

**KMA MOSQUE
351 SANDHILL ROAD
OTTAWA, ONTARIO**

TRANSPORTATION IMPACT ASSESSMENT

Prepared for:

The Kanata Muslim Association (KMA)

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118-675
TIA Report.doc

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TRANSPORTATION IMPACT ASSESSMENT

STEP 1 - SCREENING

A Screening Form has been prepared which is included as Exhibit 1 in the Appendix. The Trip Generation Trigger has been triggered in the Screening Form, with the City of Ottawa staff review recommending that the assessment study proceed to the Scoping Document. The following will address the requirements of the Scoping section of the report.

STEP 2 - SCOPING

MODULE 2.1 – Existing and Planned Conditions

Element 2.1.1 – Proposed Development

The Kanata Muslim Association (KMA) is preparing to submit a Site Plan Application for the development of a parcel of land at 351 Sandhill Road in Kanata. The development will consist of a mosque and community centre with the location in close proximity to a sizable Muslim community and the Kanata North High Tech Area. The site is located on the west side of Sandhill Road 145 m south of Klondike Road. Figure 2.1 shows the location of the site.

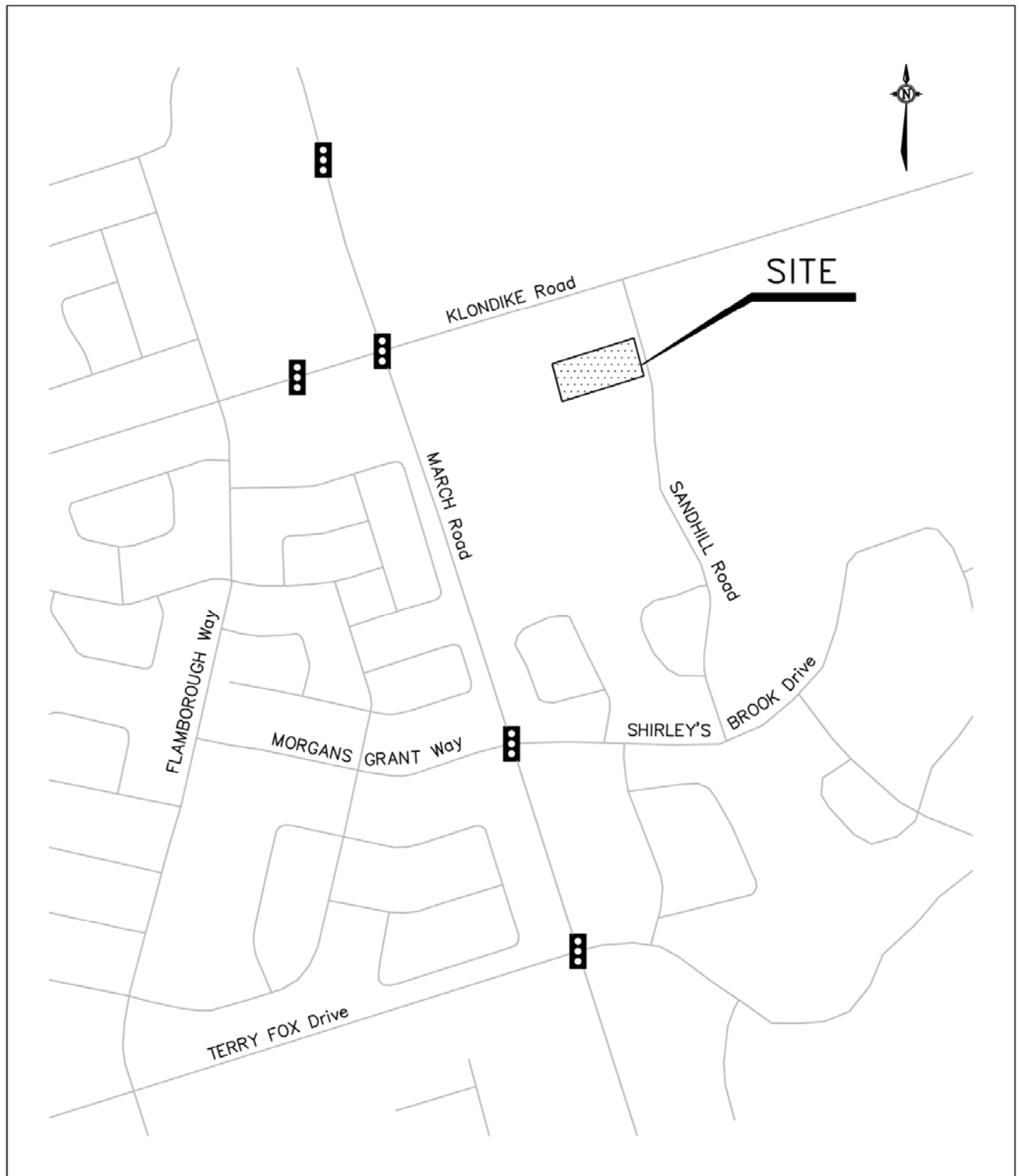
The land is 0.8104 ha. (2.0 ac.) in size with one residential home on the property. The property is currently zoned “Development Reserve Zone” (DR). The redevelopment of the lands would include the rezoning of the property to a “Minor Institutional Zone” (I1) – Area C Suburban.

The development would be constructed in two phases. The first phase would comprise of modifications to the existing 392 m² building. The second phase would be a new two storey building with a gross floor area of 1,213 m² for a total gross floor area of 1,605 m². The worship service would take place on a Friday between 12:00 PM and 2:00 PM. The development’s community centre and gymnasium would not be in use during the time period of worship.

The site would provide 126 parking spaces and 4 barrier free spaces. There would be bicycle racks for 7 bicycles. The site would have one access 6.7 m wide onto Sandhill Road. The access would be a full movement access with one lane entering and one lane exiting the site.

