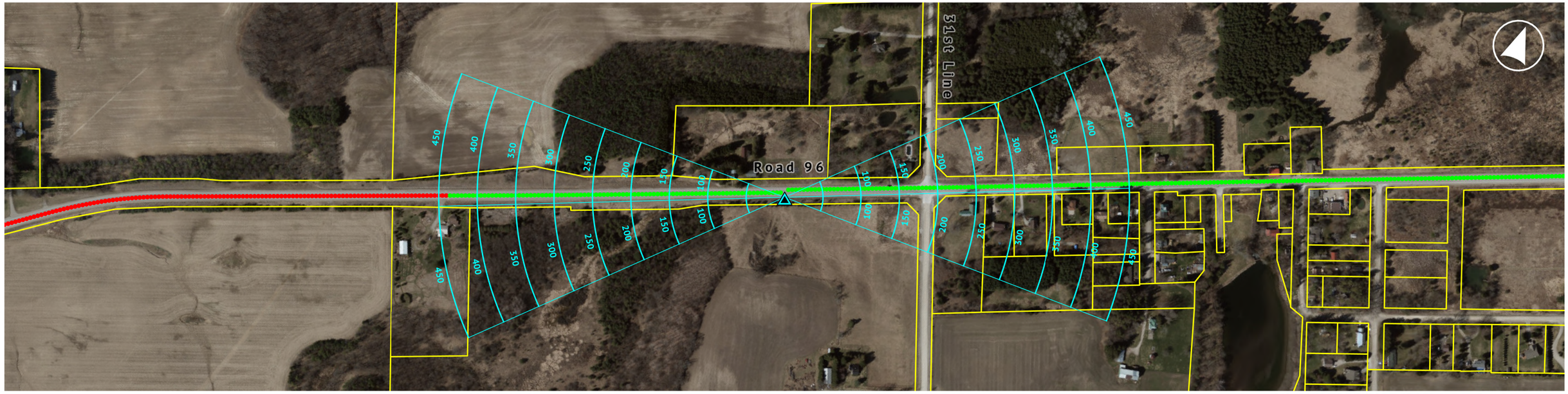
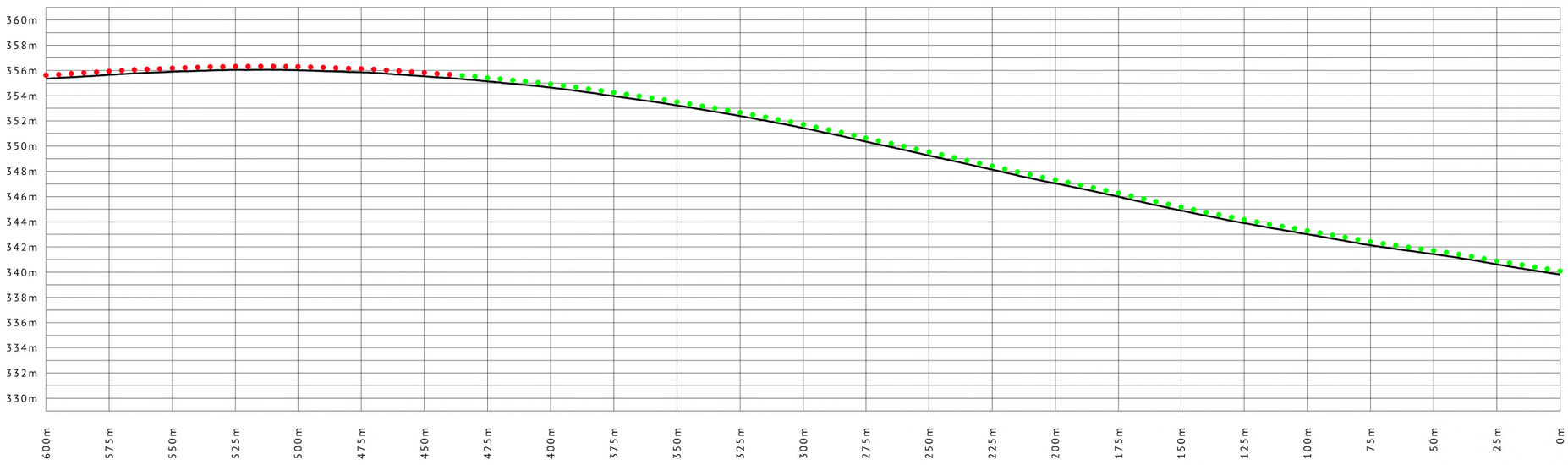
Appendix G - Figure 1



Profile West of Target (5x Vertical Exaggeration)



This Line of Sight Analysis was conducted using LiDAR derived elevation data.

