CEDAR LAKES PHASE 3 and 4
STAGECOACH ROAD
GREELY, ONTARIO

TIA STRATEGY REPORT

December 22, 2023

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Consulting Transportation Engineers
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Prepared for:

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CEDAR LAKES PHASE 3 and 4
STAGECOACH ROAD
GREELY, ONTARIO

TIA STRATEGY REPORT

INTRODUCTION

A Transportation Impact Study (TIS) report dated March 16, 2011 was prepared by this firm which addressed all phases of the Cedar Lakes Subdivision. Only Phase 2 of the subdivision was developed due to the limits of the Greely Village boundary. The province has since amended the City of Ottawa Official Plan and the city adopted changes to the Greely secondary plan and transect B9 in an omnibus bill approved by ARAC and by Ottawa city council on September 6 and 13, 2023. The municipality has required a new subdivision application, and this report was prepared to meet the requirements specified in the pre-consultation meeting for the subdivision.

The Cedar Lakes Subdivision Phase 3 and 4 will be located on 40.63 ha of vacant land on the west side of Stagecoach Road in the Village of Greely. The subdivision will consist of 71 single-family detached homes. The location of the development is provided in Figure A.1.

The firm of D. J. Halpenny & Associates Ltd. has been retained to prepare a Transportation Impact Assessment (TIA) report in support of the subdivision application. The following documents the steps which conform to the City of Ottawa *Transportation Impact Assessment Guidelines (2017)*. Exhibit A.1 in the Appendix presents the consultant Certification Form.

SCREENING

A Screening Form has been prepared which is included as Exhibit 1.1. The Screening Form shows that the Trip Generation and Safety Triggers have been satisfied which would require the preparation of a Transportation Impact Assessment (TIA) report.

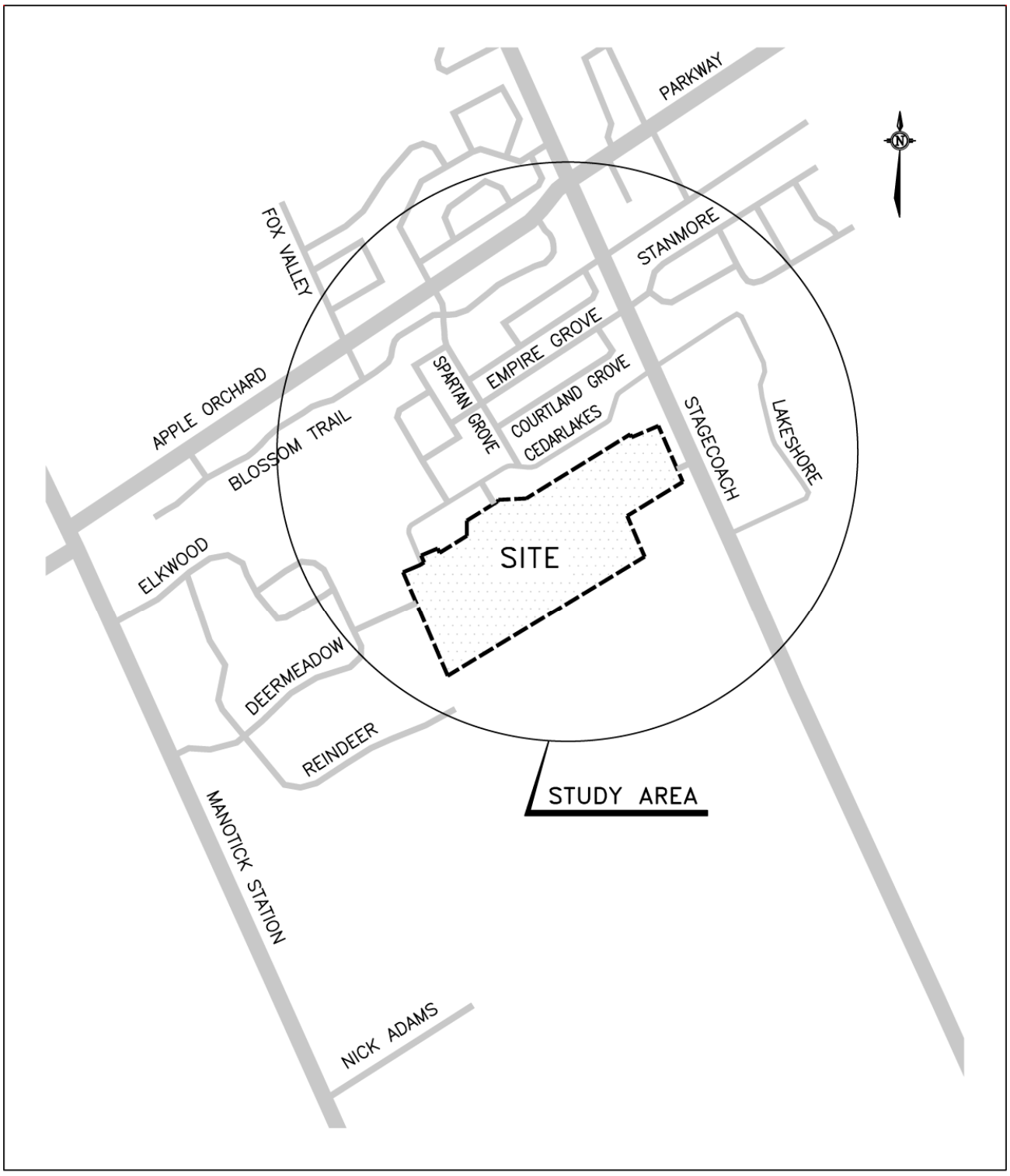
SCOPING

MODULE 2.1 – Existing and Planned Conditions

Element 2.1.1 – Proposed Development

The proposed development will consist of Phases 3 and 4 of the Cedar Lakes subdivision. The site will be located on 40.63 ha of vacant land south of Cedarlakes Way and west of Stagecoach Road in the Village of Greely.

FIGURE A.1
SITE LOCATION PLAN



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The property is currently identified as having a “RU” Zoning - Rural Countryside Zone which will require an amendment to the zoning By-law to support the development. The subdivision proposes the construction of 71 single-family detached housing units. The subdivision will have two new access points consisting of one new access onto Stagecoach Road (Street 1), and one access onto Deermeadow Drive along Block 94 which will connect to Manotick Station Road. The site will also utilize two existing accesses consisting of one access onto Spartan Grove Street and one access onto Stagecoach Road by way of Cedarlakes Way.

The Cedar Lakes Subdivision will be constructed in two phases, and is expected to be totally completed and substantially occupied by the year 2029. Figure 2.1 provides a conceptual site plan of the total subdivision.

Element 2.1.2 – Existing Conditions

The subdivision will be located on the west side of Stagecoach Road and south of Cedarlakes Way. The site will use one existing access onto Stagecoach Road from Cedarlakes Way and one access along Spartan Grove Street to Apple Orchard Road. The study will also examine the Apple Orchard (Parkway)/Stagecoach intersection which is located approximately 950 m north of the site.

The following will describe the surrounding roads which the site accesses will connect, and major intersections and road segments within the study area.

STAGECOACH ROAD

Stagecoach Road (Ottawa Road 25) is a two lane north-south arterial rural road with a pavement width of 7.0 m with paved shoulders north of Cedarlakes Way and 1.5 m gravel shoulders to the south. There are no cycling lanes or pedestrian sidewalks along the road in the vicinity of the site. The TMP identifies Stagecoach Road between Mitch Owens Road and Apple Orchard Road as a Spine Route in the Cycling Network-Primary Rural map. The posted speed limit is 70 km/h between Mitch Owens Road and a point 250 m south of Cedarlakes Way, then increases to 80 km/h south of that point.

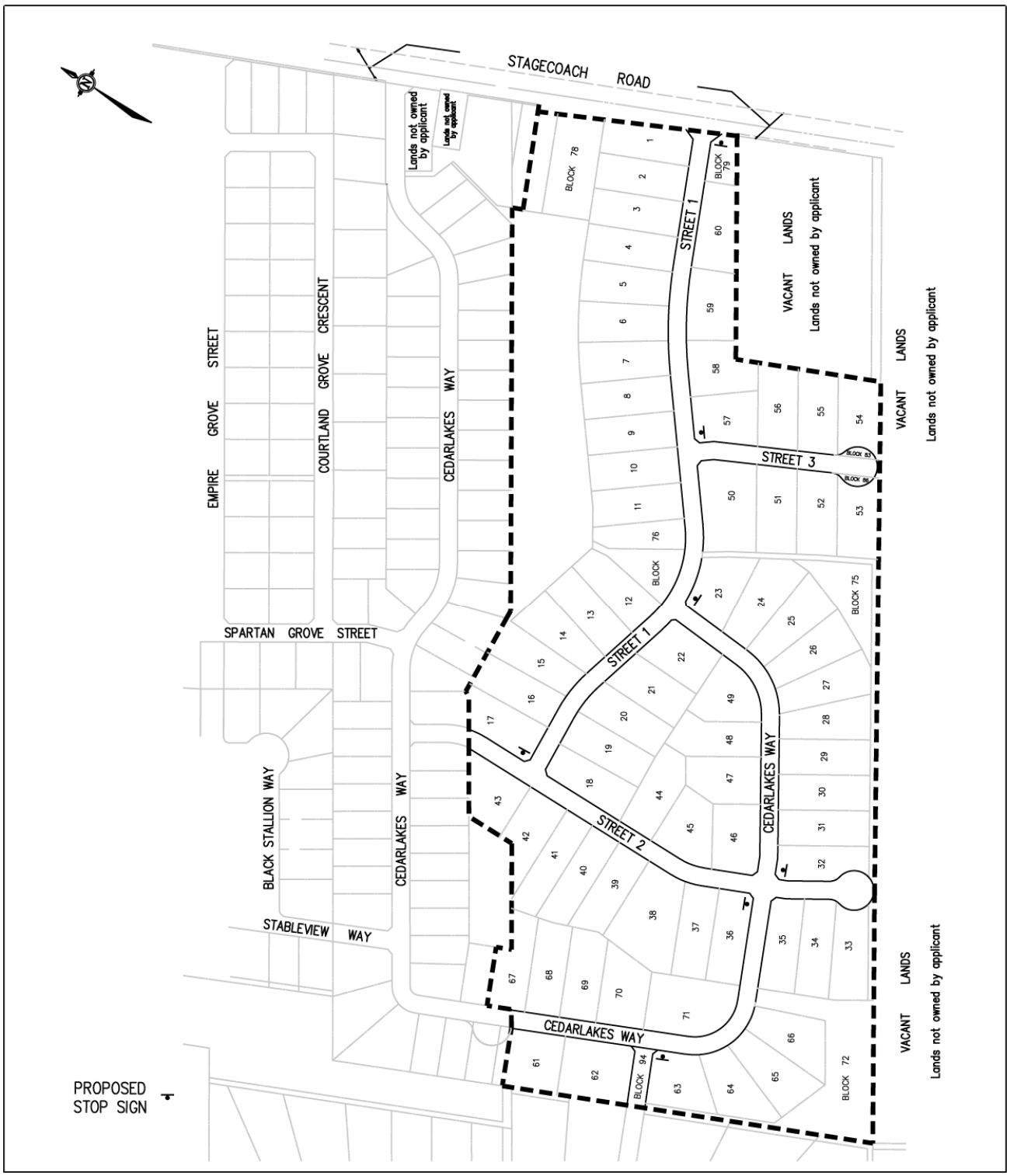
CEDARLAKES WAY

Cedarlakes Way is a two lane east-west local street with no pedestrian sidewalks or cycling facilities. The road is 7.0 m in width with gravel shoulders. The posted speed limit along the road is 40 km/h.

SPARTAN GROVE STREET

The Cedar Lakes Subdivision will have access to Apple Orchard Road from Spartan Grove Street. Spartan Grove Street is a 7.0 m collector road with gravel shoulders between Apple Orchard Road and Empire Grove Street, then becomes a local road south of Empire Grove Street. There are no pedestrian sidewalks or cycling lanes along the road. The north-south road has a posted speed limit of 50 km/h.

FIGURE 2.1
CONCEPTUAL SITE PLAN



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APPLE ORCHARD ROAD

Apple Orchard Road is an east-west collector road. The road is a two lane rural road with a 7.0 m pavement width and paved shoulders between Stagecoach Road and Blossom Trail Drive, and gravel shoulders west of Blossom Trail Drive to Manotick Station Road. There are no sidewalks along either side of the road. The speed limit is posted at 60 km./h.

INTERSECTION OF CEDARLAKES WAY AND STAGECOACH ROAD

The Cedarlakes/Stagecoach intersection is an existing intersection located at the northerly portion of the subdivision. The intersection is controlled by a stop sign at the westbound Lakeshore Drive and eastbound Cedarlakes Way approach and has the following lane configuration:

Northbound Stagecoach Road Approach -	One shared left/through/right lane
Southbound Stagecoach Road Approach -	One shared left/through/right lane
Eastbound Cedarlakes Way Approach -	One shared left/through/right lane Stop Sign)
Westbound Lakeshore Drive Approach -	One shared left/through/right lane Stop Sign)

An aerial photograph using the geoOttawa interactive map tool is provided below showing the intersection geometry of the Cedarlakes/Stagecoach intersection.

INTERSECTION OF CEDARLAKES WAY AND STAGECOACH ROAD

INTERSECTION OF SPARTAN GROVE STREET AND APPLE ORCHARD ROAD

The Spartan Grove/Apple Orchard intersection is a two-way stop controlled intersection with stop signs placed at the northbound Spartan Grove Street approach and the southbound Greely West Drive approach. Apple Orchard Road forms the eastbound and westbound approaches. Traffic from the Cedar Lakes Subdivision would travel along Spartan Grove Street from Cedarlakes Way to Apple Orchard Road. The intersection is located approximately 915 m north of the Cedar Lakes Subdivision.

The following is the lane configuration of the intersection:

Northbound Spartan Grove St. Approach -	One shared left/through/right lane (Stop Sign)
Southbound Greely West Dr. Approach -	One shared left/through/right lane (Stop Sign)
Eastbound Apple Orchard Rd. Approach -	One shared left/through/right lane
Westbound Apple Orchard Rd. Approach -	One shared left/through/right lane

An aerial photograph is provided below showing the lane configuration of the intersection of Spartan Grove Street and Apple Orchard Road.

INTERSECTION OF SPARTAN GROVE STREET AND APPLE ORCHARD ROAD

INTERSECTION OF APPLE ORCHARD ROAD AND STAGECOACH ROAD

The intersection of Apple Orchard Road and Stagecoach Road is located approximately 950 m north of the subdivision. Stagecoach Road forms the northbound and

southbound approaches, and Apple Orchard Road the eastbound approach and Parkway Road the westbound approach. The intersection was modified in 2018 to align the eastbound Apple Orchard Road approach with the westbound Parkway Road approach. With the approaches realigned, the intersection controls were modified from a two-way stop controlled intersection to an all-way stop controlled intersection. There are no dedicated turn lanes at any of the approaches. Below is the existing lane configuration of the intersection of Apple Orchard Road and Stagecoach Road:

Northbound Stagecoach Rd. Approach -	One shared left/through/right lane (Stop Sign)
Southbound Stagecoach Rd. Approach -	One shared left/through/right lane (Stop Sign)
Eastbound Apple Orchard Rd. Approach -	One shared left/through/right lane (Stop Sign)
Westbound Parkway Rd. Approach -	One shared left/through/right lane (Stop Sign)

The lane geometry is shown in an aerial photograph of the Apple Orchard/Stagecoach intersection.