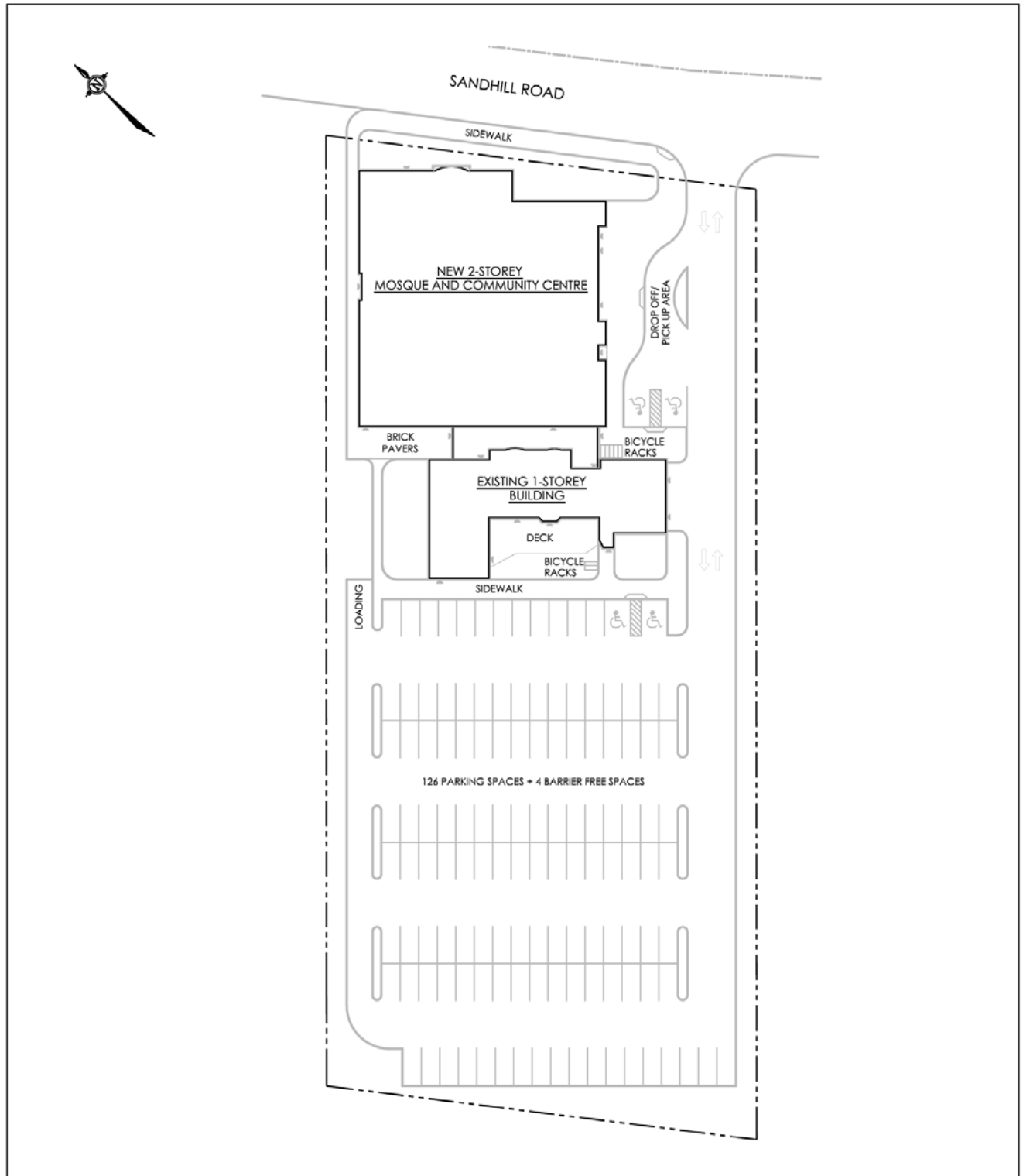
The first phase would be completed in 2018 with the second phase completed as funds become available. It has been assumed that the second phase would be completed by the year 2023. This report is in support of the applications for a zoning bylaw amendment and site plan control. Figure 2.2 provides a conceptual site plan of the development.

FIGURE 2.1
SITE LOCATION PLAN



NOT TO SCALE

FIGURE 2.2
CONCEPTUAL SITE PLAN



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Element 2.1.2 – Existing Conditions

Sandhill Road is a north-south roadway under the jurisdiction of the City of Ottawa. The road is identified in the City of Ottawa *Transportation Master Plan* (TMP) as a collector road. Sandhill Road is a two lane road with an 11 m wide pavement surface and a sidewalk along the east side of the road in the vicinity of the site. There are no signs restricting on-street parking in the vicinity of the site. The speed limit is posted at 40 km/h. with a “No Trucks” sign. The South March Public School is located on the east side of Sandhill Road across from the site. Signs are installed along Sandhill Road in the vicinity of the site informing motorists of the school zone and alerting motorists of pedestrians crossing or walking along the roadway.

Klondike Road is an east-west road under the jurisdiction of the City of Ottawa. Klondike Road is a two lane road which is identified in the *Transportation Master Plan* (TMP) as a collector road. The road was widened in 2016 which included a multi-use pathway along the south side of the road between March Road and Sandhill Road. This portion of the road retains the rural cross section. There are no sidewalks on either side of Klondike Road west of Sandhill Road, but sidewalks exist along both sides of the road east of Sandhill Road along with an urban cross section. Parking is prohibited along both sides of the roadway west of Sandhill Road. The posted speed limit is 50 km/h. During school hours (M-F 7:00 to 9:30 AM & 2:00 to 5:00 PM) the speed limit is reduced in the school zone in front of the South March Public School.

The intersection of Klondike Road and Sandhill Road is a “T” intersection. Klondike Road forms the eastbound and westbound approaches, and Sandhill Road the northbound approach. The intersection is controlled by a stop sign placed at the northbound Sandhill Road approach. The following is the lane configuration of the intersection:

Eastbound Klondike Road Approach -	One through/right lane
Westbound Klondike Road Approach -	One left/through lane
Northbound Sandhill Road Approach -	One left/right turn lane

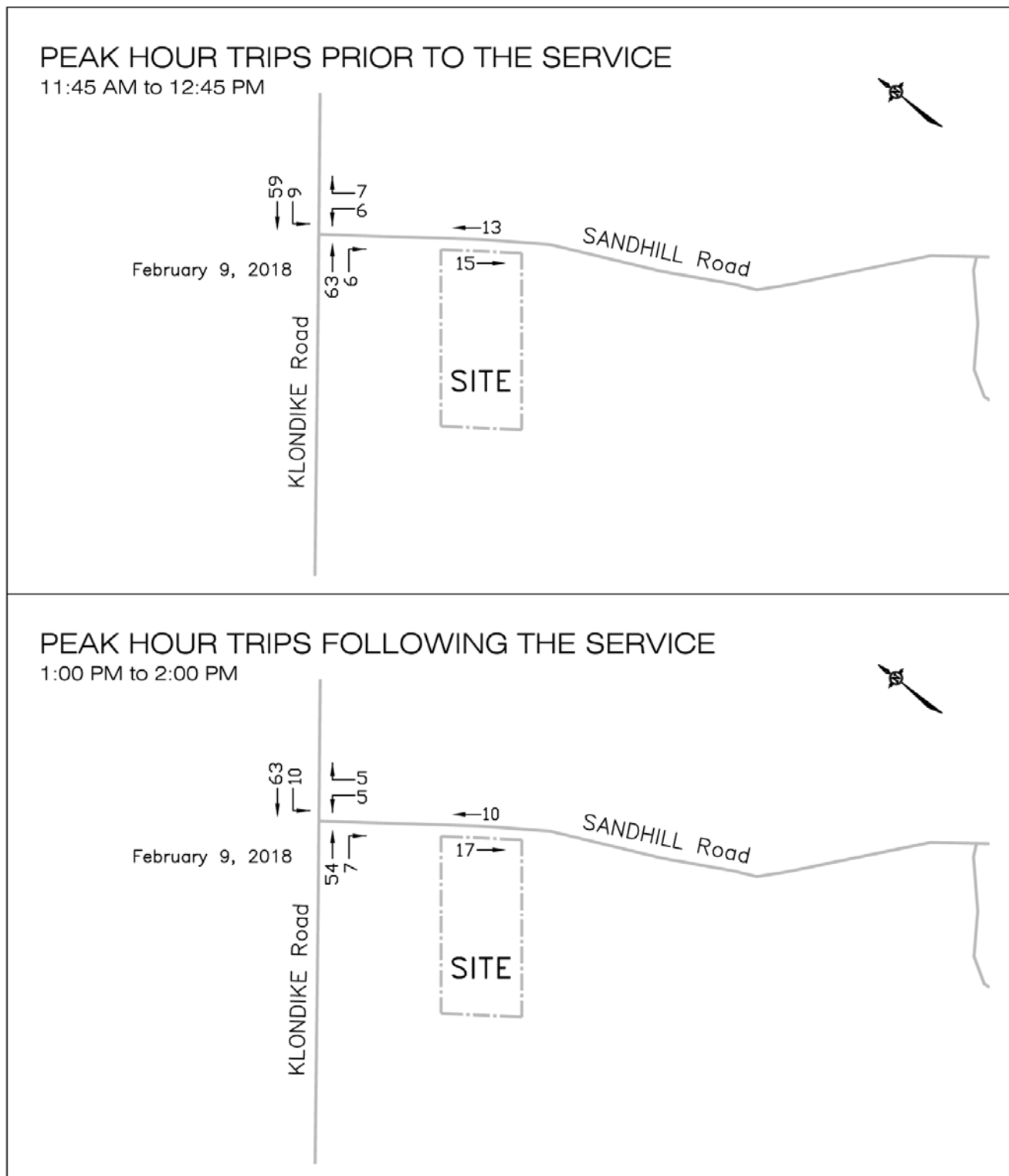
The *Transportation Master Plan* has identified a major cycling pathway along Shirley’s Brook. The pathway exists from Shirley’s Brook Drive and extends 230 m north where it terminates. The TMP does show it extending along Shirley’s Brook to Klondike Road along the west limit of the site.