The target is located 4.4m back from the edge of the travel lane where the subject access location is expected to be. The target height is 1.08m above ground height.

The observation points are located along the center of the travel lanes at a 5.0m spacing and represent an object that is 1.08m in height. On both the plan and profile the observation points are represented as green and red dots. Green dots denote that the observer has visibility of the target. Red dots denote that the observer does not have visibility of the target.

The profile only represents the analysis along the road west of the observer. Line of sight along the road east of the observer is unobstructed well beyond 500m.

Based on the analysis, the target will come into view by an observer 435m at a distance of 435m.

The image in the plan drawing represents the general ground conditions in 2020.

Target Location (1.08m Height and 4.4m Back from Edge of Travel Lane)

Observer (1.08m height) Does Not Have Visibility of Target

Observer (1.08m height) Has Visibility of Target

Road 96 Oxford County
Line of Sight Analysis: Observer Progressing Along Travel Lanes

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Appendix G - Figure 2

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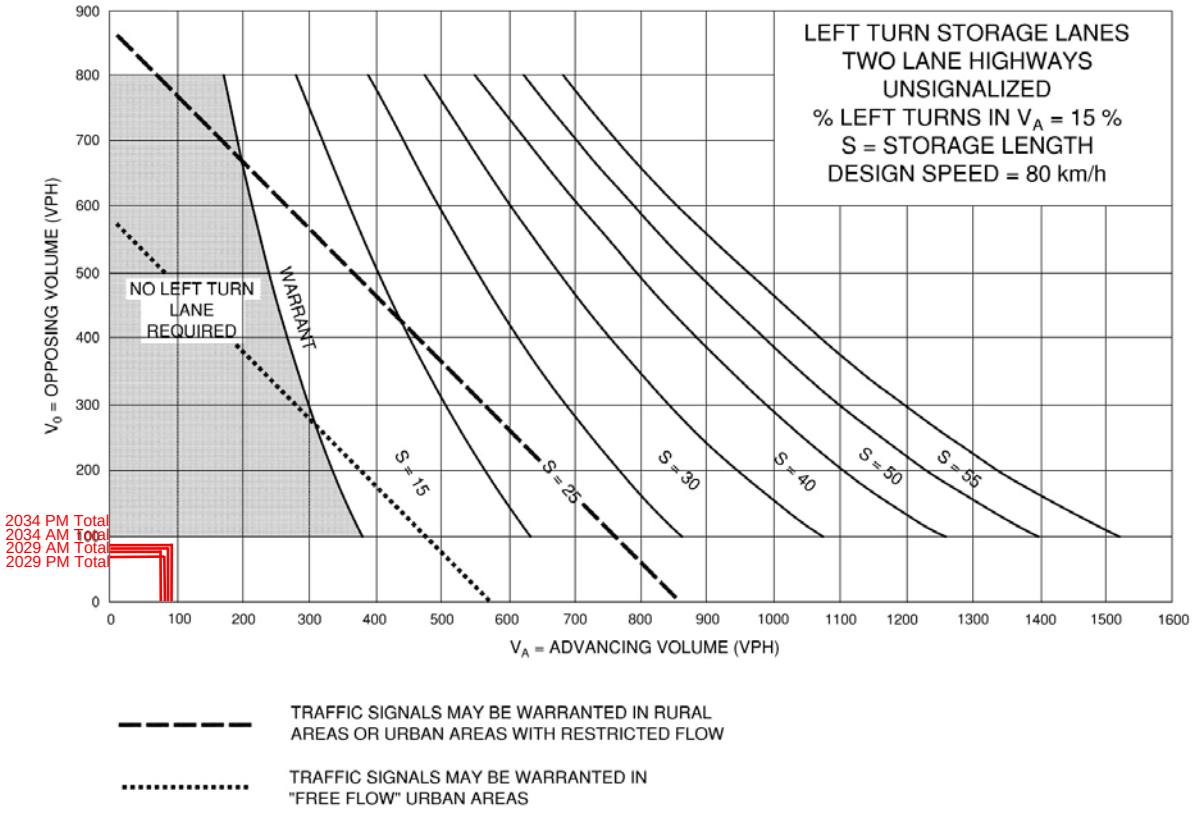
Appendix H