INTERSECTION OF APPLE ORCHARD ROAD AND STAGECOACH ROAD

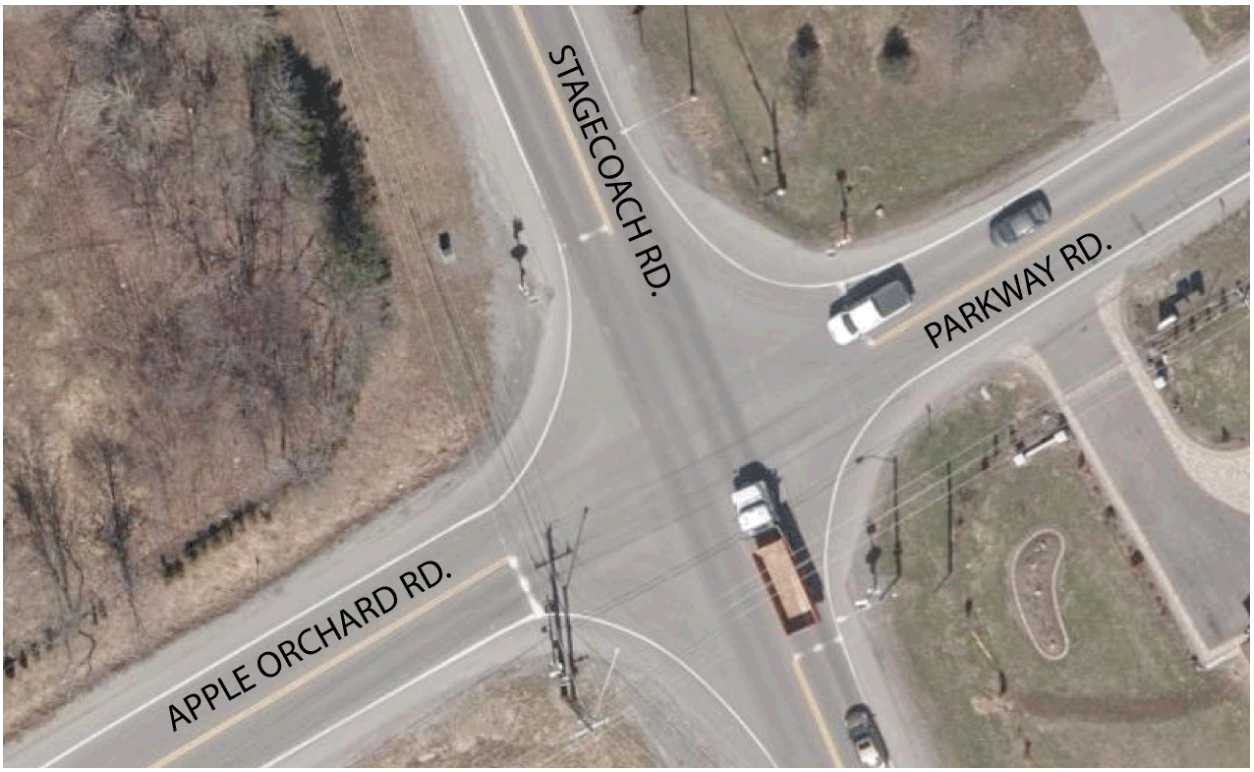
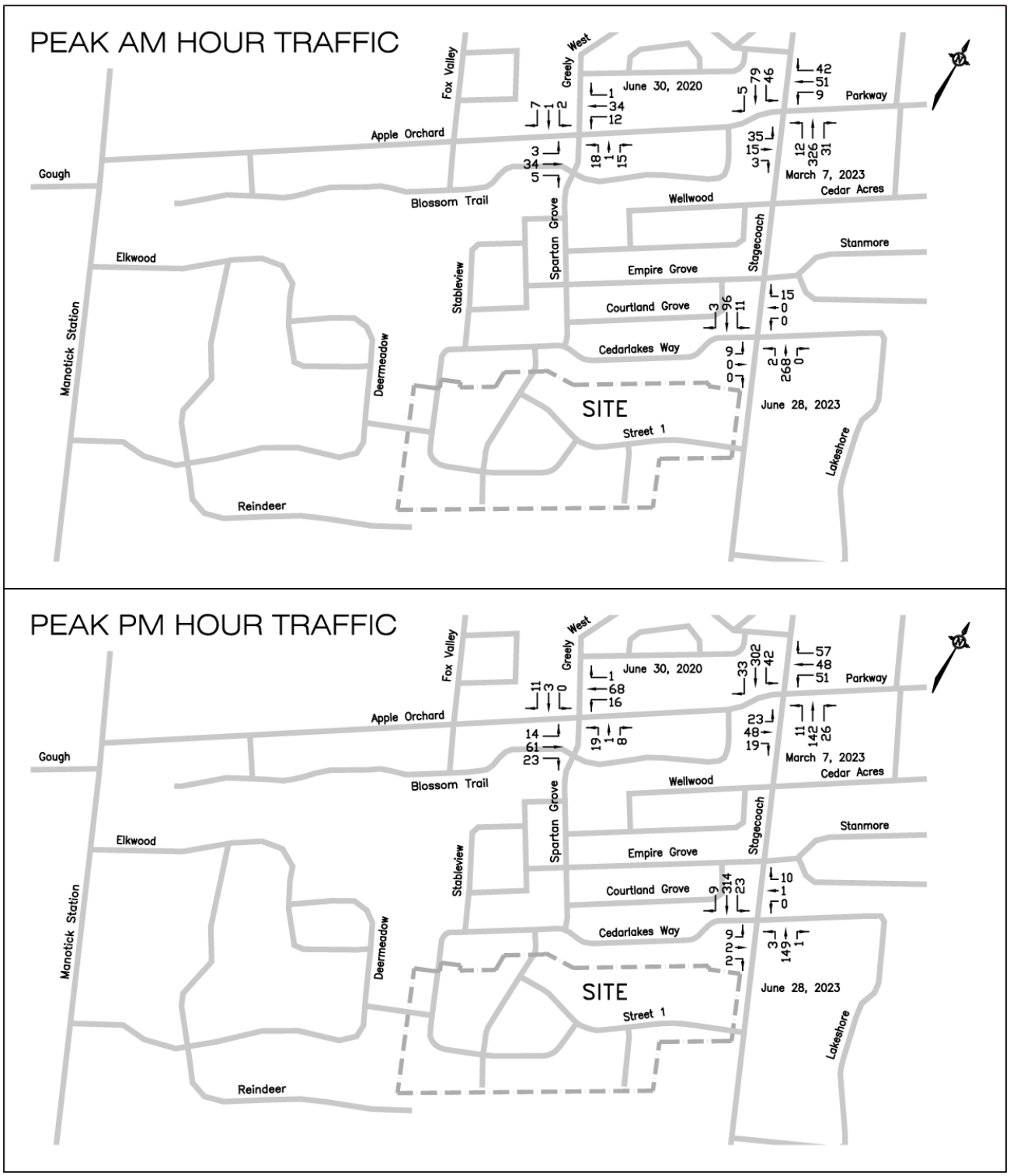


Figure 2.2 shows the traffic counts taken by the City of Ottawa at the Spartan Grove/Apple Orchard intersection in 2020 and at the Apple Orchard/Stagecoach intersection in 2023. Counts at the Cedarlakes/Stagecoach intersection were taken by the consultant in 2023. The Cedarlakes/Stagecoach counts are provided in the Appendix as Exhibit 2.1, the Spartan Grove/Apple Orchard counts as Exhibit 2.2 and the Apple Orchard/Stagecoach counts as Exhibit 2.3.

FIGURE 2.2
PEAK AM AND PM HOUR TRAFFIC COUNTS



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The City of Ottawa has no immediate plans for future changes to the roadway network within the study area. The operation of the Apple Orchard/Stagecoach intersection is being monitored by City staff for the future installation of traffic control signals.

TRANSIT

There is no regular transit service within the Village of Greely. As developments in the area are completed and occupied, regular transit service and routes would be evaluated and determined.

There is a transit route providing no charge service on Thursdays only between Osgoode and the Billings Bridge Transit Station. The route is Route 304 which provides one bus in the morning to the Billings Bridge Transit Station, and one bus returning in the afternoon. The route travels through the Village of Greely along Mitch Owens Road to Stagecoach Road, then to Apple Orchard Road and along Manotick Station Road. The nearest bus stops are located at the Woodstream/Stagecoach intersection and on Manotick Station Road at the entrance to the Orchard Walk Retirement Community.

COLLISION HISTORY

Collision data was obtained through Open Data Ottawa. The collision data was for the five year time period between January 1, 2016 and December 31, 2020. Table 2.1 summarizes the collisions by year and type at the following intersections:

Intersections	Apple Orchard Road and Stagecoach Road
	Wellwood Street and Stagecoach Road
	Empire Grove Street and Stagecoach Road
	Cedarlakes Way and Stagecoach Road
	Blossom Trail Drive and Apple Orchard Road
	Spartan Grove Street and Apple Orchard Road

The collision summary for the six intersections within the study area determined that over the five year period there were 13 collisions reported, with 7 of the collisions reported at the Apple Orchard/Stagecoach intersection.

TABLE 2.1
INTERSECTION COLLISION SUMMARY

YEAR	COLLISION TYPE					TOTAL
	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER	
INTERSECTION - Apple Orchard Road and Stagecoach Road Intersection						
2016			1			1
2017		1				1
2018		2				2
2019	1	1				2
2020					1	1
INTERSECTION - Wellwood Street and Stagecoach Road Intersection						
2016		1				1
2017						0
2018						0
2019						0
2020						0
INTERSECTION - Empire Grove Street and Stagecoach Road Intersection						
2016		1				1
2017						0
2018		1				1
2019			1			1
2020						0
INTERSECTION - Cedarlakes Way (Lakeshore Drive N) and Stagecoach Road Intersection						
2016						0
2017					1	1
2018	1					1
2019						0
2020						0
INTERSECTION - Blossom Trail Drive and Apple Orchard Road Intersection						
2016						0
2017						0
2018						0
2019						0
2020						0
INTERSECTION - Spartan Grove Street and Apple Orchard Road Intersection						
2016						0
2017						0
2018						0
2019						0
2020						0

Table 2.2 summarizes the road segment collisions along Stagecoach Road between Apple Orchard Road and Lakeshore Drive S, and along Apple Orchard Road between Stagecoach and Spartan Grove Street. The following are the road segments for each year and type examined:

Road Segments
Stagecoach Rd. between Apple Orchard Rd. and Wellwood St.
Stagecoach Rd. between Wellwood St. and Empire Grove St.
Stagecoach Rd. between Empire Grove St. and Lakeshore Dr. S
Apple Orchard Rd. between Stagecoach Rd. and Spartan Grove St.

During the five year period, the Stagecoach Road segment between Apple Orchard Road and Lakeshore Drive S experienced 5 collisions, and the Apple Orchard Road segment experienced 1 collision.

TABLE 2.2
ROAD SEGMENT COLLISION SUMMARY

YEAR	COLLISION TYPE					TOTAL
	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER	
SEGMENT - Stagecoach Road Segment - Between Apple Orchard Road and Wellwood Street						
2016	1					1
2017						0
2018						0
2019					1	1
2020						0
SEGMENT - Stagecoach Road Segment - Between Wellwood Street and Empire Grove Street						
2016						0
2017						0
2018						0
2019						0
2020						0
SEGMENT - Stagecoach Road Segment - Between Empire Grove Street and Lakeshore Drive S						
2016					1	1
2017					1	1
2018						0
2019						0
2020					1	1
SEGMENT - Apple Orchard Road Segment - Stagecoach Road and Spartan Grove Street						
2016						0
2017						0
2018					1	1
2019						0
2020						0

Element 2.1.3 – Planned Conditions

The *Transportation Master Plan 2013* (TMP) was examined to determine if there were any road or transit projects identified within the road network of the surrounding area.

The TMP did not identify any road modifications projects in the Affordable Network Plan for the surrounding area. The Apple Orchard/Stagecoach intersection was modified in 2018 to align Apple Orchard Road with Parkway Road. Traffic control signals may be installed at a future date when warranted.

The Greely Community does not have regular OC Transpo bus service. There are no transit projects identified in the TMP for the Greely area. OC Transpo does provide limited service through Greely between Osgoode and the Billings Bridge Transit Station. Route 304 is a no charge route which provides one bus to the Billings Bridge Transit

Station in the morning and one bus returning in the afternoon with service only on Thursdays. The buses pass through Greely during off peak hours.

The following is the only significant development proposed or under construction within one kilometre of the site:

- The Cadieux Subdivision is located east of Lakeshore Drive. The development consists of approximately 40 single-family homes with access to the development from Cadieux Way which connects to Lakeshore Drive. The subdivision is substantially completed at the time the June 28, 2023 traffic counts were taken at the Cedarlakes/Stagecoach intersection. Homes that were not occupied were generating traffic from contractors completing the construction.

MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The study area for the Cedar Lakes Subdivision will be confined to the new site access onto Stagecoach Road, and the existing Cedarlakes/Stagecoach intersection and Spartan Grove/Stagecoach intersection. The Apple Orchard/Stagecoach intersection located 950 m north of the subdivision will also be examined. The intersections represent the subdivision access points and major intersections within one kilometre of the site.

The study will examine the intersection geometry and roadway segments in accordance with the *Transportation Impact Assessment Guidelines (2017).* Traffic calming measures within the internal subdivision streets will be examined in accordance with the City of Ottawa *Traffic Calming Design Guidelines, April 2019*.

Element 2.2.2 – Time Periods

The time period for the analysis would be the weekday peak AM and PM time period of traffic which would occur during the peak hour of the subdivision development and the adjacent road traffic when drivers are travelling to and from work.

Element 2.2.3 – Horizon Years

The TIA will address the impact of the site generated trips from the proposed residential subdivision. The horizon year of the study will be the total completion of the development at the year 2029. The analysis will further examine the impact at the year 2034 which is five years beyond completion.

MODULE 2.3 – Exemptions Review

The exemptions, which provide possible reductions to the scope of work of the TIA Study, were examined using Table 4: Possible Exemptions which is provided in the

City's *Transportation Impact Assessment Guidelines (2017).* Utilizing the table, the following lists the possible exemptions proposed for the TIA Study report:

MODULE	ELEMENT	EXEMPTION CONSIDERATIONS
Design Review Component		
4.1 Development Design	4.1.1 Design for Sustainable Modes	**Required**
	4.1.2 Circulation and Access	**Not Required** – Only required for site plans
	4.1.3 New Street Networks	**Required** - Required for subdivisions
4.2 Parking	4.2.1 Parking Supply	**Not Required** – Only required for site plans
4.3 Boundary Street Design	4.3 Boundary Street Design	**Required**
Network Impact Component		
4.5 Transportation Demand Management	4.5.1 Context for TDM	**Required**
	4.5.2 Need and Opportunity	**Required**
	4.5.3 TDM Program	**Required**
4.6 Neighbourhood Traffic Calming	4.6 Neighbourhood Traffic Calming	**Not Required** – The site will have access onto an arterial road with less than 75 site generated auto trips
4.7 Transit	4.7.1 Transit Route Capacity	**Not Required** – less than 75 site transit trips
	4.7.2 Transit Priority Requirements	**Not Required** – less than 75 site auto trips
4.8 Network Concept	4.8 Network Concept	**Not Required** - The subdivision would not generate more than 200 person-trips per peak hour in excess of the volume permitted by established zoning.
4.9 Intersection Design	4.9.1 Intersection Controls (including site accesses)	**Required** – less than 75 site generated auto trips
	4.9.2 Intersection Design	**Required** – less than 75 site generated auto trips

MODULE 3.1 - Development-generated Travel Demand

Element 3.1.1 – Trip Generation and Mode Shares

The Cedar Lakes Subdivision will comprise of 71 single-family homes in Phases 3 and 4. The number of expected site generated trips was determined utilizing the trip statistical data and procedure documented in the *TRANS Trip Generation Manual, Summary Report October 2020*. The analysis utilized the Person-Trip Generation Rates from the TRANS document for the ITE Land Use Code 210, "Single-detached" dwelling unit type. Peak period person-trips would occur between 7:00 AM and 9:30 AM, and between 3:30 PM and 6:00 PM.

The TRANS document has divided the Ottawa-Gatineau area into 26 districts. The Cedarlakes Subdivision is located within the "Other Rural Districts" which is depicted in Figure 1 of the document. The Other Rural Districts data was used in the determination of the mode share.

The City of Ottawa has developed a spreadsheet that calculates the number of person-trips for each mode of transportation. Although the Greely community currently has no regular OC Transpo transit service, the study has assumed that by the completion of the subdivision in 2029, development in the area along with the Trillium Line extension to the Limebank Station would result in regular transit service throughout the community. The study has included transit as an available mode of travel using the mode share for an "Other Rural Districts" as provided in the TRANS manual. Table 3.1 shows the peak AM and PM hour person-trips, with an adjustment of the transit mode share which would reduce the transit share to ½ that applied to the district, and distributing the remaining share evenly between the auto driver and auto passenger modes. Trips inbound and outbound were determined from Table 9 of the TRANS manual.

TABLE 3.1
MODE SHARE SPREADSHEET (Peak AM and PM Hour Person-Trips)

Time	Number of Units	Type of Unit	District
Peak Hour	71	Single	Other Rural Districts

	AM peak			PM peak			AM peak	PM peak
	In	Out	Total	In	Out	Total	Mode Share	Mode Share
Auto Driver	14	34	48	34	21	55	66%	70%
Auto Passenger	4	10	14	10	6	16	19%	21%
Transit	3	7	10	3	2	5	13%	7%
Cycling	1	1	2	1	1	2	2%	2%
Pedestrian	0	0	0	0	0	0	0%	0%
Total	22	52	74	48	30	78	100%	100%

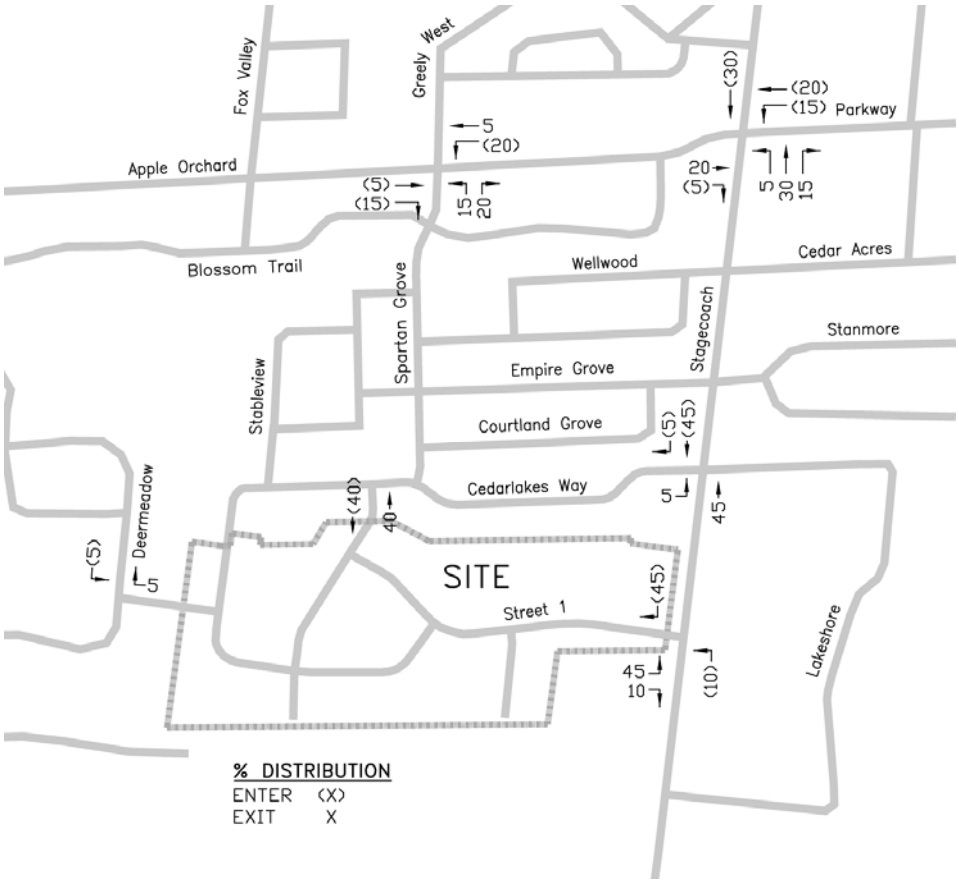
The TIA Guidelines allow for three Trip Reduction Factors. The three trip reductions would consist of trips from existing development on site, pass-by trips, and shared trips within the site between two or more uses. No trip reduction factors were applied for the following reasons:

1. The site is currently vacant with no existing uses which would generate trips.
2. The residential use would generate all primary trips with no pass-by trips.
3. The single-family homes would be a single use with no shared trips between other uses on site.

Element 3.1.2 – Trip Distribution

The distribution of site generated vehicle-trips for the proposed Cedar Lakes Subdivision was determined from the traffic patterns from the peak hour traffic counts at surrounding intersections along with data on the distribution of trips which was established in the Cedar Lakes Phase 2 Transportation Impact Study (TIS) report dated March 16, 2011 which was prepared by this firm. The background traffic data would represent trips to/from work which would be generated by the proposed subdivision. The distribution was applied to the access points to the subdivision assuming the shortest and most convenient route. The trip distribution for the residential trips during the weekday peak AM and PM hour is shown in the figure below.