OC Transpo Regular Route 165 travels eastbound along Klondike Road with a bus stop located on Klondike Road on the east side of the Sandhill/Klondike intersection.

Collision reports obtained from the City of Ottawa determined that there were no reported collisions at the Sandhill/Klondike intersection or along Sandhill Road in the vicinity of the site during the years 2014, 2015 and 2016.

Traffic counts were taken by the consultant at the intersection of Sandhill Road and Klondike Road. The counts were taken on Friday February 9, 2018 between 11:45 AM and 2:00 PM during the period when the worship service is expected to take place. Figure 2.3 shows the peak time period when trips are expected to enter prior to the service, and exit the site following the service. The 15 minute traffic counts are presented as Exhibit 2 in the Appendix.

FIGURE 2.3
2018 TRAFFIC COUNTS - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

Element 2.1.3 – Planned Conditions

The urbanization of Klondike Road from a rural cross section between March Road and Sandhill Road has been identified under Phase 1 (2014-2019) in the affordable road network of the *Transportation Master Plan 2013*. The widening of the road has already taken place which provides a wider pavement surface and a multi-use pathway along the south side of the road.

There are no large developments planned for the immediate area in the foreseeable future.

MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The expected trips generated by the KMA Mosque would occur on a Friday during the off peak hours of the adjacent roadway network resulting in only a minor impact on the intersections and roadways. For this reason, the study area was determined to be confined to the immediate area which includes the operation of the Sandhill/Klondike intersection and the impact along Sandhill Road and the site access.

Element 2.2.2 – Time Periods

The peak time period of site generated trips for the KMA Mosque would occur on a Friday during the period of worship services. The worship services would take place between 12:00 PM and 2:00 PM with the majority of parishioners arriving just prior to the 12:00 PM service and leaving between 1:30 PM and 2:00 PM. The traffic counts were conducted between 11:45 AM and 2:00 PM which would capture the volume of background traffic at the expected time when both trips entering the site prior to the service and trips exiting the site following the service would take place.

During the summer months the worship service would take place on a Friday between 1:00 PM and 2:30 PM. The service would still take place during the off peak hours of the adjacent roads resulting in a similar impact on the roads and intersections as the fall/winter/spring service.

Element 2.2.3 – Horizon Years

The first phase of the construction of the mosque would be completed by 2018, with the second phase (full development) expected by the year 2023. The horizon years for the analysis would be full development of the site at the year 2023, and five years beyond full development at the year 2028.

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	4.1.2 Circulation and Access	No - Access to the development and will be examined.
	4.1.3 New Street Networks	Yes - Only required for subdivisions.
4.2 Parking	4.2.1 Parking Supply	No - the supply of parking will be discussed.
	4.2.2 Spillover Parking	No - Spillover parking onto Sandhill will be addressed.
Network Impact Component		
4.5 Transportation Demand Management	All Elements	No - TDM measures will be addressed.
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Yes – The site will have access onto a collector road. Trips during the off peak hours would not exceed ATM capacity.
4.8 Network Concept		Yes - The site would not generate more than 200 person-trips per peak hour in excess of the volume permitted by established zoning.

STEP 3 - FORECASTING

MODULE 3.1 – Development-Generated Travel Demand

Element 3.1.1 – Trip Generation and Mode Shares

The proposed KMA Mosque development would be constructed in two phases. The first phase would consist of modifications to the existing residential house on site, and the second phase would be the construction of a new building for a total gross floor area of 1,605 m² (17,276 ft²). The second phase would be started as funds are made available with the total development expected to be completed by the year 2023.

The expected number of parishioners attending services and the proportioning of person-trips was determined from discussions with senior members of the KMA Mosque. At total development of the site (2023) the attendance is expected to be 350 persons, with a 1.7 persons/vehicle occupancy rate. With the location of the mosque in close proximity to a sizable Muslim community, the site will experience a relatively high level of non-auto travel along with a high vehicle occupancy rate. The modal share rates were estimated from information provided by members of the mosque. Table 3.1 presents the modal share summary which will be used in the TIA Submission during the Friday worship service (12:00 PM to 2:00 PM).

TABLE 3.1
MODE SHARE SUMMARY (person-trips)

Future Mode Share Targets for the Development			
Travel Mode	Mode Share Target		Rationale
Transit	10%		The percentage of person-trips was determined from discussions with members of the KMA Mosque. The proportion was from counts at the existing mosque locations.
Walking	20%		
Cycling	5%		
Auto Passenger	27%	65%	The proportion is based on 1.7 persons per vehicle as determined from members of the mosque.
Auto Driver	38%		

The expected volume of person-trips was determined using the maximum attendance at the worship service of 350 persons, and the mode shares which are shown in Table 3.1. The product is shown in Table 3.2 and is the number of person-trips attending the service.

TABLE 3.2
FUTURE DEVELOPMENT-GENERATED PERSON-TRIPS

TRAVEL MODE	DEVELOPMENT PERSON-TRIPS
	PEAK AM HOUR
Transit	35 person-trips
Walking	70 person-trips
Cycling	17 person-trips
Auto Passenger	95 person-trips
Auto Driver	133 person-trips

The number of peak hour site generated auto-trips and person-trips are summarized in Table 3.3.

TABLE 3.3
TOTAL PEAK HOUR SITE TRIPS (12:00 PM to 2:00 PM Service)

Trips Site	AUTO-TRIPS (Auto Driver - Table 3.2)	PERSON-TRIPS (Service Attendance)
Mosque	133 vehicles	350 persons

The trips were distributed to trips entering and exiting the site at the proportion shown in the Institute of Transportation Engineers (ITE) publication, *Trip Generation Manual*. The land use used was the ITE Land Use 562 “Mosque” with the distribution shown in Table 3.4.