Left Turn Warrant Analysis

Exhibit 9A-16



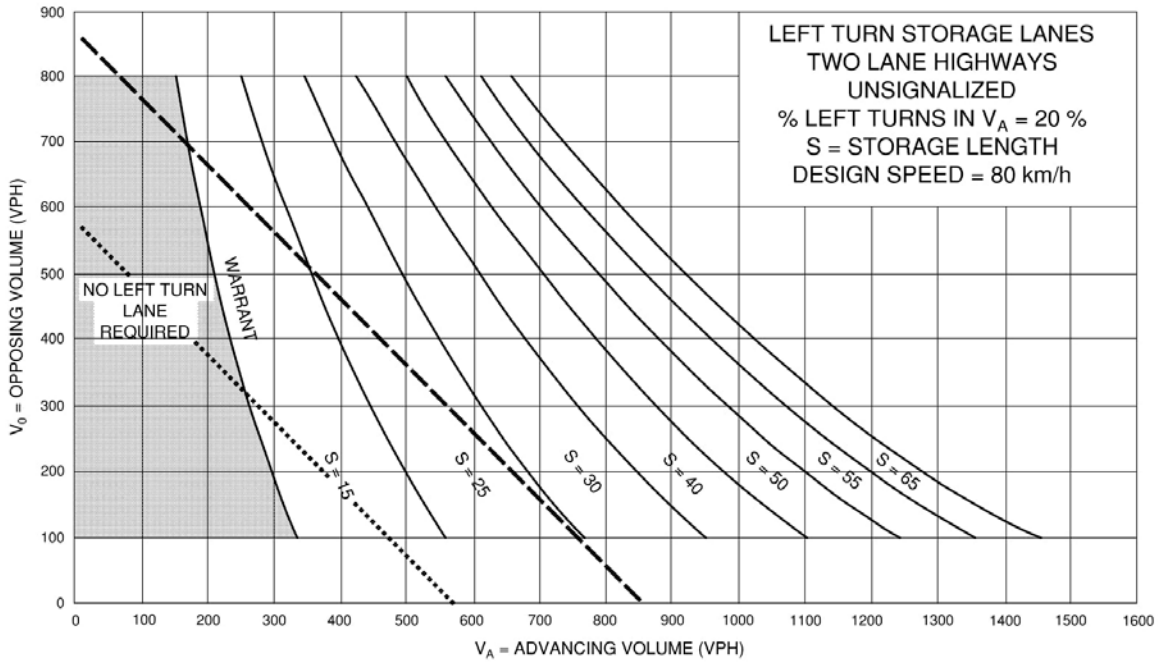
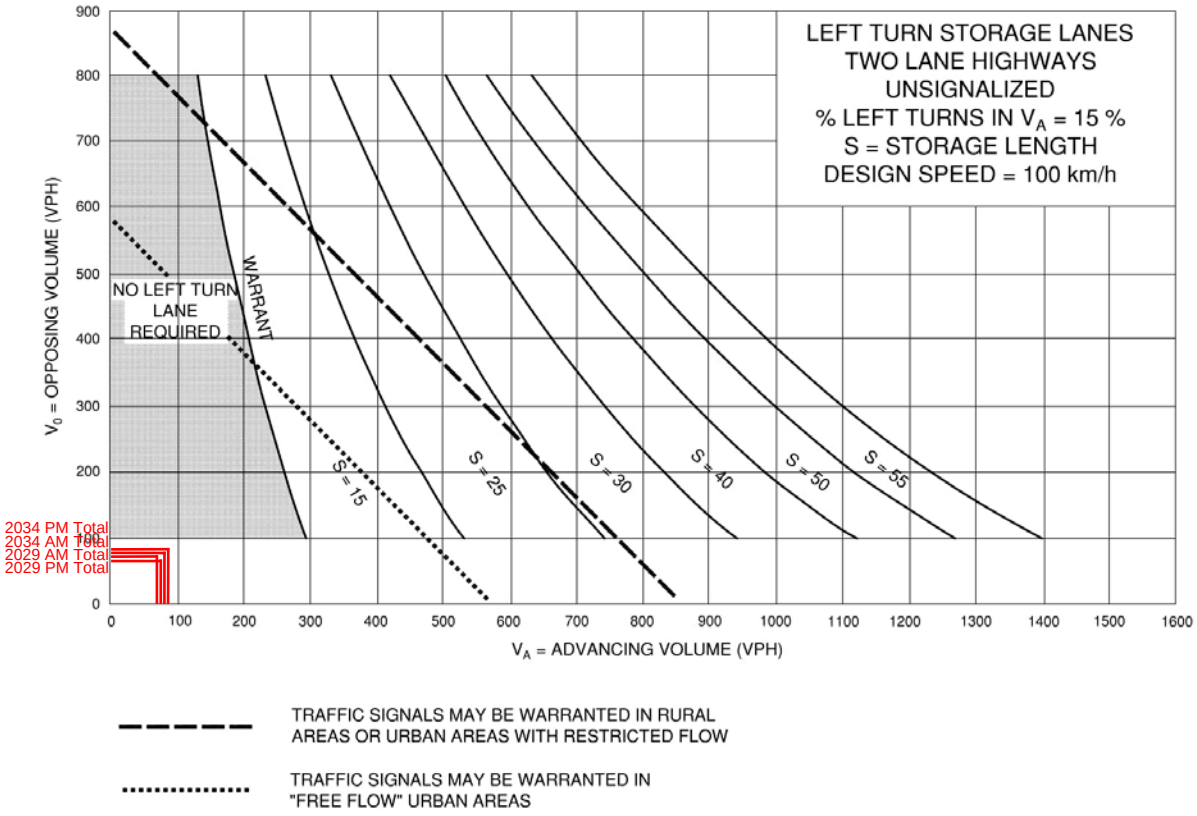