SUBDIVISION TRIP DISTRIBUTION



Element 3.1.3 – Trip Assignment

The distribution of site generated vehicle-trips was determined from the peak AM and PM hour Mode Share Spreadsheet shown in Table 3.1. The mode share for an auto driver entering and exiting the site during peak hour is provided in Table 3.2.

TABLE 3.2
PEAK HOUR DISTRIBUTION OF VEHICLE-TRIPS

PEAK HOUR TRIPS / LAND USE	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
71 Single-Family Homes	48	14 (30%)	34 (70%)	55	34 (62%)	21 (38%)

The trip distribution, as discussed in Element 3.1.2, was applied to the peak AM and PM peak hour vehicle-trips shown in Table 3.2. Figure 3.1 presents the peak AM and PM hour residential vehicle trips to/from the site.

ANALYSIS

MODULE 3.2 - Background Network Travel Demand

Element 3.2.1 – Transportation Network Plans

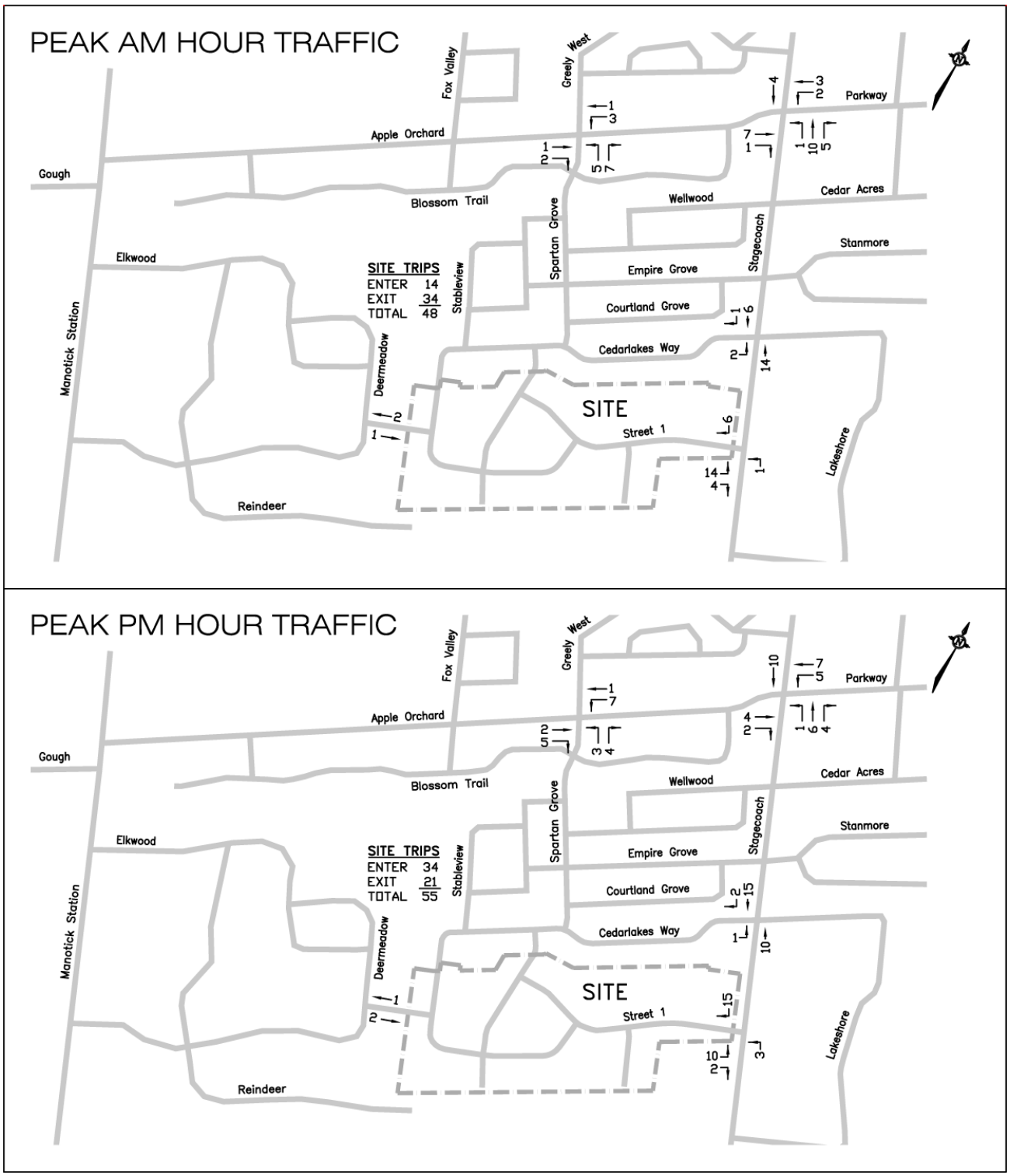
The City of Ottawa *Transportation Master Plan (TMP) 2013* was reviewed to identify transit and roadway projects in the vicinity of the development. The east-west approaches (Apple Orchard and Parkway) of the Apple Orchard/Stagecoach intersection were aligned during an intersection modification in 2018. The intersection is an all-way stop controlled intersection with the possibility of traffic signals at a future date when warranted. There are no transportation projects identified in the TMP.

There currently are no regular transit routes serving the Village of Greely. New transit routes to Greely may be planned for the future as further development comes on board and the O-Train Trillium Line Extension is completed.

Element 3.2.2 – Background Growth

The future 2029 and 2034 traffic was calculated for the Cedar Lakes/Stagecoach, Spartan Grove/Apple Orchard and Apple Orchard/Stagecoach intersection. The counts for the Cedar Lakes/Stagecoach and Apple Orchard/Stagecoach were taken in 2023, and the counts for the Spartan Grove/Apple Orchard intersection in June 30, 2020. The 2023 traffic counts are considered outside the influence of the COVID-19 virus and were not adjusted. The 2020 counts at the Spartan Grove/Apple Orchard intersection

FIGURE 3.1
PEAK AM AND PM HOUR SITE GENERATED TRIPS



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intersection were adjusted to reflect a reduction in travel due to COVID-19. The adjustment was based on the reduction in traffic determined from the City of Ottawa traffic counts at the Bank/Mitch Owens intersection. The AADT counts at the intersection taken on June 13, 2019 and May 29, 2021 determined that the traffic experienced a decrease in traffic of 22 percent which was attributed to the COVID-19 virus. The 2020 counts at the Spartan Grove/Apple Orchard intersection were therefore increased by 20 percent at all approaches to reflect traffic for a post COVID-19 scenario for background and total traffic.

The growth in background traffic at the intersections within the study area was determined by the following two methods:

- The examination of historical traffic counts obtained from the City of Ottawa at the Apple Orchard/Stagecoach intersection between the year of 2011 and 2023. The counts determined that the volume of background traffic decreased at an average annual compounded rate of -2.25 percent during the peak AM hour and -0.73 percent during the peak PM hour.

- The trip trend of trips to/from the Rural Southeast area for auto driver trips was examined in the *National Capital Region Travel Trends* document prepared by the IBI Group. The document showed that the trip trend from the Rural Southeast area has increased at an average annual compounded rate of 0.88 percent for the peak AM hour between the years of 2005 and 2011.

The study has therefore assumed that the background traffic would experience an average annual compounded increase of 1.0 percent which is consistent with traffic studies for other development in the area. The 1.0 percent annual increase would translate to the following growth factors which were applied to all intersection approaches:

Growth Factor at the Apple Orchard/Stagecoach and Cedar Lakes/Stagecoach Intersections

2023 → 2029 = 1.062 Completion
2023 → 2034 = 1.116 Completion + 5 Years

Growth Factor at the Spartan Grove/Apple Orchard Intersection

2020 → 2029 = 1.094 Completion
2020 → 2034 = 1.149 Completion + 5 Years

Element 3.2.3 – Other Developments

Other development in the area which would contribute to the increase in background traffic is the following:

- The Emerald Links Country Estates Phase III Subdivision is located north of Apple Orchard Road and east of Manotick Station Road. The development will have one access point onto Manotick Station Road, with access through the

proposed Emerald Subdivision to Fox Valley Road and to Stagecoach Road by way of Jack Pine Crescent. Due to the size of the subdivision, no TIA study was required but trips were determined using the TRANS Trip Generation Manual for use in this study.

- The Emerald Subdivision at 6544 Jack Pine Crescent is a 73 single-family home subdivision located north of Apple Orchard Road and west of Stagecoach Road. The subdivision will have access to Apple Orchard Road from Fox Valley Road, and access to Stagecoach Road along Jack Pine Crescent. The subdivision is expected to be completed by 2027 with the site generated trips obtained from the TIA report prepared by the consultant.

The average annual growth in background traffic, and the site generated trips from the Emerald Links Country Estates Subdivision and Emerald Subdivision were applied to the intersections examined in the study area. Figure 3.2 presents the 2029 peak AM and PM peak hour background vehicle traffic (does not include trips from the proposed Cedar Lakes Phase 3 and 4 Subdivision). Figure 3.3 shows the expected 2034 peak hour background traffic which represents five years beyond completion of the development.

MODULE 3.3 - Demand Rationalization

The Village of Greely is a suburban-rural community located in the south end of the City of Ottawa. The community is not densely populated and comprises mainly or single family and town house residential units. All roadways in the study area consist of two lane rural roads which handle a low volume of traffic and contain sufficient capacity for future development. There are no exclusive turn lanes at any of the intersections, and all intersections are controlled by stop signs.

The trips generated by the site are expected to be low resulting in a minor impact on the surrounding road network. There would be no requirement to reduce travel demand due to insufficient infrastructure capacity. Any reduction in peak hour travel demand could be accomplished by providing OC Transpo transit service to Greely. Travel demand may be reduced by the completion of the O-Train Trillium Line Extension.

The total vehicular traffic is the sum of the peak hour site generated trips (Figure 3.1) and the peak hour background traffic (Figure 3.2 for the year 2029 and Figure 3.3 for the year 2034). Figure 3.4 presents the total 2029 peak hour vehicular traffic and Figure 3.5 the total 2034 peak hour vehicular traffic.

FIGURE 3.2
2029 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

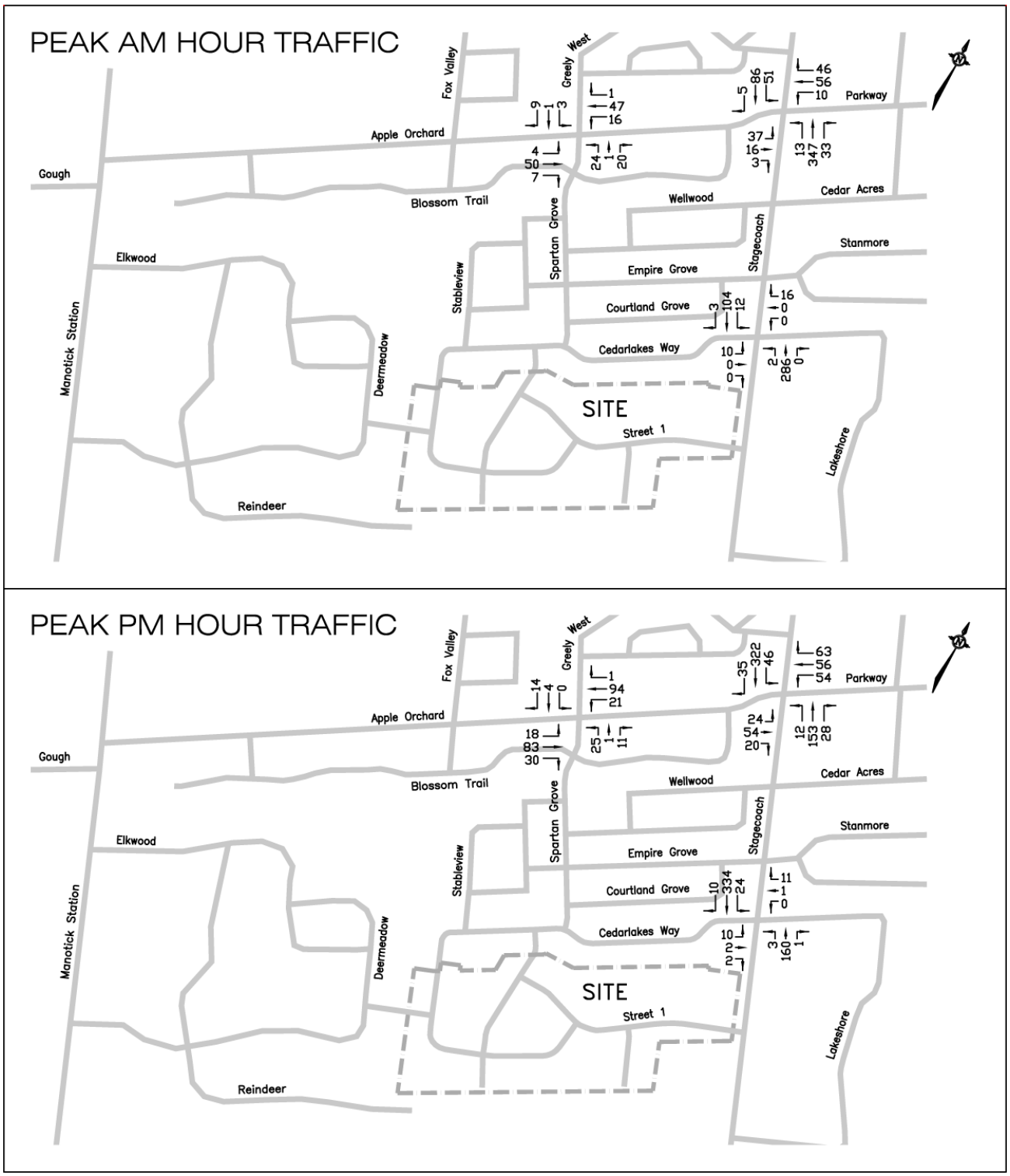

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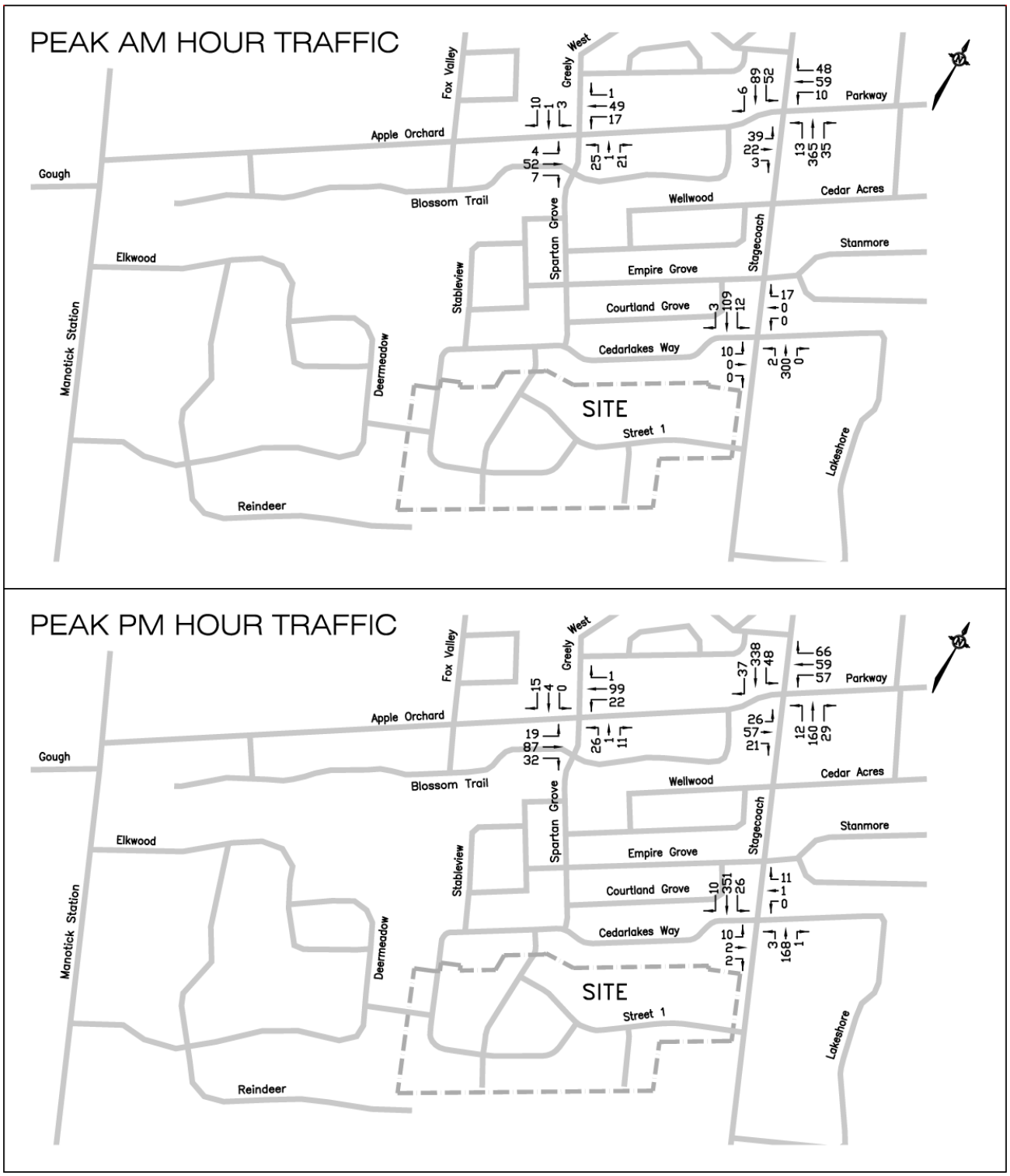
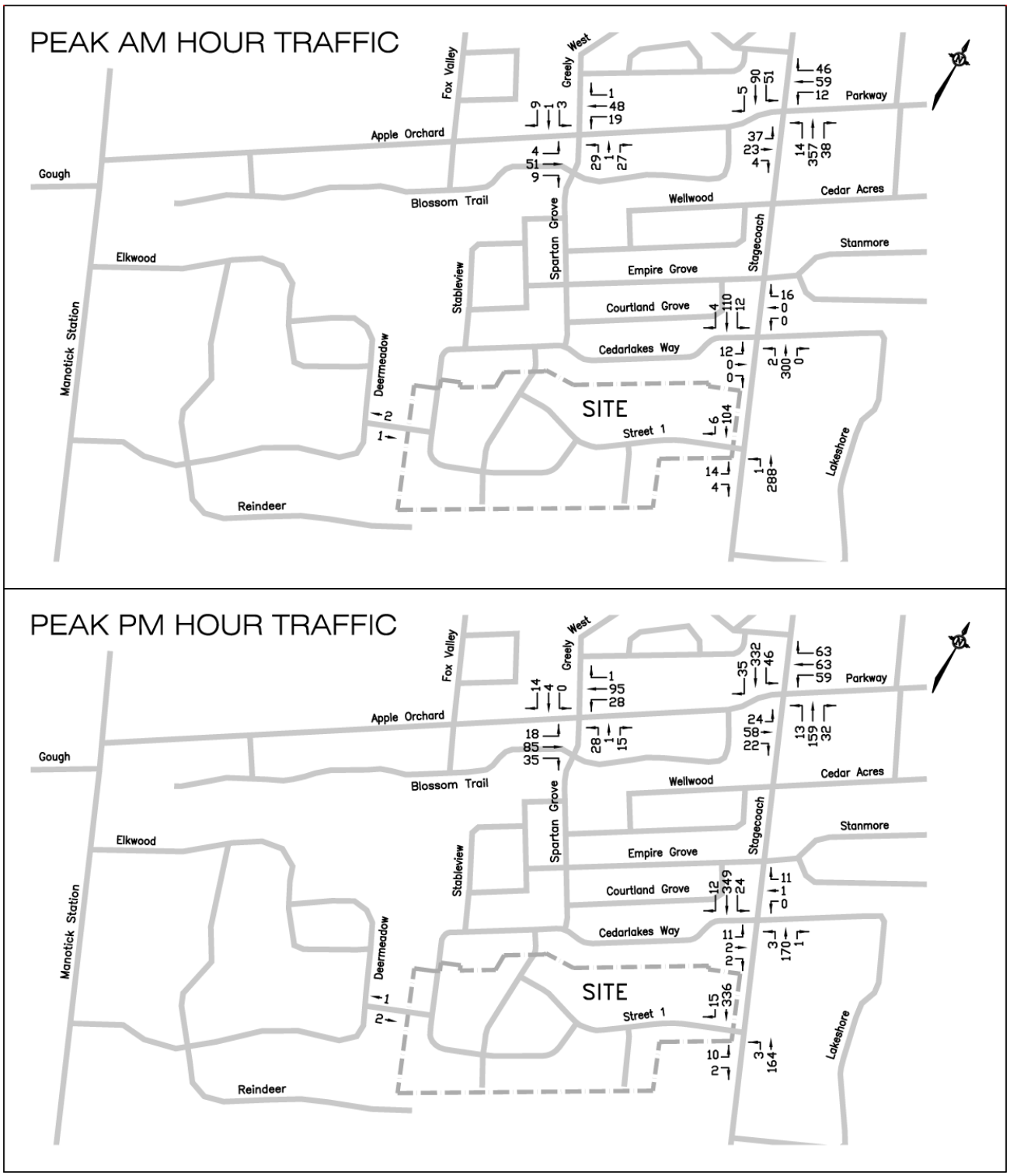
FIGURE 3.3
2034 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