TABLE 3.4
PROPORTION OF TRIPS ENTERING/EXITING DURING PEAK TIME PERIODS

Prior to Service – 11:45 AM to 12:45 PM		Following the Service (12:45 PM - 1:45 PM)	
Trips Entering	Trips Exiting	Trips Entering	Trips Exiting
96%	4%	4%	96%

The number of expected site generated trips would have one Trip Reduction Factor which could be applied to the site. The site is currently occupied by one residential house. Although the trips generated by the house would be replaced by trips to/from the mosque, the number of trips would be minor and were not considered in the trip analysis.

The community centre and gymnasium has a gross floor space of 494 m² (5,317 ft²). The space would be available to members of the mosque for social events during the evenings and weekends. The number of trips generated by the facilities would be low and would not coincide with the peak hour background traffic along the adjacent roads. The community centre and gymnasium would not be used during the periods of worship and would therefore not contribute to the peak hour traffic which is examined in the TIA study.

The total number of trips generated by the mosque during the peak hour of worship is 133 vehicle trips for an attendance of 350 parishioners (Table 3.3). The 350 parishioners is the maximum expected attendance based on available space. The attendance and trips generated are consistent with those recorded at the Masjid Bilal Mosque at 4509 Innes Road in Orleans. The Masjid Bilal Mosque has a similar design and size as the mosque proposed on Sandhill Road, with an attendance of 350 parishioners and a traffic count taken on a Friday between 11:45 AM and 12:45 PM of 121 vehicles entering and exiting the site prior to the worship service.

As a further comparison check, the number of site generated trips was compared to the statistical data presented in the ITE document, *Trip Generation Manual*, 9th Edition, Land Use 562 “Mosque”. The data has a sample size of one study with no community centre or gymnasium. The study was surveyed at a site in Ontario. The trip generation rate is 18.37 Trips/1000 ft² of gross floor area and represents trips on a Friday afternoon peak hour. The expected trips using the ITE trip rate is as follows:

$$(\text{total floor area} - \text{community centre/gym area}) \times (\text{ITE trip rate}) \times (\text{vehicle mode share}) = \text{veh. trips}$$

$$(17,276 \text{ ft}^2 - 5,317 \text{ ft}^2) \times (18.37 \text{ Trips}/1000 \text{ ft}^2) \times (65\%) = 143 \text{ Vehicle Trips}$$

The calculated vehicle trips from the site are consistent with the trips using the ITE trip manual.

For special events when attendance may exceed 350 persons, the service would be split into two services with a sufficient gap between the services to eliminate congestion in the parking lot.

Element 3.1.2 – Trip Distribution

The distribution of site generated trips for the KMA Mosque were determined following discussions with members of the mosque and examination of the surrounding populated area and areas of employment. The surrounding area does contain a sizable Muslim community which would travel between their home and the mosque either by walking or by automobile. The Kanata North High Tech Area and retail centres are located along March Road which would be a short drive during the day to attend a service. All site generated trips were considered primary trips and would be distributed to the following:

To/From the east – north along Sandhill then east along Klondike	10%
To/From the north & west – north along Sandhill then west along Klondike	50%
To/From the south & east – south along Sandhill then east along Shirley's Brook	10%
To/From the south & west – south along Sandhill then west along Shirley's Brook	30%

Element 3.1.3 – Trip Assignment

The trip assignment has examined the site generated trips from the KMA Mosque. The trip assignment utilized the auto-trips of Table 3.3 (133 peak hour vehicle trips) and trip proportion of Table 3.4. There were two peak hour time periods examined for the 12:00 PM to 2:00 PM service. The first represented trips entering the site prior to the service (11:45 AM to 12:45 PM), and the second represented trips exiting the site following the service (1:00 PM to 2:00 PM). The trip assignment presented in Figure 3.1 shows the distribution of site trips for the total development of the mosque in 2023.

MODULE 3.2 – Background Network Travel Demands

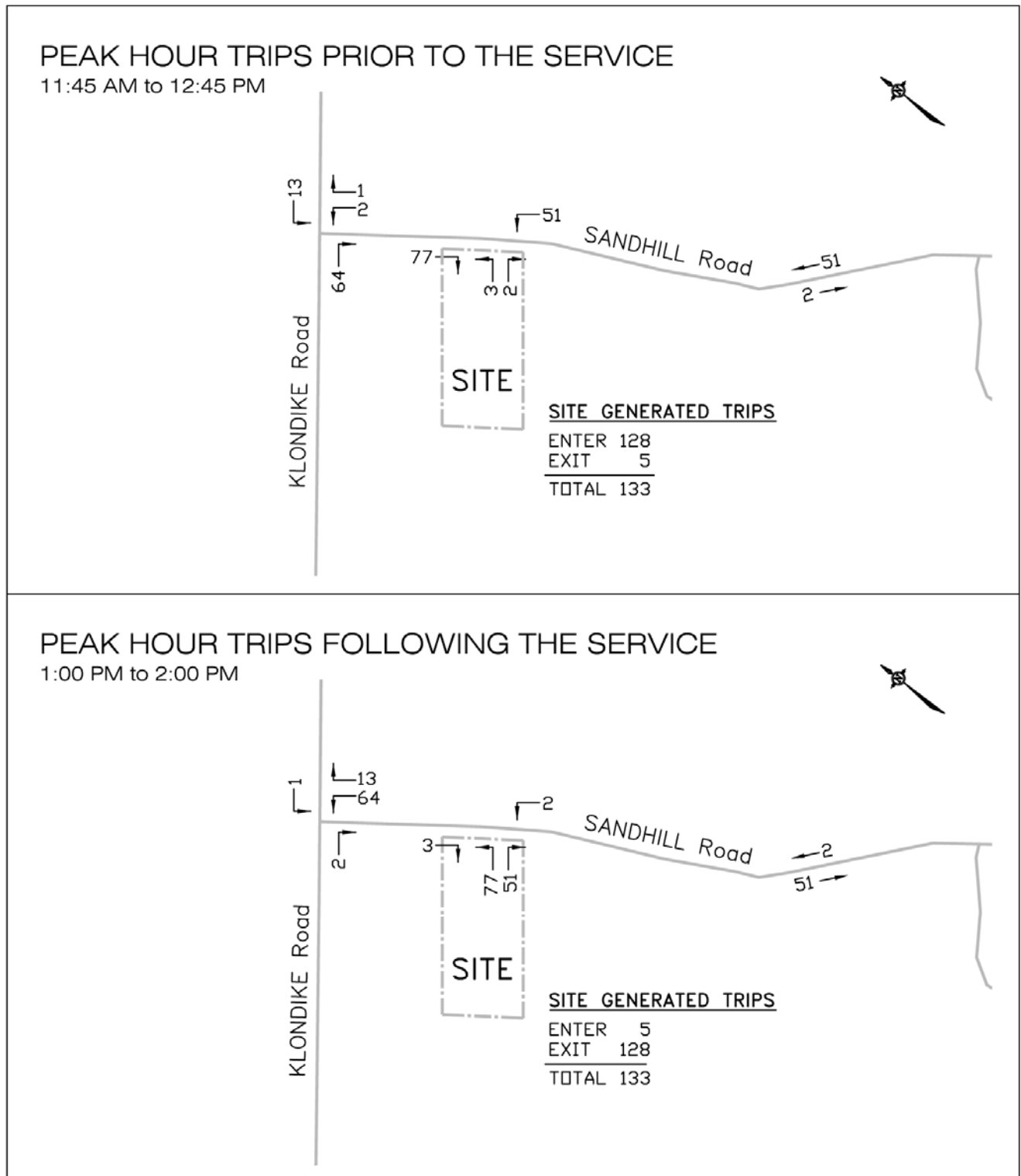
Element 3.2.1 – Transportation Network Plans

The City of Ottawa *Transportation Master Plan 2013* has identified modifications of Klondike Road between March Road and Sandhill Road. The modifications comprised of the widening of Klondike Road under Phase 1 (2014-2019) in the affordable road network. The roadway modifications have now been completed and comprise of the widening of Klondike Road and construction of a multi-use pathway along the south side of the road. The roadway modifications would not have an impact on the growth in background traffic.