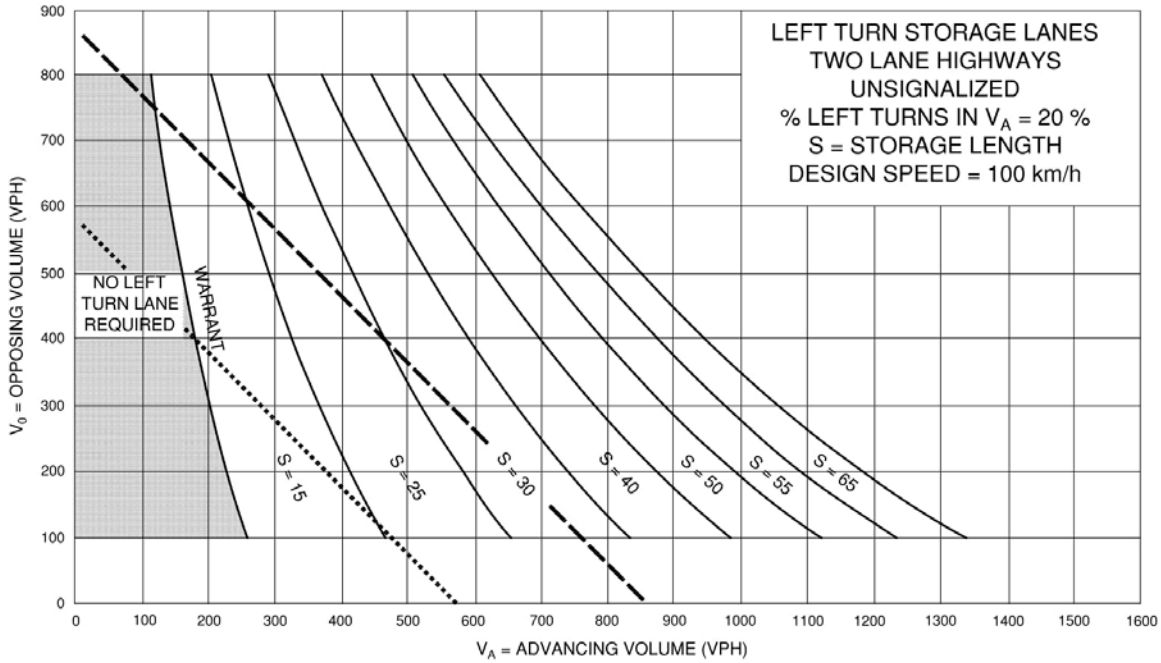


Exhibit 9A-24





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