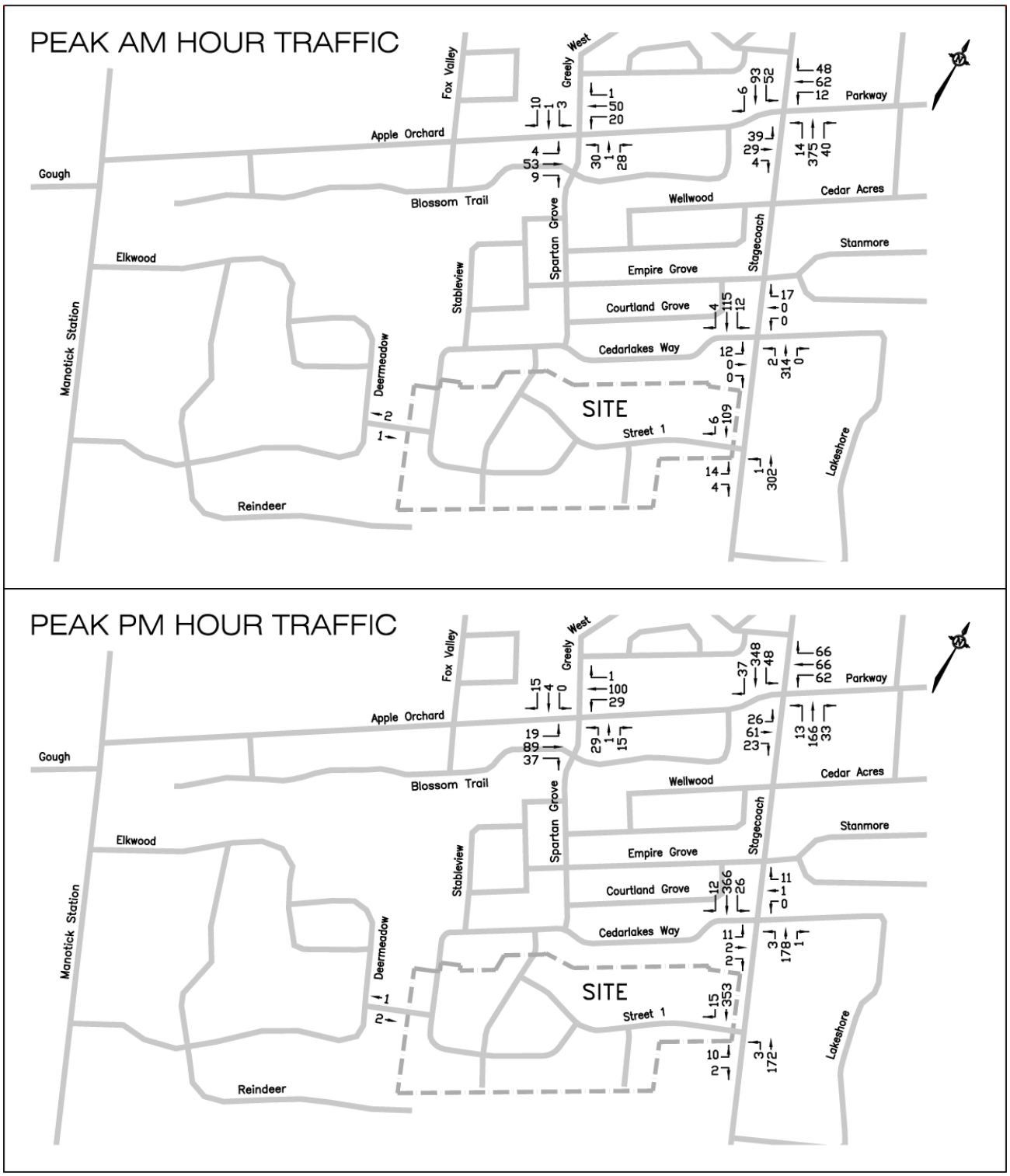
NOT TO SCALE

FIGURE 3.4
2029 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

FIGURE 3.5
2034 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

MODULE 4.1 – Development Design

Element 4.1.1 – Design for Sustainable Modes

There are no regular OC Transpo transit routes within Greely Community. There is a transit route along Stagecoach Road and Apple Orchard Road in the morning (9:30 AM) which travels to the Billings Bridge transit station, and one bus returning (3:00 PM). The route is Route 304 which provides no charge service with one bus travelling on Thursdays outside the peak hour of traffic along the adjacent roads.

Element 4.1.3 – New Street Networks

The Cedar Lakes Subdivision will consist of 71 single-family homes. The homes will be fronting onto several local streets. The streets within the subdivision will have a rural cross section with a 7.0 m paved surface and gravel shoulders. There will be no sidewalks or cycling facilities along the roads within the subdivision.

The subdivision will have two new access points consisting of one onto Stagecoach Road (Street 1), and one onto Deermeadow Drive along Block 94 which will connect to Manotick Station Road by way of Elkwood Drive. The site will have access onto Stagecoach Road along the existing street of Cedarlakes Way, and onto Apple Orchard Road from the existing Spartan Grove Street. The multiple access points would reduce the site traffic along the local roads within the subdivision.

MODULE 4.3 – Boundary Street Design

The City of Ottawa Complete Streets concept allows for the safe movement of everyone whether they choose to walk, bike, drive, or take public transit. The boundary roads to the Cedar Lakes Subdivision would consist of Apple Orchard Road and Stagecoach Road. The multi-modal level of service for the street segments was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines* and the Multi-Modal Level of Service - Segments Form. The MMLOS analysis sheets are provided in the Appendix as Exhibit 4.1 for Stagecoach Road and Exhibit 4.2 for Apple Orchard Road. The following examined the MMLOS for the various modes of travel along the Stagecoach Road and Apple Orchard Road street segments.

PEDESTRIAN LEVEL OF SERVICE (PLOS)

There are no sidewalks along Stagecoach Road or Apple Orchard Road. The posted speed limit along the road segments is 70 km/h for Stagecoach Road and 60 km/h for Apple Orchard Road. The analysis sheets determined that the pedestrian level of service for both the Stagecoach Road and Apple Orchard Road street segments were PLOS “F”.

BICYCLE LEVEL OF SERVICE (BLOS)

Stagecoach Road is designated as an arterial road and Apple Orchard Road a collector road with rural cross sections and paved or gravel shoulders in the vicinity of the site. Stagecoach Road is designated as a Spine Route between Mitch Owens Road and Apple Orchard Road in the Ottawa TMP. There are no cycling facilities along the road segments. The analysis sheets have determined that both street segments functioned at a BLOS "F".

TRANSIT LEVEL OF SERVICE (TLOS)

The Greely Community is not served by regular transit service. The Transit Level of Service (TLOS) was not addressed in the study.

TRUCK LEVEL OF SERVICE (TkLOS)

The Truck Level of Service (TkLOS) for the Stagecoach Road and Apple Orchard Road street segments was determined to be a TkLOS "C" with the analysis sheets provided in the Appendix as Exhibit 4.1 and 4.2.

Traffic collisions along the Stagecoach Road and Apple Orchard Road segments are shown in Table 2.2. Over the five year period between 2016 and 2020, 5 collisions were recorded along the Stagecoach Road segment between Apple Orchard Road and Lakeshore Drive, and 1 collision along Apple Orchard Road between Stagecoach Road and Spartan Grove Street. The pattern of collisions did not identify any measures which could be taken to reduce the number of collisions.

The calculated MMLOS for the Stagecoach Road and Apple Orchard Road street segments were compared to the MMLOS targets. Table 4.1 shows the calculated level of service for the street segments and the targets for all modes of travel for a Village Residential as designation in the Official Plan - Schedule A - Designation Plan. The MMLOS targets were obtained from Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines*. Table 4.1 summarizes the MMLOS road segments and targets.

TABLE 4.1
MULTI-MODAL (MMLOS) SEGMENT SUMMARY TABLE - Street Segment

ROAD SEGMENT	Level of Service (LOS) – 2034				
	Pedestrian	Bicycle	Transit	Auto	Truck
Calculated Stagecoach	F	F	N/A	-	C
Calculated Apple Orchard	F	F	N/A	-	C
Target	C	C	N/A	-	D

The pedestrian LOS did not meet the target due to the vehicle operation speed and lack of sidewalks along Stagecoach Road and Apple Orchard Road. Lowering the posted speed limit and providing sidewalks along the rural roads would increase the PLOS to meet target.

The bicycle LOS target was not met because of the operating speed of traffic along Stagecoach Road and Apple Orchard Road. Lowering the posted speed limit or providing designated bike lanes would allow the BLOS to meet target.

Peak AM and PM hour traffic counts were taken at the Cedarlakes/Stagecoach intersection on June 28, 2023 and at the Spartan Grove/Apple Orchard intersection on June 30, 2020. The counts determined the volume of pedestrians and cyclists entering the intersection to be very low.

MODULE 4.5 – Transportation Demand Management

Element 4.5.1 – Context for TDM

The Cedar Lakes Subdivision is located at the south end of the Village of Greely, outside a Design Priority Area (DPA). The surrounding development consists of low density residential homes. The subdivision has access onto arterial and collector roads which would have a minor impact on the surrounding residential and recreational areas.

Due to the rural location of the subdivision, there is no regular OC Transpo transit service, and no sidewalks or cycling lanes in the vicinity of the site. Trips from the site would be primarily by vehicle with some cycling trips.

Element 4.5.2 – Need and Opportunity

The surrounding area provides no pedestrian sidewalks, cycling lanes, or regular transit service, resulting in the majority of the trips made by motor vehicles. The adjacent roads currently function at an acceptable level of service with reserve capacity with the number of expected subdivision trips having a minor impact on the surrounding road network. There would be no negative impacts if TDM target shares are not met.

Element 4.5.3 – TDM Program

The study utilizes the following TDM Measures Checklist for the subdivision which examines the implementation of facilities that are supportive of sustainable modes.

TDM Measures Checklist:

Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

		TDM measures: *Residential developments*	Check if proposed & add descriptions
		3. TRANSIT	
		3.1 Transit information	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☐ N/A
BETTER	3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐ N/A
		3.2 Transit fare incentives	
BASIC ★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐ N/A
BETTER	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐ N/A
		3.3 Enhanced public transit service	
BETTER ★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐ N/A
		3.4 Private transit service	
BETTER	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☒ No fare OC Transpo service is provided on Thursdays from the Greely Community Centre to Billings Bridge and South keys by Route 304
		4. CARSHARING & BIKESHARING	
		4.1 Bikeshare stations & memberships	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☐ N/A
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐ N/A
		4.2 Carshare vehicles & memberships	
BETTER	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5. PARKING	
		5.1 Priced parking	
BASIC ★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐ N/A
BASIC ★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐ N/A

TDM measures: *Residential developments*				Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☒ A multimodal travel information package can be included with the purchase agreement
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The Cedar Lakes Subdivision would have four access points. The first would be a new intersection where Street 1 connects to Stagecoach Road. The "T" intersection would be a two-way stop controlled intersection with a stop sign at the eastbound Street 1 approach.

The second access would be a minor access at the west limit of the site where a new street would connect Cedarlakes Way to Deermeadow Drive along Block 94. The street would be controlled by a stop sign at both the eastbound and westbound approaches of the new street.

The Cedar Lakes Subdivision would connect to the subdivision on the north side providing the third access point along the existing Spartan Grove Street and connecting to Apple Orchard Road at a stop controlled approach.

The fourth access would be along the existing section of Cedarlakes Way and connecting to Stagecoach Road at an eastbound Cedarlakes Way stop controlled approach.

The expected 2034 traffic at the subdivision access points onto the surrounding roadway network determined that the volume of traffic at each approach to the intersections was low and would not trigger the requirement of traffic control signals.

Element 4.9.2 – Intersection Design

The study will examine the operation of the new Street 1 (Site Access)/Stagecoach intersection, and the existing Cedarlakes/Stagecoach, Spartan Grove/Apple Orchard and Apple Orchard/Stagecoach intersections. The time period of the analysis would be the weekday peak AM and PM hour of the adjacent streets which is the peak time period of the residential subdivision and the surrounding roads as determined by the traffic counts. The analysis will examine the operation of the intersections during the

weekday peak hour for the existing traffic volumes from Figure 2.2, and the background and total traffic at the years 2029 and 2034. Since all intersections examined were unsignalized, only the vehicle travel mode was considered.

VEHICLE LEVEL OF SERVICE (LOS) – Intersection Capacity Analysis

The analysis will utilize the *Highway Capacity Software (HCS2023) TWSC Version 8.2,* which uses the capacity analysis procedure documented in the *Highway Capacity Manual (HCM) 7th Edition*.

For unsignalized intersections, the level of service of each lane movement and approach is determined as a function of the average control delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected control delay at the approach.

LEVEL OF SERVICE	AVERAGE CONTROL DELAY	
Level of Service A	0-10 sec./vehicle	Little or No Delay
Level of Service B	>10-15 sec./vehicle	Short Traffic Delays
Level of Service C	>15-25 sec./vehicle	Average Traffic Delays
Level of Service D	>25-35 sec./vehicle	Long Traffic Delays
Level of Service E	>35-50 sec./vehicle	Very Long Traffic Delays
Level of Service F	>50 sec./vehicle	Extreme Delays – Demand Exceeds Capacity

The results of the analysis are discussed in detail in the following sections:

Street 1 and Stagecoach Road Intersection

The Street 1/Stagecoach intersection is a new intersection with Street 1 forming the eastbound approach to the "T" intersection and Stagecoach Road the northbound and southbound approaches. The intersection would be controlled by a stop sign at the Street 1 approach. The operational analysis was completed for the peak hours at the completion of the subdivision in 2029, and at the year 2034.

Utilizing the 2029 and 2034 total peak hour traffic, the eastbound Street 1 approach would function at a LOS "B" and northbound Stagecoach Road approach at a LOS "A" during both the peak AM and PM hours. The 95th percentile queue using the 2034 traffic was 0.1 vehicles at the eastbound Street 1 approach and 0.0 vehicles at the northbound Stagecoach Road approach during both the peak AM and PM hours. The operation of the intersection is summarized in Table 4.2 with the analysis sheets provided in the Appendix as Exhibit 4.3 and 4.6.

The intersection analysis determined that the construction of the Street 1/Stagecoach intersection would not trigger any requirement for roadway or lane modifications to Stagecoach Road. The new intersection would only require a private approach permit for the Street 1 stop controlled approach which would consist of one lane which would provide left/right turning movements.

TABLE 4.2
STREET 1/STAGECOACH INTERSECTION – LOS & Delay

APPROACH	WEEKDAY PEAK AM HOUR ***2029 Total*** (2034 Total)		WEEKDAY PEAK PM HOUR ***2029 Total*** (2034 Total)	
	LOS	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
EB L/R - Street 1	***B*** (B)	***10.9*** (11.0)	***B*** (B)	***12.2*** (12.5)
NB L/T - Stagecoach	***A*** (A)	***0.0*** (0.0)	***A*** (A)	***0.2*** (0.0)

Cedarlakes and Stagecoach Road Intersection

The Cedarlakes/Stagecoach intersection is an existing intersection where Cedarlakes Way is the eastbound approach which was constructed under Phase 1 and 2 of the Cedar Lakes Subdivision. Cedarlakes Way is located 350 m north of the proposed Street 1/Stagecoach intersection.