Element 3.2.2 – Background Growth

To determine the growth in background traffic, the study has examined the past growth in the area and the current zoning of parcels of vacant land. Most of the residential development in the surrounding area has already been completed. Vacant lands along the north side of Klondike Road across from Sandhill Road is zoned "Development Reserve Zone" (DR) which would allow future urban development. East of Sandhill Road at the intersection of Klondike Road and March Valley Road, there are vacant parcels of land which are zoned "Business Park Industrial

FIGURE 3.1
SITE GENERATED TRIPS - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

Zone” (IP), which would allow a variety of commercial and light industrial uses. Development of these lands is likely not to occur within the horizon years of the study. If development were to occur, the additional traffic would be minimal during the off peak weekday hours of the adjacent roads which is the time period which the mosque would provide services for worship.

The study has assumed that road traffic along Klondike Road and Sandhill Road would increase at an annual compounded rate of 2.0 percent to account for development outside the study area. The increase would be applied to all approaches to the Sandhill/Klondike intersection.

Element 3.2.3 – Other Developments

Other development which may take place in the study area is a residential development on the south side of the site. The development has a municipal address of 335 Sandhill Road and may comprise of terrace or townhouse units. There are no time lines for the construction of the development which may take place beyond the horizon year of the study. If development does take place, there would be a small increase in weekday off peak trips from the site which can be accommodated in the 2.0 percent annual increase which is applied to the background traffic along Sandhill Road. Figure 3.2 presents the 2023 background traffic and Figure 3.3 the 2028 background traffic.

MODULE 3.3 – Demand Rationalization

The expected traffic from the KMA Mosque will have a minor impact on the surrounding roadways. With the peak hour of site generated trips occurring during the off peak hours of the adjacent road, there would be sufficient capacity on the roads and at the intersections for the additional traffic. The expected future traffic along Sandhill Road would not exceed the capacity of the road as determined from the Transportation Association of Canada (TAC) publication, *Geometric Design Guide for Canadian Roads*.

STEP 4 - ANALYSIS

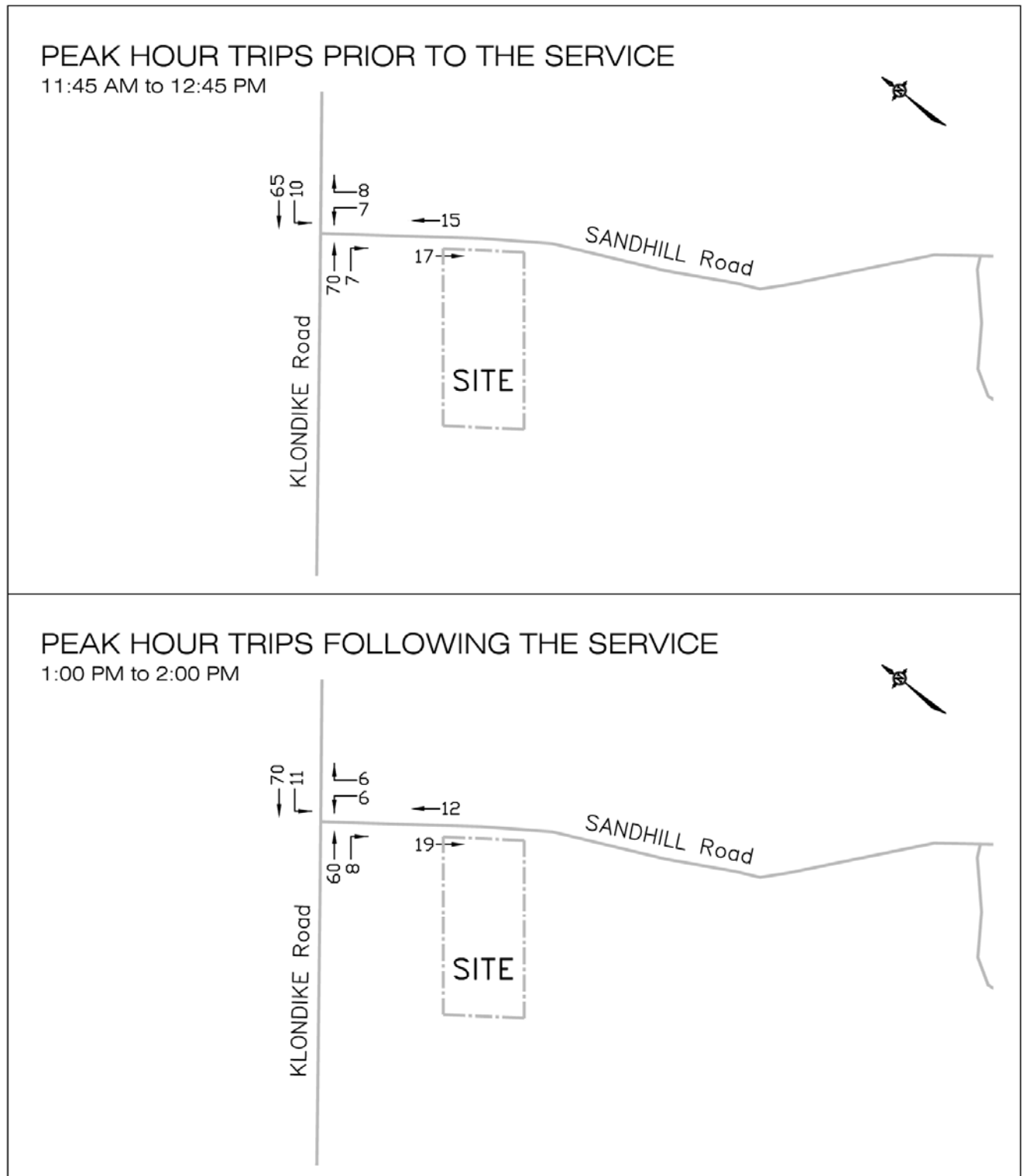
MODULE 4.1 – Development Design

Element 4.1.1 – Design for Sustainable Modes

The KMA Mosque Site Plan is consistent with the City of Ottawa Planning and Design Guidelines by placing all of the parking within the site in a surface parking lot. The parking lot is located at the rear of the property behind the buildings which would provide a visual separation between the lot and the municipal street. Bicycle racks will be located close to the buildings.

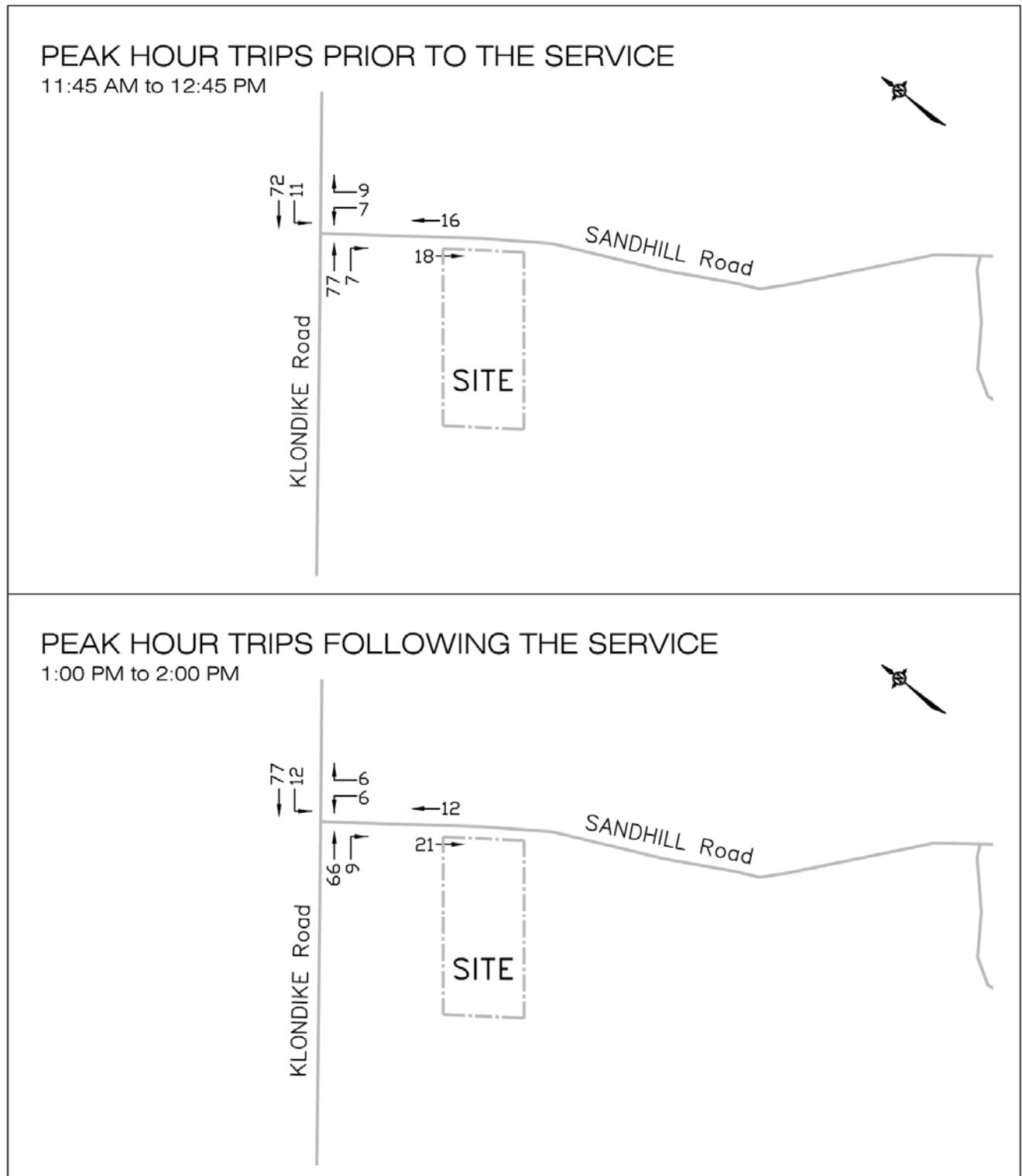
The Site Plan provides a sidewalk network within the site and across the frontage of the site along Sandhill Road. There is an existing sidewalk along the east side of Sandhill Road across from the site. The sidewalks provide access to the sidewalk and multi-use pathway along Klondike Road and transit stops on Klondike Road and Marconi Avenue.

FIGURE 3.2
2023 BACKGROUND TRAFFIC - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

FIGURE 3.3
2028 BACKGROUND TRAFFIC - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

Element 4.1.2 – Circulation and Access

The site will have one 6.7 m wide access onto Sandhill Road (collector road) and would not be in close proximity to adjacent driveways or intersections. The access is designated as a fire route and would accommodate any delivery vehicles or waste disposal trucks. No service vehicles would be parked along Sandhill Road.

Element 4.1.3 – New Street Networks

Exempt as determined in the Scoping module.

MODULE 4.2 – Parking

Element 4.2.1 – Parking Supply

The Site Plan provides 130 parking spaces of which 4 are designated as barrier free spaces. The number of spaces provided exceeds the requirements in the City of Ottawa Zoning Bylaw.

Element 4.2.2 – Spillover Parking

The site will provide 130 parking spaces with a maximum of 128 spaces occupied which is based on trips entering prior to the service. Spillover parking onto Sandhill Road is not expected.

MODULE 4.3 – Boundary Street Design

Sandhill Road and Klondike Road are identified in the City of Ottawa TMP as collector roads. The site will have one access onto Sandhill Road approximately 145 m south of Klondike Road. The South March Public School is located on the east side of Sandhill Road across from the site, with the front of the school and all access points off of Klondike Road. There are no driveways or accesses in close proximity to the proposed mosque access.

Sandhill Road is a collector road with a sidewalk provided only on the east side of the road adjacent to South March Public School and the Juanita Snelgrove Park. With the site providing a sidewalk across the frontage of the site, Sandhill Road has a gap in the sidewalk on the west side of Sandhill Road connecting the site with the sidewalk/multi-use pathway along Klondike Road.

Collision report obtained from the City of Ottawa for the years 2014, 2015 and 2016 determined that there were no reported collisions at the Sandhill/Klondike intersection or along Sandhill Road in the vicinity of the site.

With the peak hour site generated trips occurring in off peak hours of the adjacent streets, the trips from the site would not exacerbate any existing operational concerns on the boundary roads.

MODULE 4.4 – Access Intersection Design

Element 4.4.1 – Location and Design of Access

The access would be 6.7 m in width with one lane entering and one lane exiting. The access would not require any exclusive turn lanes along Sandhill Road but would function as a private approach.

There are no driveways on the east side of Sandhill Road across from the site. On the west side the closest access would be into the vacant property bordering the south limit of the site.

The closest signalized intersection to the site would be the intersection of March Road and Klondike Road.

Element 4.4.2 – Intersection Control

The site access would be controlled by a stop controlled approach to Sandhill Road. There would be no requirement for further traffic control measures at the site access.

Element 4.4.3 – Intersection Design

The intersection analysis will use the *Highway Capacity Software, Version 7.4*, which utilizes the intersection capacity analysis procedure as documented in the *Highway Capacity Manual 2010 and 6th Edition*. For unsignalized intersections the level of service of each lane movement and approach is determined as a function of the 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	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 expected length of queue at the critical lane movements for an unsignalized intersection was determined by the calculation of the 95th percentile queue at the lane approach. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicles.