Cedarlakes Way and Lakeshore Drive are the stop controlled eastbound and westbound approaches, and Stagecoach Road and northbound and southbound approaches. There are no exclusive turn lanes at any approach to the intersection.

The intersection would function well utilizing the existing 2023 traffic counts. The eastbound Cedarlakes Way approach would function at a LOS “B”, and the northbound, southbound and westbound approaches would function at a LOS “A” during both the peak AM and PM hours. Table 4.3 presents the level of service and approach delay with the analysis sheets provided as Exhibit 4.7 for the peak AM hour and Exhibit 4.8 for the peak PM hour.

TABLE 4.3
CEDARLAKES/STAGECOACH INTERSECTION – LOS & Delay

APPROACH	WEEKDAY PEAK AM HOUR 2023 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)		WEEKDAY PEAK PM HOUR 2023 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)	
	LOS	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
EB L/T/R - Cedarlakes	B **B** *B* ***B*** (B)	12.2 **12.6** *12.8* ***12.9*** (13.1)	B **B** *B* ***B*** (B)	13.4 **14.0** *14.4* ***14.4*** (14.9)
WB L/T/R - Lakeshore	A **B** *B* ***B*** (B)	9.9 **10.1** *10.2* ***10.2*** (10.3)	A **A** *A* ***A*** (A)	9.6 **9.6** *9.7* ***9.7*** (9.8)
NB L/T/R - Stagecoach	A **A** *A* ***A*** (A)	0.1 **0.1** *0.1* ***0.1*** (0.1)	A **A** *A* ***A*** (A)	0.2 **0.2** *0.2* ***0.2*** (0.2)
SB L/T/R - Stagecoach	A **A** *A* ***A*** (A)	0.9 **0.9** *0.9* ***0.8*** (0.8)	A **A** *A* ***A*** (A)	0.7 **0.7** *0.7* ***0.7*** (0.7)

For the expected 2029 and 2034 background traffic which would not include trips from the Cedar Lakes Subdivision, the eastbound Cedarlakes Way and westbound Lakeshore Drive approaches would function at a LOS “B”, and the northbound and southbound Stagecoach Road approaches at a LOS “A” during the peak AM hour. During the 2029 and 2034 peak PM hour, the eastbound approach would function at a LOS “B” and the northbound, southbound and westbound approaches at a LOS “A”. The operation of the approaches is listed in Table 4.3 with the background traffic analysis sheets provided as Exhibit 4.9 to 4.12.

The analysis of the 2029 and 2034 total traffic which includes trips from the subdivision, determined that during the peak AM hour the eastbound and westbound approaches functioned at a LOS “B” and the northbound and southbound approaches at a LOS “A” as shown in Table 4.3. During the peak PM hour, the eastbound approach functioned at a LOS “B” and the northbound, southbound and westbound approaches at a LOS “A”. The 95th percentile queue was 0.1 vehicles at the eastbound approach and 0.0 vehicles at the northbound approach during the 2034 peak AM and PM hours. Table 4.3 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.13 to 4.16.

The Cedar Lakes Subdivision would have a minor impact on the operation of the intersection, and would not trigger the requirement for any intersection modifications.

Spartan Grove Street and Apple Orchard Road Intersection

The Spartan Grove/Apple Orchard intersection is an existing intersection located 915 m north of the Cedar Lakes Subdivision. Apple Orchard Road forms the eastbound and westbound approaches, and Spartan Grove the northbound and Greely West Drive the southbound approach. The intersection is controlled by two-way stop signs placed at the northbound and southbound approaches. There are no exclusive turn lanes at any approach to the intersection.

The existing 2020 traffic counts determined that all approaches to the intersection would function at a LOS “A” during the peak AM and PM hour. The operation of the intersection is shown in Table 4.4, with the analysis sheets provided as Exhibit 4.17 and Exhibit 4.18.

Using the 2029 and 2034 background traffic, all approaches would function at a LOS “A” during the peak AM hour. During the peak PM hour, the northbound Spartan Grove Street approach would function at a LOS “B” with all other approaches functioning at a LOS “A”. The analysis results are shown in Table 4.4 which the 2029 and 2034 background traffic analysis sheets provided as Exhibit 4.19 to Exhibit 4.22.

For the 2029 and 2034 total traffic scenarios, all approaches to the intersection would continue to function at a LOS “A” during the peak AM hour, and during the peak PM hour the northbound Spartan Grove Street approach would function at a LOS “B” and the eastbound, westbound and southbound approaches would function at a LOS “A”. The 95th percentile queue using the 2034 traffic determined that the northbound

approach would experience a queue of 0.2 vehicles, and the southbound and westbound approaches a queue of 0.1 vehicles during the peak PM hour. Table 4.4 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.23 to Exhibit 4.26.

TABLE 4.4
SPARTAN GROVE/APPLE ORCHARD INTERSECTION – LOS & Delay

APPROACH	WEEKDAY PEAK AM HOUR 2020 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)		WEEKDAY PEAK PM HOUR 2020 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)	
	LOS	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
EB L/T/R - Apple Orchard	A **A** *A* ***A*** (A)	0.5 **0.5** *0.5* ***0.5*** (0.5)	A **A** *A* ***A*** (A)	1.1 **1.1** *1.1* ***1.1*** (1.1)
WB L/T/R - Apple Orchard	A **A** *A* ***A*** (A)	1.9 **1.9** *1.9* ***2.1*** (2.2)	A **A** *A* ***A*** (A)	1.5 **1.5** *1.5* ***1.8*** (1.8)
NB L/T/R - Spartan Grove	A **A** *A* ***A*** (A)	9.1 **9.4** *9.4* ***9.5*** (9.5)	A **B** *B* ***B*** (B)	9.9 **10.6** *10.8* ***10.7*** (10.9)
SB L/T/R - Greely W.	A **A** *A* ***A*** (A)	8.8 **9.0** *9.0* ***9.0*** (9.0)	A **A** *A* ***A*** (A)	9.1 **9.4** *9.4* ***9.5*** (9.5)

The Cedar Lakes Subdivision would have a minor impact on the operation of the Spartan Grove/Apple Orchard intersection, and would not trigger the requirement for any intersection modifications.

Apple Orchard Road and Stagecoach Road Intersection

The Apple Orchard/Stagecoach intersection is located 950 m north of the proposed subdivision with Stagecoach Road forming the northbound and southbound approaches, Apple Orchard Road the eastbound approach, and Parkway Road the westbound approach. The intersection was modified in 2018 to align the eastbound Apple Orchard Road approach with the westbound Parkway Road approach. With the approaches realigned, the intersection controls were modified from a two-way stop controlled intersection to an all-way stop controlled intersection. There are no dedicated turn lanes at any of the approaches.

An operational analysis was conducted using the 2023 traffic counts which determined that the intersection would operate at an overall LOS “B” during both the peak AM and PM hours. Table 4.5 summarizes the level of service and delay of the intersection with the analysis work sheets provided as Exhibit 4.27 and Exhibit 4.28.

A traffic control signal warrant analysis conforming to the methodology documented in Table 21, Justification 7 - Projected Volumes in the *Ontario Traffic Manual, Book 12, Traffic Signals* was conducted for the Apple Orchard/Stagecoach intersection. The analysis determined that the intersections did not meet the warrants, with 57 percent of the warrant met at the year 2029 and 60 percent met at the year 2034. The City of

Ottawa currently monitors the intersection to determine if traffic signals should be installed in the future. The analysis for the 2029 and 2034 background and total traffic scenarios would utilize the existing intersection geometry and all-way traffic control signs. Exhibit 4.29 in the Appendix presents the 2029 and 2034 traffic signal warrant analysis.

Utilizing the expected 2029 background traffic, The Apple Orchard/Stagecoach intersection would operate at a LOS "B" during both the peak AM and PM hours. At the year 2034, the intersection would operate at an overall LOS "B" during the peak AM hour and LOS "C" during the peak PM hour. Table 4.5 shows the operation of the intersection with the background traffic analysis work sheets provided as Exhibit 4.30 to Exhibit 4.33.

TABLE 4.5
APPLE ORCHARD/STAGECOACH INTERSECTION – LOS & Delay

APPROACH	WEEKDAY PEAK AM HOUR 2023 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)		WEEKDAY PEAK PM HOUR 2023 Existing **2029 Background** *2034 Background* ***2029 Total*** (2034 Total)	
	LOS	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
EB L/T/R - Apple Orchard	A **A** *A* ***A*** (A)	9.1 **9.3** *9.5* ***9.5*** (9.7)	A **B** *B* ***B*** (B)	10.0 **10.4** *10.8* ***10.8*** *(*11.1)
WB L/T/R - Parkway	A **A** *B* ***B*** (B)	9.7 **10.0** *10.2* ***10.2*** (10.5)	B **B** *B* ***B*** (B)	10.7 **11.4** *11.9* ***11.9*** (12.5)
NB L/T/R - Stagecoach	B **B** *C* ***B*** (C)	12.8 **13.9** *15.0* ***14.8*** (16.2)	B **B** *B* ***B*** (B)	11.0 **11.7** *12.2* ***12.2*** (12.8)
SB L/T/R - Stagecoach	A **A** *B* ***B*** (B)	9.5 **9.8** *10.1* ***10.0*** (10.3)	C **C** *C* ***C*** (C)	15.2 **17.4** *19.5* ***18.9*** (21.5)
Total Intersection	B **B** *B* ***B*** (B)	11.3 **12.1** *12.8* ***12.6*** (13.5)	B **B** *C* ***C*** (C)	12.8 **14.1** *15.4* ***15.1*** (16.5)

The total traffic is the addition of the background traffic and subdivision trips. Using the total expected traffic at the year 2029, the intersection would operate at a LOS "B" during the total peak AM hour and a LOS "C" during the peak PM hour. At the year 2034 the intersection would continue to operate at a LOS "B" during the peak AM hour and LOS "C" during the peak PM hour. The 95th percentile queue during the 2034 peak AM hour would be 4.6 vehicles at the northbound approach and 1.0 vehicle at the southbound approach. During the peak PM hour the queuing would be 1.8 vehicles at the northbound approach and 6.1 vehicles at the southbound approach. The operation of the intersection is summarized in Table 4.5 with the analysis sheets provided as Exhibit 4.34 to 4.37.

The expected trips from the subdivision would have a minor impact on the operation of the Apple Orchard/Stagecoach intersection, and would not trigger the requirement for any intersection modifications.

MULTI-MODAL LEVEL OF SERVICE (MMLOS) - Intersections

As documented in the *Multi-Modal Level of Service (MMLOS) Guidelines*, only signalized intersections are considered for the multi-modal intersection LOS measures. For this TIA, only the peak hour vehicle LOS analysis was determined.

The HCM states that for two-way stop controlled intersections the vehicle LOS is defined for each lane movement and not defined as an intersection as a whole. For an all-way stop controlled intersection the vehicle LOS methodology analyzes each intersection approach independently with an overall LOS for the intersection. Table 4.6 presents the 2034 vehicle LOS as a range for the intersection approaches shown in Tables 4.2 to 4.5. The vehicle LOS target was obtained from Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines.*

TABLE 4.6
MULTI-MODAL (MMLOS) INTERSECTION SUMMARY TABLE - Intersection

INTERSECTION	Level of Service (LOS) – 2034				
	Pedestrian	Bicycle	Transit	Auto	Truck
Street 1/Stagecoach	-	-	-	A-B	-
Cedar Lakes/Stagecoach	-	-	-	A-B	-
Spartan Grove/Apple Orchard	-	-	-	A	-
Apple Orchard/Stagecoach	-	-	-	B-C	-
Target	-	-	-	D	-

SUMMARY

A Plan of Subdivision has been prepared for the Cedar Lakes Phase 3 and 4 development which is situated on 40.63 ha of vacant land in the Village of Greely. The subdivision is located on the west side of Stagecoach Road approximately 950 m south of Apple Orchard Road, adjacent to the south limit of Cedar Lakes Phase 1 and 2 which was substantially completed by 2022. The development will consist of 71 single-family detached homes constructed in two phases with an expected date of completion and occupancy of 2029.

The Transportation Impact Assessment (TIA) report has established a study area which would comprise of the new subdivision access intersection of Street 1/Stagecoach, and the existing intersections of Cedarlakes/Stagecoach, Spartan Grove/Apple Orchard, and Apple Orchard/Stagecoach intersections. The operational analysis will be conducted for the weekday peak AM and PM hours at the completion of the total Phase 3 and 4 in

2029, and at five years beyond completion at the year 2034. The TIA analysis has examined all modes of transportation along the road segments and the intersections within the study area. The transportation analysis has determined the following:

1. The Cedar Lakes Subdivision Phase 3 and 4 would consist of 71 single-family housing units and is expected to generate 14 vehicle trips arriving and 34 vehicle trips departing during the weekday peak AM hour for a total of 48 trips, and 34 vehicle trips arriving and 21 vehicle trips departing during the weekday peak PM hour for a total of 55 trips.

2. The subdivision will have four access points onto the surrounding road network. As part of the subdivision, a new access will be provided onto Stagecoach Road at the east limit of the site forming the Street 1/Stagecoach intersection. The second new access will be a minor access along Block 94 connecting Cedarlakes Way to Deermeadow Drive, and eventually onto Manotick Station Road at the west limit of the site. The third and fourth access points would be along existing roads at the north limit of the subdivision linking the development to Stagecoach Road at the Cedarlakes/Stagecoach intersection and Apple Orchard Road at the Spartan Grove/Apple Orchard intersection.

3. The Multi-Modal Level of Service (MMLOS) was completed for the street segments of Stagecoach Road and Apple Orchard Road. The bicycle and pedestrian modes did not meet the target levels due mainly to the rural nature of the subdivision and surrounding area. The pedestrian level of service PLOS could be improved by lowering the speed limit and providing sidewalks. The bicycle level of service BLOS could be improved by lowering the speed limit and providing designated bike lanes.

4. An operational analysis was conducted at the three subdivision access points of Street 1/Stagecoach, Cedarlakes/Stagecoach, and Spartan Grove/Apple Orchard intersections. All three intersections are two-way stop controlled intersections which operated at an acceptable level of service during the 2029 and 2034 peak AM and PM hour and would not require any intersection modifications due to the development of the subdivision. The minor access along Block 94 was not examined due to the small number of expected site trips.

   The Apple Orchard/Stagecoach intersection located 950 m north of the site was also examined as it is within the study area of the TIA. The intersection is currently an all-way stop controlled intersection with Stagecoach Road forming the northbound and southbound approaches, Apple Orchard Road the eastbound approach and Parkway Road the westbound approach. The intersection was determined to operate at an acceptable level of service using the 2023 traffic counts. A traffic signal warrant analysis was conducted using the expected 2034 traffic. The analysis determined that the intersection did not meet the traffic signal warrant, therefore the intersection was further examined utilizing the existing geometry and all-way stop control signs. The intersection was determined to operate at an acceptable level of service using the 2029 and 2034

total traffic. The Cedar Lakes Subdivision Phase 3 and 4 would not trigger any requirements for intersection modifications to the Apple Orchard/Stagecoach intersection.

5. The roadway network within the subdivision will comprise of rural local roads with a 7.0 m wide paved surface and gravel shoulders. All intersections would be controlled by two-way stop control signs (Ra-1) placed at the minor street approaches. The locations of the stop signs are shown in Figure 2.1.

   The interior street layout of the subdivision proposes a horizontal alignment with intersections which promotes traffic calming within the community.

Prepared by:

David J. Halpenny, M. Eng., P. Eng.

APPENDIX

CERTIFICATION FORM

SCREENING FORM

TRAFFIC COUNTS

MULTI-MODAL LEVEL OF SERVICE - SEGMENT FORM

OPERATIONAL ANALYSIS WORK SHEETS

TRAFFIC CONTROL SIGNAL WARRANT ANALYSIS

EXHIBIT A.1
CERTIFICATION FORM

Transportation Impact Assessment Guidelines

Certification Form for TIA Study PM

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

- [X] I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
- [X] I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
- [X] I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
- [X] I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise
  - [X] is either transportation engineering
  - [ ] or transportation planning .

[1,2] License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Dated at Ottawa (City) this 2nd day of September, 20 21.

Name : David J. Halpenny

Professional title: President, D. J. Halpenny & Associates Ltd.

D J Halpenny

Signature of individual certifier that s/he meets the above criteria

Office Contact Information (Please Print)	
Address:	P.O. Box 774
City / Postal Code:	Manotick ON K4M 1A7
Telephone / Extension:	613-692-8662
E-Mail Address:	David@DJHalpenny.com

Stamp

EXHIBIT 1.1
SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	Village of Greely, Stagecoach Road
Description of Location	Cedar Lakes Subdivision - Residential Development (See Figure A.1)
Land Use Classification	"RU" Zoning – Rural Countryside Zone
Development Size (units)	71 Single-Family Housing Units (See Figure 2.1)
Development Size (ha)	40.63 ha Lot Area for Phases 3 to 5
Number of Accesses and Locations	Four access points. One new access onto Stagecoach Rd. and one new access onto Deermeadow Dr. One existing access onto Spartan Grove St. and one existing access onto Stagecoach Rd. (Cedarlakes Way)
Phase of Development	Three Phases of development (Phases 3 to 4)
Buildout Year	2029

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-Family homes	60 units

	Yes	No
71 Single-Family units > 60 Minimum Development Size	X	

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		X
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		X

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?	X	
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		X
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		X
Is the proposed driveway within auxiliary lanes of an intersection?		X
Does the proposed driveway make use of an existing median break that serves an existing site?		X
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		X
Does the development include a drive-thru facility?		X

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?	X	
Does the development satisfy the Location Trigger?		X
Does the development satisfy the Safety Trigger?	X	

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

EXHIBIT 2.1
AM AND PM HOUR TRAFFIC COUNTS (June 28, 2023) – Cedarlakes/Stagecoach

All Vehicles

Time Period	NB - Stagecoach			SB - Stagecoach			EB - Cedarlakes			WB - Lakeshore			
AM	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**Total**
07:00 – 07:15	0	70	0	4	27	0	2	0	0	0	0	2	**105**
07:15 – 07:30	0	63	0	2	22	0	0	0	0	0	0	5	**92**
07:30 – 07:45	1	72	0	1	22	1	5	0	0	0	0	5	**107**
07:45 – 08:00	1	63	0	4	25	2	2	0	0	0	0	3	**100**
08:00 – 08:15	0	39	0	2	15	0	2	0	0	2	0	6	**66**
08:15 – 08:30	1	48	1	2	22	0	3	0	1	1	0	6	**85**
08:30 – 08:45	0	50	0	2	32	4	2	0	1	0	1	4	**96**
08:45 – 09:00	1	43	0	3	26	2	8	0	1	0	0	3	**87**
PM													
04:00 – 04:15	1	37	0	4	75	2	2	0	0	0	0	5	**126**
04:15 – 04:30	1	39	1	7	90	5	2	2	2	0	0	3	**152**
04:30 – 04:45	0	31	0	5	68	1	4	0	0	0	1	1	**111**
04:45 – 05:00	1	42	0	7	81	1	1	0	0	0	0	1	**134**
05:00 – 05:15	0	29	0	7	82	1	2	0	0	0	0	1	**122**
05:15 – 05:30	1	35	1	6	84	5	1	1	0	0	1	3	**138**
05:30 – 05:45	0	26	0	5	55	4	1	1	0	0	0	3	**95**
05:45 – 06:00	0	25	0	5	52	1	1	0	0	0	0	2	**86**

Truck & Bus Traffic

Time Period	NB - Stagecoach			SB - Stagecoach			EB - Cedarlakes			WB - Lakeshore			
AM	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**Total**
07:00 – 07:15	0	6	0	0	4	0	0	0	0	0	0	0	**10**
07:15 – 07:30	0	3	0	1	2	0	0	0	0	0	0	0	**6**
07:30 – 07:45	1	4	0	0	4	1	0	0	0	0	0	1	**11**
07:45 – 08:00	0	4	0	3	3	0	0	0	0	0	0	0	**10**
08:00 – 08:15	0	2	0	1	4	0	0	0	0	2	0	2	**11**
08:15 – 08:30	1	2	0	0	1	0	0	0	0	0	0	0	**4**
08:30 – 08:45	0	5	0	0	6	0	1	0	1	0	1	0	**14**
08:45 – 09:00	0	1	0	1	1	0	0	0	1	0	0	0	**4**
PM													
04:00 – 04:15	0	6	0	1	4	0	1	0	0	0	0	1	**13**
04:15 – 04:30	1	3	0	0	7	0	0	1	0	0	0	0	**12**
04:30 – 04:45	0	9	0	0	7	0	0	0	0	0	0	0	**16**
04:45 – 05:00	0	6	0	0	5	0	0	0	0	0	0	0	**11**
05:00 – 05:15	0	3	0	0	1	0	0	0	0	0	0	0	**4**
05:15 – 05:30	0	0	0	0	2	0	0	0	0	0	0	0	**2**
05:30 – 05:45	0	3	0	0	0	0	0	0	0	0	0	0	**3**
05:45 – 06:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**

EXHIBIT 2.2
2020 PEAK AM HOUR TRAFFIC COUNTS - APPLE ORCHARD/SPARTAN GROVE

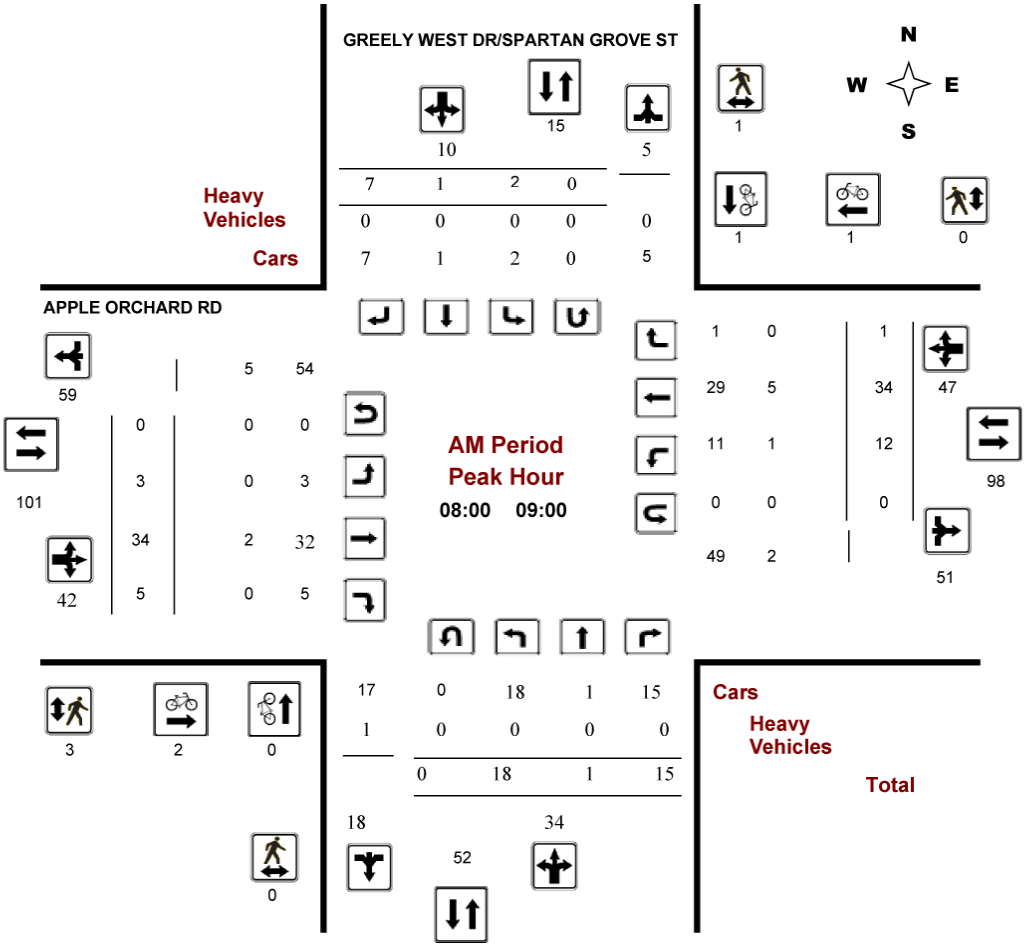
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

APPLE ORCHARD RD @ GREELY WEST DR/SPARTAN GROV

Survey Date: Tuesday, June 30, 2020 **WO No:** 40985

Start Time: 07:00 **Device:** Miovision



Comments

2020 PEAK PM HOUR TRAFFIC COUNTS - APPLE ORCHARD/SPARTAN GROVE

Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

APPLE ORCHARD RD @ GREELY WEST DR/SPARTAN GROV

Survey Date: Tuesday, June 30, 2020 **WO No:** 40985

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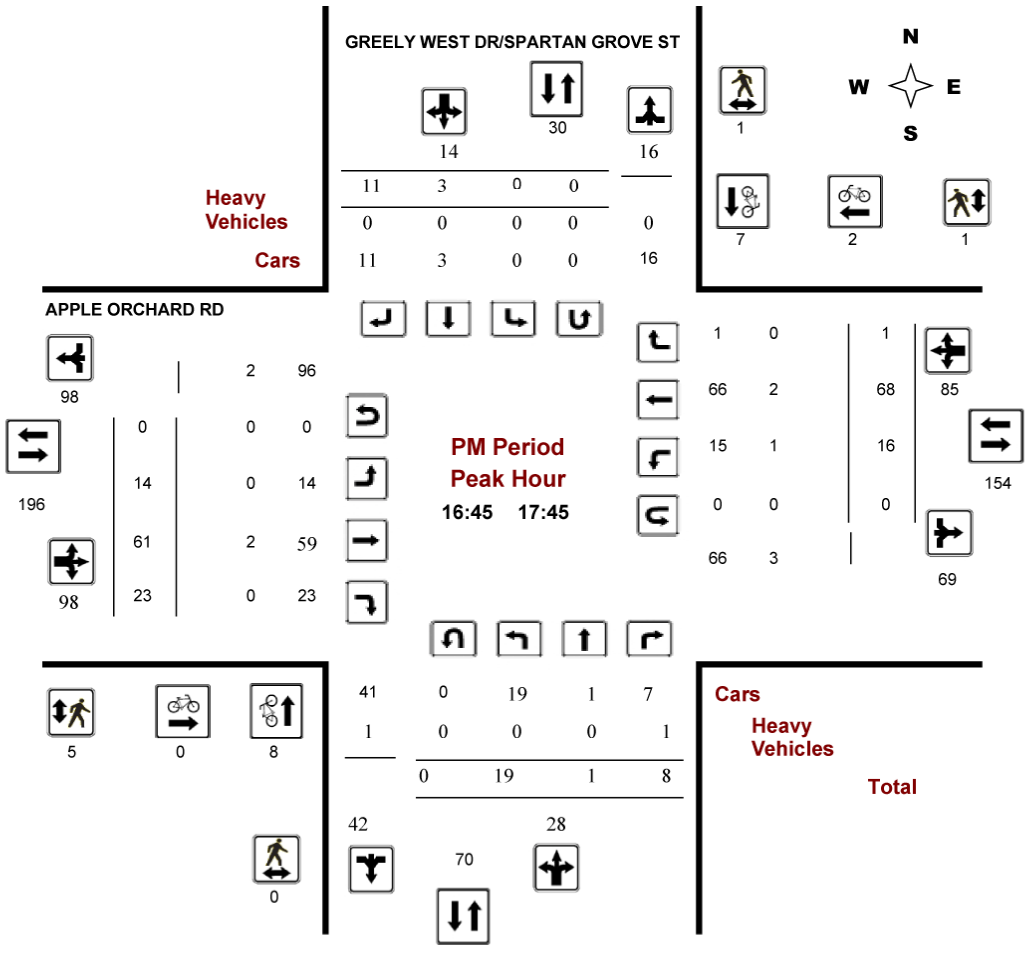
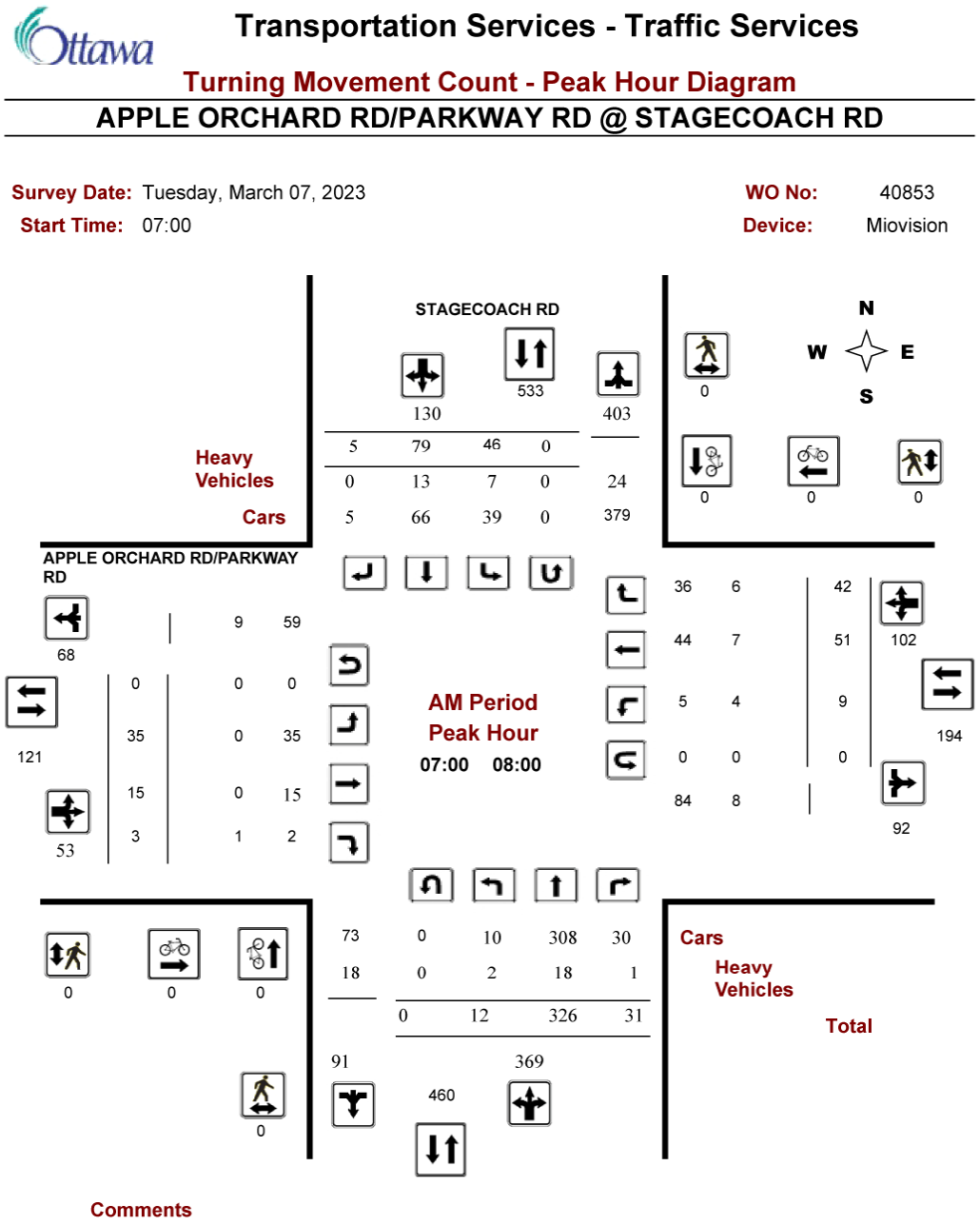


Comments

EXHIBIT 2.3
2023 PEAK AM HOUR TRAFFIC COUNTS - APPLE ORCHARD/STAGECOACH



2023 PEAK PM HOUR TRAFFIC COUNTS - APPLE ORCHARD/STAGECOACH

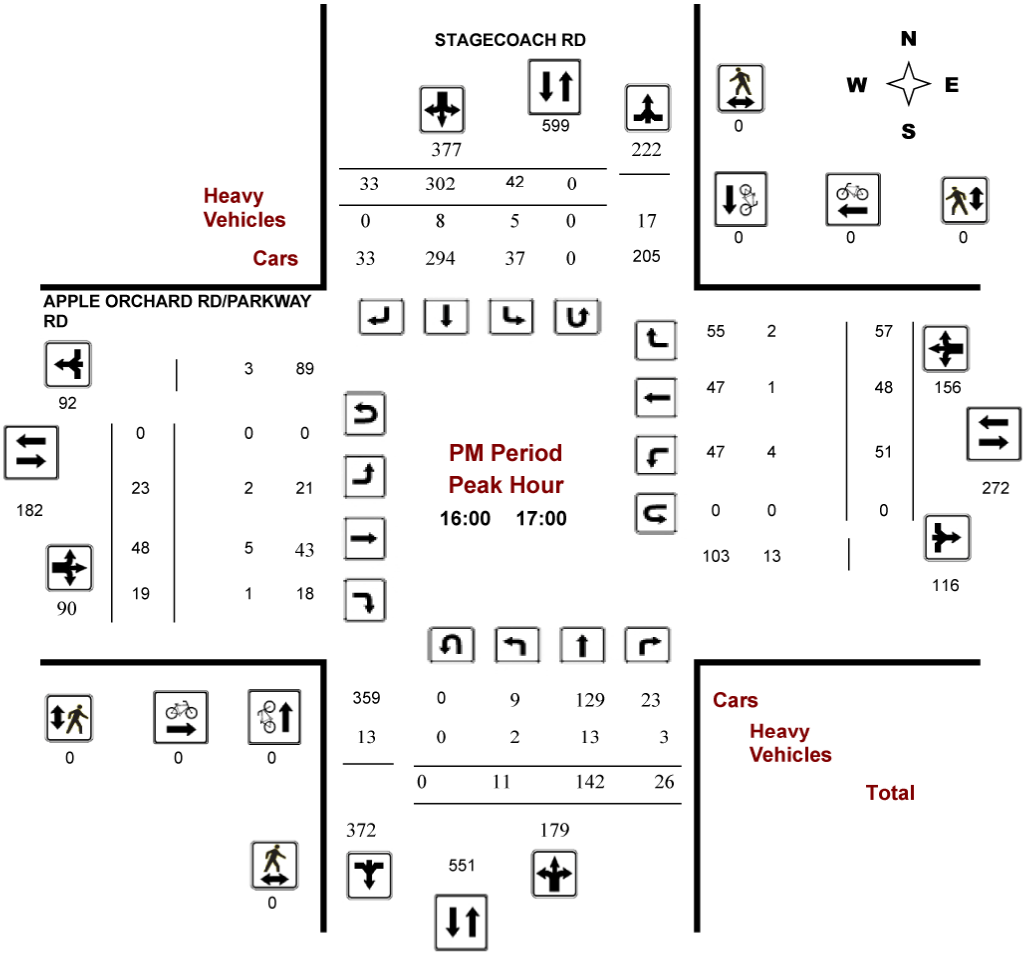
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

APPLE ORCHARD RD/PARKWAY RD @ STAGECOACH RD

Survey Date: Tuesday, March 07, 2023 **WO No:** 40853

Start Time: 07:00 **Device:** Miovision



Comments

EXHIBIT 4.1
2034 MMLOS ROAD SEGMENT - STAGECOACH ROAD

Multi-Modal Level of Service - Segments Form

Consultant		Project	Cedar Lakes Subdivision
Scenario	Total 2034 Traffic	Date	Dec-23
Comments	Stagecoach Road		
	Apple Orchard Rd. to Lakeshore Dr.		

SEGMENTS		Apple Orchard	Section 1	Section 2	Section 3
Pedestrian	Sidewalk Width	F	no sidewalk		
	Boulevard Width		n/a		
	Avg Daily Curb Lane Traffic Volume		> 3000		
	Operating Speed		> 60 km/h		
	On-Street Parking		no		
	Exposure to Traffic PLoS		F	-	-
	Effective Sidewalk Width		1.2 m		
	Pedestrian Volume		250 ped/hr		
	Crowding PLoS		B	-	-
	Level of Service		F	-	-
Bicycle	Type of Cycling Facility	F	Mixed Traffic		
	Number of Travel Lanes		2-3 lanes total		
	Operating Speed		≥ 60 km/h		
	# of Lanes & Operating Speed LoS		F	-	-
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		-	-	-
	Bike Lane Blockages				
	Blockage LoS		-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
	Sidestreet Operating Speed		>40 to 50 km/h		
	Unsignalized Crossing - Lowest LoS		B	-	-
	Level of Service		F	-	-
Transit	Facility Type	-			
	Friction or Ratio Transit:Posted Speed				
	Level of Service		-	-	-
Truck	Truck Lane Width	C	≤ 3.5 m		
	Travel Lanes per Direction		1		
	Level of Service		C	-	-

EXHIBIT 4.2
2034 MMLOS ROAD SEGMENT - APPLE ORCHARD ROAD

Multi-Modal Level of Service - Segments Form

Consultant		Project	Cedar Lakes Subdivision
Scenario	Total 2034 Traffic	Date	Dec-23
Comments	Apple Orchard Road		
	Manotick Station Rd. to Stagecoach Rd.		