The expected trips generated by the site prior to and following the Friday service are presented in Table 4.1 and Figure 3.1. The trips were determined for a maximum of 350 parishioners and utilized the trip distribution as shown in Table 3.3 and Table 3.4 in Element 3.1.1.

TABLE 4.1
PEAK HOUR SITE TRIPS PRIOR TO AND FOLLOWING THE SERVICE

KMA MOSQUE	PRIOR TO SERVICE			FOLLOWING THE SERVICE		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
350 Parishioners	133	128 (96%)	5 (4%)	133	5 (4%)	128 (96%)

The total traffic is the sum of the peak hour background traffic, Figure 3.2 for the 2023 and Figure 3.3 for the 2028 traffic, and the site generated trips provided as Figure 3.1. Figure 4.1 presents the total peak hour traffic prior to and following the worship service at the year 2023 and Figure 4.2 the peak hour traffic at the year 2028.

VEHICULAR LEVEL OF SERVICE (LOS) - Intersection Capacity Analysis

Site Access and Sandhill Road Intersection

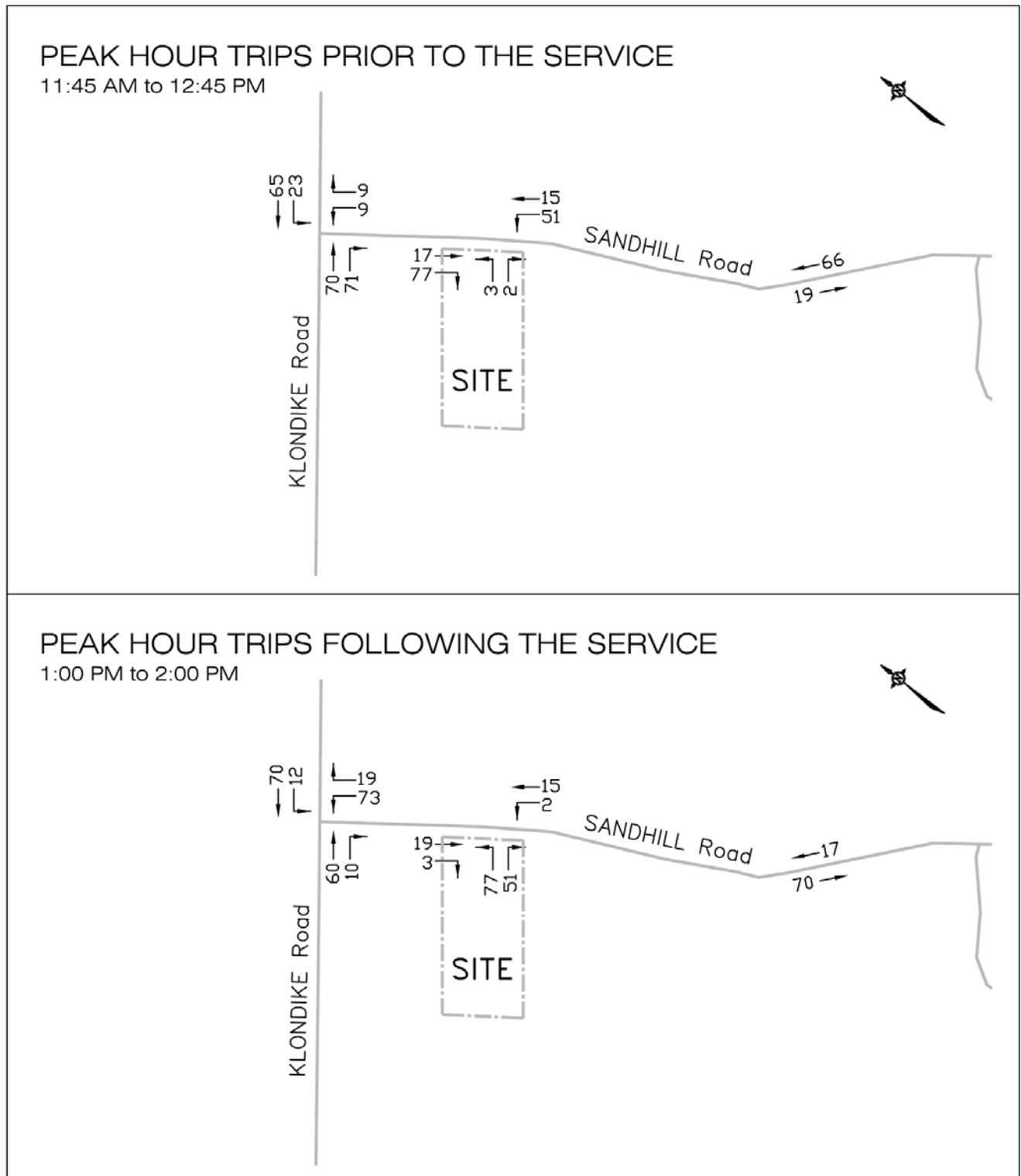
The intersection is a two-way stop controlled intersection with the stop approach at the eastbound site exit. Table 4.2 summarizes the operation of the intersection with the analysis sheets provided in the Appendix as Exhibits 3 to 6.

TABLE 4.2
SITE ACCESS AND SANDHILL RD. INTERSECTION – LoS & Control Delay

Intersection Approach	PRIOR TO THE SERVICE YEAR 2023 (2028)		FOLLOWING THE SERVICE YEAR 2023 (2028)	
	LoS	Delay (sec/veh)	LoS	Delay (sec/veh)
EB Left/Right – Site Access	A (A)	9.2 (9.2)	A (A)	9.1 (9.1)
NB Left/Through – Sandhill	A (A)	7.5 (7.5)	A (A)	7.3 (7.3)