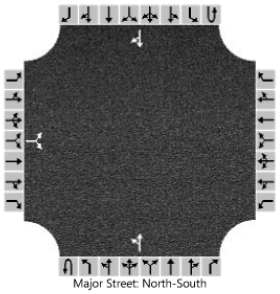
SEGMENTS		Apple Orchard	Section 1	Section 2	Section 3
Pedestrian	Sidewalk Width Boulevard Width	F	no sidewalk n/a		
	Avg Daily Curb Lane Traffic Volume		≤ 3000		
	Operating Speed On-Street Parking		> 60 km/h no		
	Exposure to Traffic PLoS		F	-	-
	Effective Sidewalk Width		1.2 m		
	Pedestrian Volume		250 ped/hr		
	Crowding PLoS		B	-	-
	Level of Service		F	-	-
Bicycle	Type of Cycling Facility	F	Mixed Traffic		
	Number of Travel Lanes		2-3 lanes total		
	Operating Speed		≥ 60 km/h		
	# of Lanes & Operating Speed LoS		F	-	-
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		-	-	-
	Bike Lane Blockages				
	Blockage LoS		-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
	Sidestreet Operating Speed		>40 to 50 km/h		
	Unsignalized Crossing - Lowest LoS		B	-	-
	Level of Service		F	-	-
Transit	Facility Type	-			
	Friction or Ratio Transit:Posted Speed				
	Level of Service		-	-	-
Truck	Truck Lane Width	C	≤ 3.5 m		
	Travel Lanes per Direction		1		
	Level of Service		C	-	-

EXHIBIT 4.3
2029 TOTAL PEAK AM HOUR ANALYSIS – Street 1/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Street 1/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Street 1
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		14		4						1	288				104	6
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

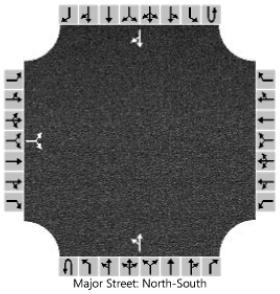
Flow Rate, v (veh/h)			20							1						
Capacity, c (veh/h)			632							1462						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			10.9							7.5	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	10.9								0.0							
Approach LOS	B								A							

EXHIBIT 4.4
2029 TOTAL PEAK PM HOUR ANALYSIS – Street 1/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Street 1/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Street 1
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		10		2						3	164				336	15
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13							3						
Capacity, c (veh/h)			511							1171						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			12.2							8.1	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	12.2								0.2							
Approach LOS	B								A							

HCS™ TWSC Version 2023
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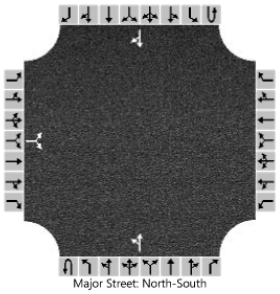
EXHIBIT 4.5
2034 TOTAL PEAK AM HOUR ANALYSIS – Street 1/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Street 1/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Street 1
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		14		4						1	302				109	6
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			20							1						
Capacity, c (veh/h)			617							1455						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			11.0							7.5	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	11.0								0.0							
Approach LOS	B								A							

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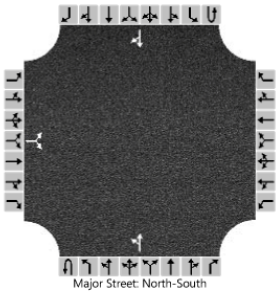
EXHIBIT 4.6
2034 TOTAL PEAK PM HOUR ANALYSIS – Street 1/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Street 1/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Street 1
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		10		2						3	172				353	15
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13							3						
Capacity, c (veh/h)			493							1153						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			12.5							8.1	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	12.5								0.2							
Approach LOS	B								A							

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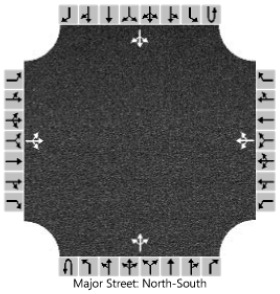
EXHIBIT 4.7
2023 EXISTING PEAK AM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2023	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Existing	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		9	0	0		0	0	15		2	268	0		11	96	3
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			10				16			2				12		
Capacity, c (veh/h)			513				746			1477				1265		
v/c Ratio			0.02				0.02			0.00				0.01		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			12.2				9.9			7.4	0.0	0.0		7.9	0.1	0.1
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)		12.2				9.9				0.1				0.9		
Approach LOS		B				A				A				A		

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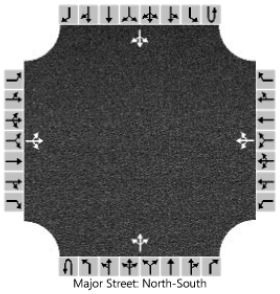
EXHIBIT 4.8
2023 EXISTING PEAK PM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2023	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Existing	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		9	2	2		0	1	10		3	149	1		23	314	9
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			14				12			3				25		
Capacity, c (veh/h)			443				801			1202				1410		
v/c Ratio			0.03				0.01			0.00				0.02		
95% Queue Length, Q_{95} (veh)			0.1				0.0			0.0				0.1		
Control Delay (s/veh)			13.4				9.6			8.0	0.0	0.0		7.6	0.2	0.2
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)		13.4				9.6				0.2				0.7		
Approach LOS		B				A				A				A		

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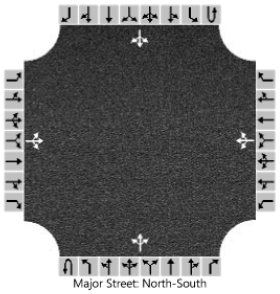
EXHIBIT 4.9
2029 BACKGROUND PEAK AM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	0	0		0	0	16		2	286	0		12	104	3
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				17			2				13		
Capacity, c (veh/h)			488				727			1466				1244		
v/c Ratio			0.02				0.02			0.00				0.01		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			12.6				10.1			7.5	0.0	0.0		7.9	0.1	0.1
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)	12.6				10.1				0.1				0.9			
Approach LOS	B				B				A				A			

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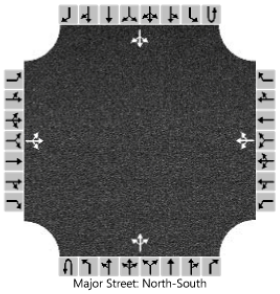
EXHIBIT 4.10
2029 BACKGROUND PEAK PM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	2	2		0	1	11		3	160	1		24	334	10
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			15				13			3				26		
Capacity, c (veh/h)			417				790			1179				1395		
v/c Ratio			0.04				0.02			0.00				0.02		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			14.0				9.6			8.1	0.0	0.0		7.6	0.2	0.2
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)		14.0				9.6				0.2				0.7		
Approach LOS		B				A				A				A		

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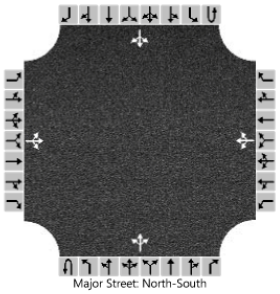
EXHIBIT 4.11
2034 BACKGROUND PEAK AM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	0	0		0	0	17		2	300	0		12	109	3
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				18			2				13		
Capacity, c (veh/h)			471				713			1459				1228		
v/c Ratio			0.02				0.03			0.00				0.01		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			12.8				10.2			7.5	0.0	0.0		8.0	0.1	0.1
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)		12.8				10.2				0.1				0.9		
Approach LOS		B				B				A				A		

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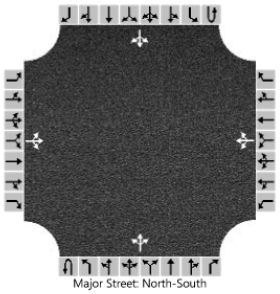
EXHIBIT 4.12
2034 BACKGROUND PEAK PM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	2	2		0	1	11		3	168	1		26	351	10
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			15				13			3				28		
Capacity, c (veh/h)			397				777			1161				1385		
v/c Ratio			0.04				0.02			0.00				0.02		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			14.4				9.7			8.1	0.0	0.0		7.7	0.2	0.2
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)	14.4				9.7				0.2				0.7			
Approach LOS	B				A				A				A			

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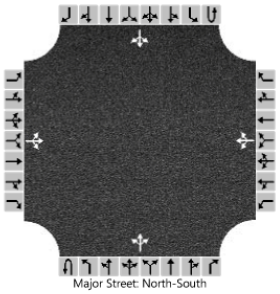
EXHIBIT 4.13
2029 TOTAL PEAK AM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		12	0	0		0	0	16		2	300	0		12	110	4
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13				17			2				13		
Capacity, c (veh/h)			471				713			1457				1228		
v/c Ratio			0.03				0.02			0.00				0.01		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			12.9				10.2			7.5	0.0	0.0		8.0	0.1	0.1
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)		12.9				10.2				0.1				0.8		
Approach LOS		B				B				A				A		

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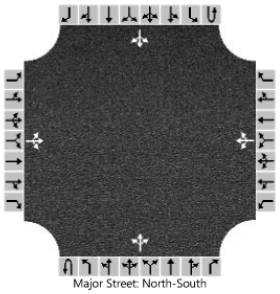
EXHIBIT 4.14
2029 TOTAL PEAK PM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2029	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		11	2	2		0	1	11		3	170	1		24	349	12
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			16				13			3				26		
Capacity, c (veh/h)			398				776			1161				1383		
v/c Ratio			0.04				0.02			0.00				0.02		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			14.4				9.7			8.1	0.0	0.0		7.7	0.2	0.2
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)		14.4				9.7				0.2				0.7		
Approach LOS		B				A				A				A		

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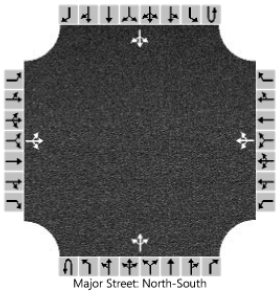
EXHIBIT 4.15
2034 TOTAL PEAK AM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		12	0	0		0	0	17		2	314	0		12	115	4
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13				18			2				13		
Capacity, c (veh/h)			455				699			1450				1212		
v/c Ratio			0.03				0.03			0.00				0.01		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			13.1				10.3			7.5	0.0	0.0		8.0	0.1	0.1
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)		13.1				10.3				0.1				0.8		
Approach LOS		B				B				A				A		

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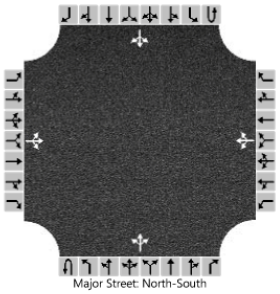
EXHIBIT 4.16
2034 TOTAL PEAK PM HOUR ANALYSIS – Cedarlakes/Stagecoach

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Cedarlakes/Stagecoach
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Cedarlakes Way (Lakeshore Dr.)
Analysis Year	2034	North/South Street	Stagecoach Road
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		11	2	2		0	1	11		3	178	1		26	366	12
Percent Heavy Vehicles (%)		3	0	3		3	0	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.50	6.23		7.13	6.50	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.00	3.33		3.53	4.00	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			16				13			3				28		
Capacity, c (veh/h)			379				763			1143				1373		
v/c Ratio			0.04				0.02			0.00				0.02		
95% Queue Length, Q_{95} (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			14.9				9.8			8.2	0.0	0.0		7.7	0.2	0.2
Level of Service (LOS)			B				A			A	A	A		A	A	A
Approach Delay (s/veh)	14.9				9.8				0.2				0.7			
Approach LOS	B				A				A				A			

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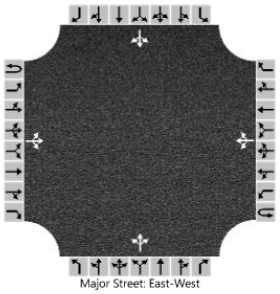
EXHIBIT 4.17
2020 EXISTING PEAK AM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2020	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak AM Hour - Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		3	34	5		12	34	1		18	1	15		2	1	7
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		3				13					37				11	
Capacity, c (veh/h)		1566				1560					914				954	
v/c Ratio		0.00				0.01					0.04				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.0	
Control Delay (s/veh)		7.3	0.0	0.0		7.3	0.1	0.1			9.1				8.8	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	0.5				1.9				9.1				8.8			
Approach LOS	A				A				A				A			

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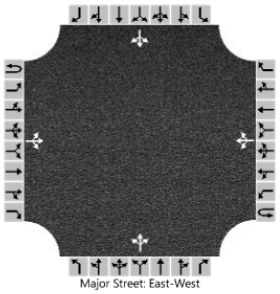
EXHIBIT 4.18
2020 EXISTING PEAK PM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2020	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak PM Hour - Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	61	23		16	68	1		19	1	8		0	3	11
Percent Heavy Vehicles (%)		3				3				3	1	3		3	1	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.51	6.23		7.13	6.51	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.01	3.33		3.53	4.01	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		15				17					30				15	
Capacity, c (veh/h)		1518				1497					759				889	
v/c Ratio		0.01				0.01					0.04				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.4	0.1	0.1		7.4	0.1	0.1			9.9				9.1	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	1.1				1.5				9.9				9.1			
Approach LOS	A				A				A				A			

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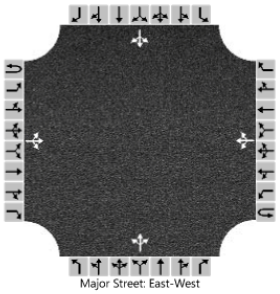
EXHIBIT 4.19
2029 BACKGROUND PEAK AM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2029	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak AM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	50	7		16	47	1		24	1	20		3	1	9
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				17					49				14	
Capacity, c (veh/h)		1547				1535					868				918	
v/c Ratio		0.00				0.01					0.06				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.0	
Control Delay (s/veh)		7.3	0.0	0.0		7.4	0.1	0.1			9.4				9.0	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	0.5				1.9				9.4				9.0			
Approach LOS	A				A				A				A			

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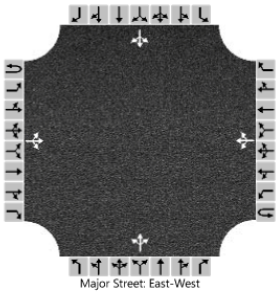
EXHIBIT 4.20
2029 BACKGROUND PEAK PM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2029	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak PM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		18	83	30		21	94	1		25	1	11		0	4	14
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		20				23					40				20	
Capacity, c (veh/h)		1482				1458					684				836	
v/c Ratio		0.01				0.02					0.06				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		7.5	0.1	0.1		7.5	0.1	0.1			10.6				9.4	
Level of Service (LOS)		A	A	A		A	A	A			B				A	
Approach Delay (s/veh)	1.1				1.5				10.6				9.4			
Approach LOS	A				A				B				A			

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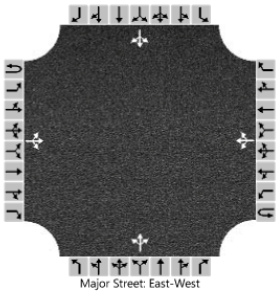
EXHIBIT 4.21
2034 BACKGROUND PEAK AM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2034	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak AM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	52	7		17	49	1		25	1	21		3	1	10
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				18					51				15	
Capacity, c (veh/h)		1544				1532					861				919	
v/c Ratio		0.00				0.01					0.06				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		7.3	0.0	0.0		7.4	0.1	0.1			9.4				9.0	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	0.5				1.9				9.4				9.0			
Approach LOS	A				A				A				A			

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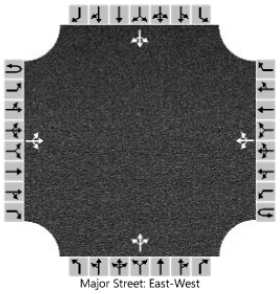
EXHIBIT 4.22
2034 BACKGROUND PEAK PM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2034	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak PM Hour - Background	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		19	87	32		22	99	1		26	1	11		0	4	15
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		21				24					41				21	
Capacity, c (veh/h)		1476				1450					666				831	
v/c Ratio		0.01				0.02					0.06				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.5	0.1	0.1		7.5	0.1	0.1			10.8				9.4	
Level of Service (LOS)		A	A	A		A	A	A			B				A	
Approach Delay (s/veh)	1.1				1.5				10.8				9.4			
Approach LOS	A				A				B				A			

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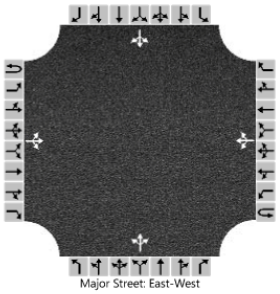
EXHIBIT 4.23
2029 TOTAL PEAK AM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2029	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	51	9		19	48	1		29	1	27		3	1	9
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				21					62				14	
Capacity, c (veh/h)		1546				1530					864				908	
v/c Ratio		0.00				0.01					0.07				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.0	
Control Delay (s/veh)		7.3	0.0	0.0		7.4	0.1	0.1			9.5				9.0	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	0.5				2.1				9.5				9.0			
Approach LOS	A				A				A				A			

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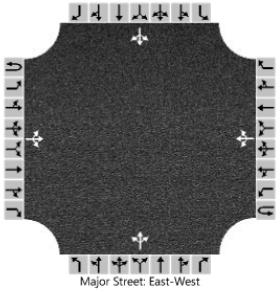
EXHIBIT 4.24
2029 TOTAL PEAK PM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2029	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		18	85	35		28	95	1		28	1	15		0	4	14
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		20				30					48				20	
Capacity, c (veh/h)		1481				1449					675				825	
v/c Ratio		0.01				0.02					0.07				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.5	0.1	0.1		7.5	0.2	0.2			10.7				9.5	
Level of Service (LOS)		A	A	A		A	A	A			B				A	
Approach Delay (s/veh)	1.1				1.8				10.7				9.5			
Approach LOS	A				A				B				A			

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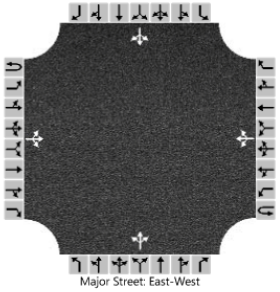
EXHIBIT 4.25
2034 TOTAL PEAK AM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2034	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak AM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	53	9		20	50	1		30	1	28		3	1	10
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				22					64				15	
Capacity, c (veh/h)		1543				1528					857				909	
v/c Ratio		0.00				0.01					0.07				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		7.3	0.0	0.0		7.4	0.1	0.1			9.5				9.0	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	0.5				2.2				9.5				9.0			
Approach LOS	A				A				A				A			

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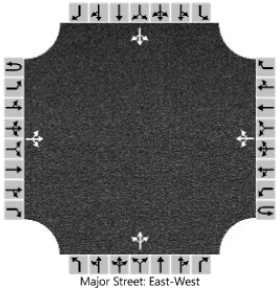
EXHIBIT 4.26
2034 TOTAL PEAK PM HOUR ANALYSIS – Spartan Grove/Apple Orchard

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Spartan Grove/Apple Orchard
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	12/4/2023	East/West Street	Apple Orchard Road
Analysis Year	2034	North/South Street	Spartan Grove Street (Greely West Dr.)
Time Analyzed	Peak PM Hour - Total	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Cedar Lakes Phase 3 to 4		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		19	89	37		29	100	1		29	1	15		0	4	15
Percent Heavy Vehicles (%)		3				3				3	0	3		3	0	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.50	6.23		7.13	6.50	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.00	3.33		3.53	4.00	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		21				32					49				21	
Capacity, c (veh/h)		1474				1441					658				821	
v/c Ratio		0.01				0.02					0.07				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.5	0.1	0.1		7.6	0.2	0.2			10.9				9.5	
Level of Service (LOS)		A	A	A		A	A	A			B				A	
Approach Delay (s/veh)	1.1				1.8				10.9				9.5			
Approach LOS	A				A				B				A			

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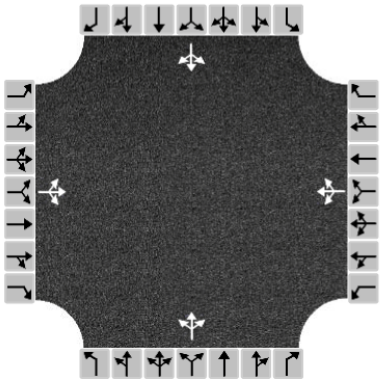
EXHIBIT 4.27
2023 EXISTING PEAK AM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2023
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak AM Hour - Existing
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	35	15	3	9	51	42	12	326	31	46	79	5
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	58			111			401			141		
Percent Heavy Vehicles	1			25			10			15		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.051			0.099			0.357			0.126		
Final Departure Headway, h_d (s)	5.55			5.53			4.70			5.19		
Final Degree of Utilization, x	0.089			0.170			0.524			0.204		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.55			3.53			2.70			3.19		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	58			111			401			141		
Capacity (veh/h)	648			651			765			694		
95% Queue Length, Q_{95} (veh)	0.3			0.6			3.1			0.8		
Control Delay (s/veh)	9.1			9.7			12.8			9.5		
Level of Service, LOS	A			A			B			A		
Approach Delay (s/veh) | LOS	9.1	A		9.7	A		12.8	B		9.5	A	
Intersection Delay (s/veh) | LOS	11.3						B					

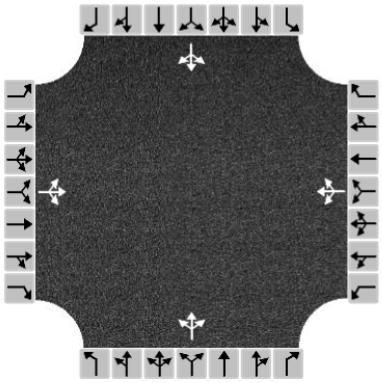
EXHIBIT 4.28
2023 EXISTING PEAK PM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information

Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2023
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak PM Hour - Existing
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	23	48	19	51	48	57	11	142	26	42	302	33
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	98			170			195			410		
Percent Heavy Vehicles	5			5			20			10		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.087			0.151			0.173			0.364		
Final Departure Headway, h_d (s)	5.88			5.65			5.58			5.15		
Final Degree of Utilization, x	0.160			0.266			0.302			0.586		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.88			3.65			3.58			3.15		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	98			170			195			410		
Capacity (veh/h)	612			637			645			699		
95% Queue Length, Q_{95} (veh)	0.6			1.1			1.3			3.8		
Control Delay (s/veh)	10.0			10.7			11.0			15.2		
Level of Service, LOS	A			B			B			C		
Approach Delay (s/veh) | LOS	10.0	A		10.7	B		11.0	B		15.2	C	
Intersection Delay (s/veh) | LOS	12.8						B					

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EXHIBIT 4.29
2029 & 2034 TRAFFIC SIGNAL WARRANT ANALYSIS – Apple Orchard/Stagecoach

MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL USING PROJECTED VOLUME

Intersection Location: Apple Orchard Road and Stagecoach Road

Projected Volume: Year 2029 Total Traffic

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT 1 LANE EACH DIRECTION HIGHWAYS		COMPLIANCE		
				SECTIONAL		
		FREE FLOW	RESTR. FLOW	NUMERICAL	%	ENTIRE %
1. VEHICULAR VOLUME	A. Vehicle volume all approaches (Average hour)	480	(720)	411	57	(57%)
	B. Vehicle volume, along minor roads, (average hour)	120	(170)	118	69	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volume, along artery (average hour)	480	(720)	293	41	41%
	B. Combined vehicle and pedestrian volume crossing artery from minor streets, (average hour)	50	(75)	64	85	

Projected Volume: Year 2034 Total Traffic

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT 1 LANE EACH DIRECTION HIGHWAYS		COMPLIANCE		
				SECTIONAL		
		FREE FLOW	RESTR. FLOW	NUMERICAL	%	ENTIRE %
1. VEHICULAR VOLUME	A. Vehicle volume all approaches (Average hour)	480	(720)	431	60	(60%)
	B. Vehicle volume, along minor roads, (average hour)	120	(170)	125	74	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volume, along artery (average hour)	480	(720)	306	43	43%
	B. Combined vehicle and pedestrian volume crossing artery from minor streets, (average hour)	50	(75)	67	89	

Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4

NOTES:
1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.

2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.

4. The lowest sectional percentage governs the entire Warrant.

5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).

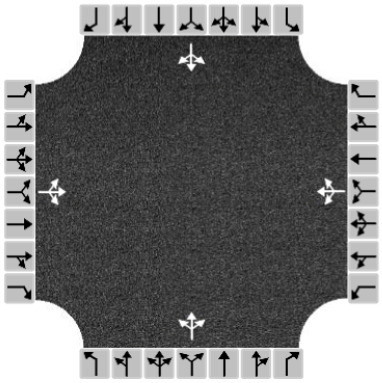
6. The crossing volumes are defined as:
   (a) Left turns from both minor road approaches
   (b) The heaviest through volume from the minor road
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left turn volume > 120 vph.
      (ii) the left turn volume plus the opposing volume > 720 vph.
   (d) Pedestrians crossing the major road.

EXHIBIT 4.30
2029 BACKGROUND PEAK AM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2029
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak AM Hour - Background
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	37	16	3	10	56	46	13	347	33	51	86	5
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	61			122			427			154		
Percent Heavy Vehicles	1			25			10			15		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.054			0.108			0.380			0.137		
Final Departure Headway, h_d (s)	5.70			5.66			4.78			5.29		
Final Degree of Utilization, x	0.096			0.191			0.567			0.227		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.70			3.66			2.78			3.29		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	61			122			427			154		
Capacity (veh/h)	632			636			753			681		
95% Queue Length, Q_{95} (veh)	0.3			0.7			3.6			0.9		
Control Delay (s/veh)	9.3			10.0			13.9			9.8		
Level of Service, LOS	A			A			B			A		
Approach Delay (s/veh) | LOS	9.3	A		10.0	A		13.9	B		9.8	A	
Intersection Delay (s/veh) | LOS	12.1						B					

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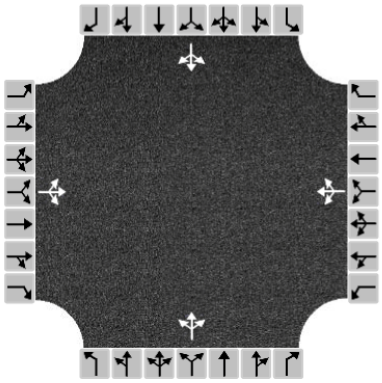
EXHIBIT 4.31
2029 BACKGROUND PEAK PM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2029
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak PM Hour - Background
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	24	54	20	54	56	63	12	153	28	46	322	35
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	107			188			210			438		
Percent Heavy Vehicles	5			5			20			10		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.095			0.167			0.186			0.389		
Final Departure Headway, h_d (s)	6.10			5.84			5.77			5.30		
Final Degree of Utilization, x	0.181			0.305			0.336			0.645		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	4.10			3.84			3.77			3.30		

Capacity, Delay and Level of Service

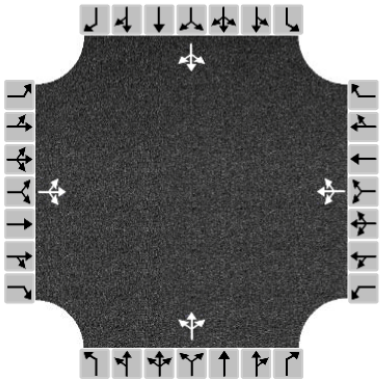
Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	107			188			210			438		
Capacity (veh/h)	590			617			624			679		
95% Queue Length, Q_{95} (veh)	0.7			1.3			1.5			4.7		
Control Delay (s/veh)	10.4			11.4			11.7			17.4		
Level of Service, LOS	B			B			B			C		
Approach Delay (s/veh) | LOS	10.4	B		11.4	B		11.7	B		17.4	C	
Intersection Delay (s/veh) | LOS	14.1						B					

EXHIBIT 4.32
2034 BACKGROUND PEAK AM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2034
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak AM Hour - Background
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	39	22	3	10	59	48	13	365	35	52	89	6
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	70			127			449			160		
Percent Heavy Vehicles	1			25			10			15		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.062			0.113			0.399			0.142		
Final Departure Headway, h_d (s)	5.80			5.76			4.85			5.39		
Final Degree of Utilization, x	0.112			0.204			0.605			0.239		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.80			3.76			2.85			3.39		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	70			127			449			160		
Capacity (veh/h)	621			625			742			668		
95% Queue Length, Q_{95} (veh)	0.4			0.8			4.1			0.9		
Control Delay (s/veh)	9.5			10.2			15.0			10.1		
Level of Service, LOS	A			B			C			B		
Approach Delay (s/veh) | LOS	9.5	A		10.2	B		15.0	C		10.1	B	
Intersection Delay (s/veh) | LOS	12.8						B					

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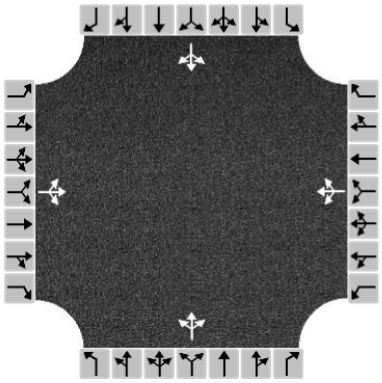
EXHIBIT 4.33
2034 BACKGROUND PEAK PM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2034
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak PM Hour - Background
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	26	57	21	57	59	66	12	160	29	48	338	37
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	113			198			218			460		
Percent Heavy Vehicles	5			5			20			10		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.100			0.176			0.194			0.409		
Final Departure Headway, h_d (s)	6.26			5.98			5.90			5.40		
Final Degree of Utilization, x	0.197			0.329			0.358			0.690		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	4.26			3.98			3.90			3.40		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	113			198			218			460		
Capacity (veh/h)	575			602			610			666		
95% Queue Length, Q_{95} (veh)	0.7			1.4			1.6			5.5		
Control Delay (s/veh)	10.8			11.9			12.2			19.5		
Level of Service, LOS	B			B			B			C		
Approach Delay (s/veh) | LOS	10.8	B		11.9	B		12.2	B		19.5	C	
Intersection Delay (s/veh) | LOS	15.4						C					

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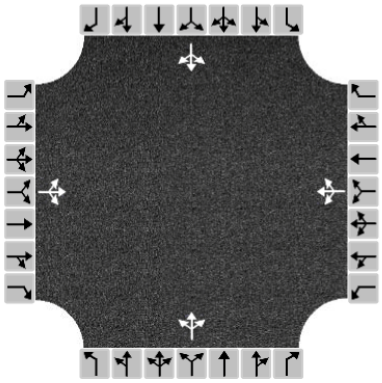
EXHIBIT 4.34
2029 TOTAL PEAK AM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information

Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2029
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak AM Hour - Total
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	37	23	4	12	59	46	14	357	38	51	90	5
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	70			127			445			159		
Percent Heavy Vehicles	1			25			10			15		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.062			0.113			0.395			0.141		
Final Departure Headway, h_d (s)	5.76			5.76			4.84			5.38		
Final Degree of Utilization, x	0.111			0.204			0.598			0.237		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.76			3.76			2.84			3.38		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	70			127			445			159		
Capacity (veh/h)	625			625			744			670		
95% Queue Length, Q_{95} (veh)	0.4			0.8			4.0			0.9		
Control Delay (s/veh)	9.5			10.2			14.8			10.0		
Level of Service, LOS	A			B			B			B		
Approach Delay (s/veh) | LOS	9.5	A		10.2	B		14.8	B		10.0	B	
Intersection Delay (s/veh) | LOS	12.6						B					

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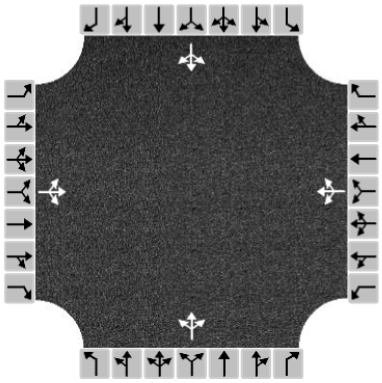
EXHIBIT 4.35
2029 TOTAL PEAK PM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information

Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2029
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak PM Hour - Total
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	24	58	22	59	63	63	13	159	32	46	332	35
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	113			201			222			449		
Percent Heavy Vehicles	5			5			20			10		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.100			0.179			0.197			0.399		
Final Departure Headway, h_d (s)	6.24			5.97			5.89			5.42		
Final Degree of Utilization, x	0.196			0.334			0.363			0.676		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	4.24			3.97			3.89			3.42		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	113			201			222			449		
Capacity (veh/h)	577			603			611			664		
95% Queue Length, Q_{95} (veh)	0.7			1.5			1.7			5.2		
Control Delay (s/veh)	10.8			11.9			12.2			18.9		
Level of Service, LOS	B			B			B			C		
Approach Delay (s/veh) | LOS	10.8	B		11.9	B		12.2	B		18.9	C	
Intersection Delay (s/veh) | LOS	15.1						C					

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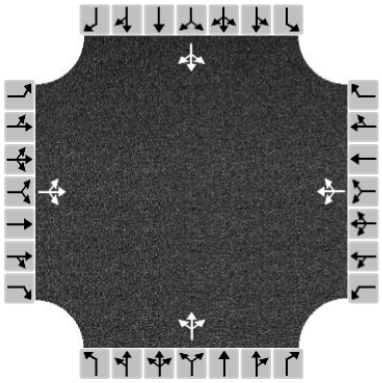
EXHIBIT 4.36
2034 TOTAL PEAK AM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information	
Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2034
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak AM Hour - Total
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	39	29	4	12	62	48	14	375	40	52	93	6
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	78			133			466			164		
Percent Heavy Vehicles	1			25			10			15		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.070			0.118			0.414			0.146		
Final Departure Headway, h_d (s)	5.88			5.88			4.92			5.48		
Final Degree of Utilization, x	0.128			0.217			0.637			0.250		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	3.88			3.88			2.92			3.48		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	78			133			466			164		
Capacity (veh/h)	612			612			732			657		
95% Queue Length, Q_{95} (veh)	0.4			0.8			4.6			1.0		
Control Delay (s/veh)	9.7			10.5			16.2			10.3		
Level of Service, LOS	A			B			C			B		
Approach Delay (s/veh) | LOS	9.7	A		10.5	B		16.2	C		10.3	B	
Intersection Delay (s/veh) | LOS	13.5						B					

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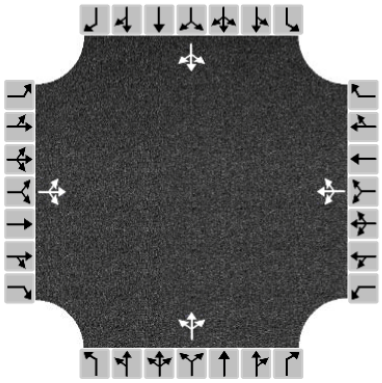
EXHIBIT 4.37
2034 TOTAL PEAK PM HOUR ANALYSIS – Apple Orchard/Stagecoach

HCS All-Way Stop Control Report

General and Site Information

Analyst	
Agency/Co.	
Date Performed	12/4/2023
Analysis Year	2034
Analysis Time Period (hrs)	0.25
Time Analyzed	Peak PM Hour - Total
Project Description	Cedar Lakes - Phase 3 to 4
Intersection	Apple Orchard/Stagecoach
Jurisdiction	City of Ottawa
East/West Street	Apple Orchard Road (Parkway Rd.)
North/South Street	Stagecoach Road
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	26	61	23	62	66	66	13	166	33	48	348	37
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	120			211			230			471		
Percent Heavy Vehicles	5			5			20			10		
Initial Departure Headway, h_d (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.106			0.187			0.205			0.418		
Final Departure Headway, h_d (s)	6.41			6.12			6.03			5.53		
Final Degree of Utilization, x	0.213			0.358			0.386			0.722		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, t_s (s)	4.41			4.12			4.03			3.53		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	120			211			230			471		
Capacity (veh/h)	561			588			597			652		
95% Queue Length, Q_{95} (veh)	0.8			1.6			1.8			6.1		
Control Delay (s/veh)	11.1			12.5			12.8			21.5		
Level of Service, LOS	B			B			B			C		
Approach Delay (s/veh) | LOS	11.1	B		12.5	B		12.8	B		21.5	C	
Intersection Delay (s/veh) | LOS	16.5						C					

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