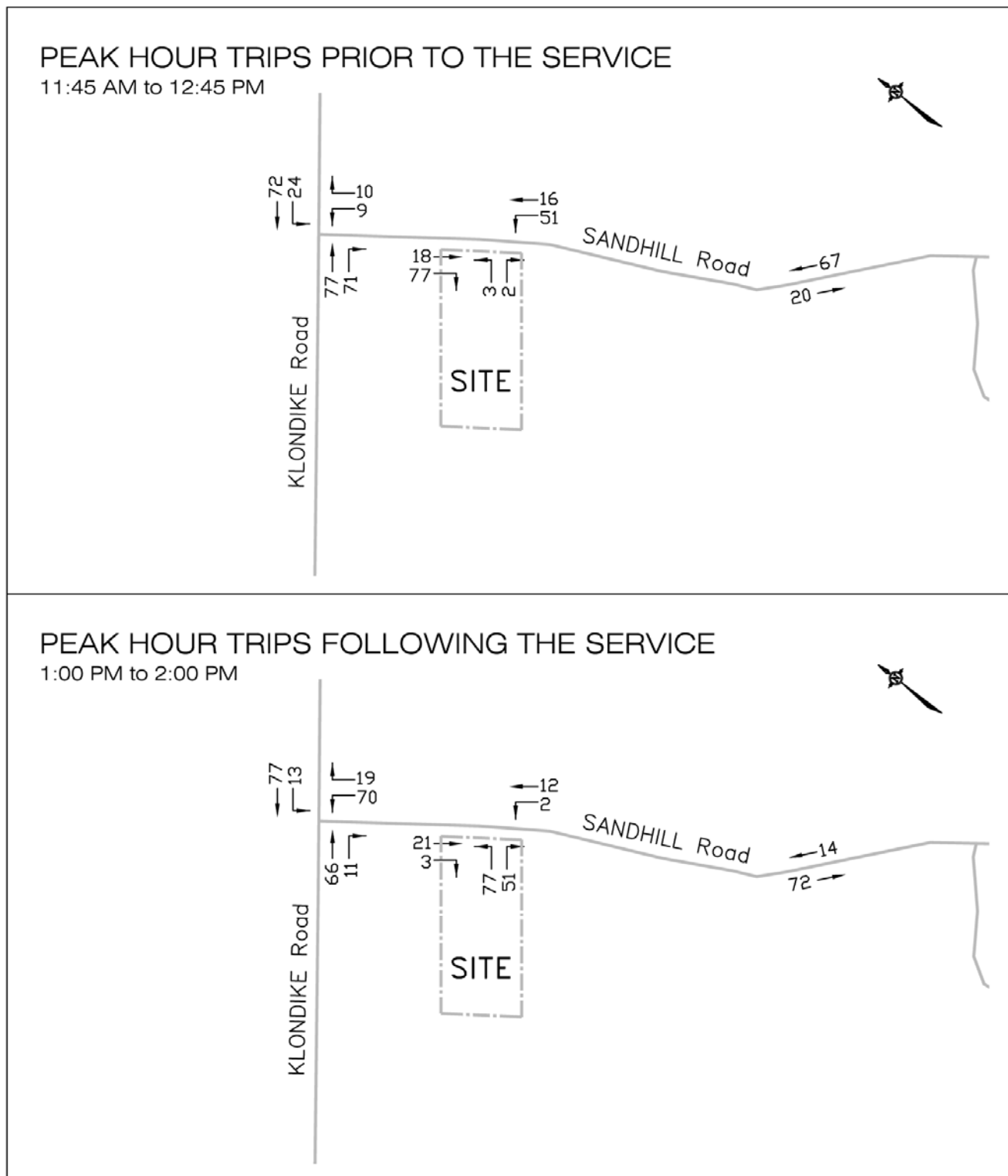
For both the total traffic scenarios of trips entering the site prior to worship service and following the service, the analysis determined that all approached functioned at a Level of Service (LoS) “A” for the expected traffic at the years 2023 and 2028. For the 2028 traffic, the 95th percentile queue at the eastbound site exit would be 0.4 vehicles (7 metres) leaving the site with a clear throat distance of 60 m provided at the site exit lane. There would be no roadway modifications triggered by the site generated trips.

FIGURE 4.1
2023 TOTAL TRAFFIC - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

FIGURE 4.2
2028 TOTAL TRAFFIC - PRIOR TO AND FOLLOWING THE SERVICE



NOT TO SCALE

Sandhill Road and Klondike Road Intersection

The intersection is a two-way stop controlled intersection with a stop sign at the Sandhill Road approach. All approaches are single lanes with shared turning movements. Table 4.3 summarizes the operation of the intersection with Exhibits 7 to 12 detailing the analysis.

TABLE 4.3
SANDHILL RD. AND KLONDIKE RD. INTERSECTION – LoS & Control Delay

Intersection Approach	PRIOR TO THE SERVICE YEAR 2018 2023 (2028)		FOLLOWING THE SERVICE YEAR 2018 2023 (2028)	
	LoS	Delay (sec/veh)	LoS	Delay (sec/veh)
WB Left/Through – Klondike	A A (A)	7.4 7.5 (7.5)	A A (A)	7.4 7.5 (7.5)
NB Left/Right – Sandhill	A A (A)	9.1 9.5 (9.6)	A B (B)	9.0 10.1 (10.2)

The operational analysis determined that all approaches functioned at a LoS “A” using the Friday afternoon traffic counts taken on February 9, 2018. Following the development of the site for both the 2023 and 2028 horizon years, all approaches functioned at a LoS “A” prior to worship service. Following the service as parishioners are leaving the site, the 2023 and 2028 traffic at the Klondike Road approaches would function at a LoS “A” and the Sandhill Road left/right turn approach would function at a LoS “B”. For the expected 2028 traffic following the service, the 95th percentile queue at northbound Sandhill Road approach would be 0.4 vehicles (7 metres). There would be no roadway modifications triggered by the site generated trips.

PEDESTRIAN LEVEL OF SERVICE (PLOS)

The pedestrian level of service (PLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. Table 4.4 presents the level of service for street segments within the study area, with the analysis for the 2028 PLOS street segment evaluation provided in the Appendix as Exhibit 13, Exhibit 14 and Exhibit 15.

TABLE 4.4
PEDESTRIAN LEVEL OF SERVICE (PLOS) – STREET SEGMENT

Street	Segment	Level of Service	Analysis
Sandhill Road	Klondike to 180 m south of site	B	Exhibit 13
Klondike Road W.	March Road to Sandhill Road	D	Exhibit 14
Klondike Road E.	Sandhill to east of Sandhill Road	B	Exhibit 15

BICYCLE LEVEL OF SERVICE (BLOS)

The bicycle level of service (BLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The Klondike Road segment between March Road and Sandhill Road has a multi-use pathway which provides a physically separated bikeway. Table 4.5 presents the level of service for street segments within the study area, with the analysis for the 2028 traffic provided as Exhibit 16, Exhibit 17 and Exhibit 18.

TABLE 4.5
BICYCLE LEVEL OF SERVICE (BLOS) – STREET SEGMENT

Street	Segment	Level of Service	Analysis
Sandhill Road	Klondike to 180 m south of site	B	Exhibit 16
Klondike Road W.	March Road to Sandhill Road	A	Exhibit 17
Klondike Road E.	Sandhill to east of Sandhill Road	B	Exhibit 18

TRANSIT LEVEL OF SERVICE (TLOS)

OC Transpo Regular Route 165 travels eastbound along Klondike Road with a bus stop at the Sandhill/Klondike intersection, and Route 63 travels along Marconi Avenue past Klondike Road.

The TLOS evaluation methodology and table in the MMLOS Guidelines are intended primarily to be applied only along corridors with existing or planned rapid transit or transit priority measures. The TLOS methodology would not apply to the roadways within the study area which are lower volume collector roads, and the time period of the transportation impact evaluation taking place during off peak hours of the adjacent street traffic.

MODULE 4.5 – Transportation Demand Management

Element 4.5.1 – Context for TDM

The proposed site for the mosque will not be in a Transit Oriented Development area or Design Priority Area. The area has transit service along Klondike Road, with more opportunity for routes along March Road to service the growing area.

The nature of the trips to the mosque would result in a higher vehicle occupancy rate than most land uses. With the mosque located within a large Muslim community, the site would have a high percentage of trips made by walking. Table 3.2 in Element 3.1.1 showed 70 person-trips were made by walking and 35 person-trips by transit.

With the peak hour of the worship service not coinciding with the peak hour of traffic along the adjacent roads, any trips higher than expected from the site would result in a minor impact on the surrounding roads and land uses.

Element 4.5.2 – Need and Opportunity

If the mode share targets assumed for the site were not met, the result would be only a minor impact on other land uses in the study area.

Element 4.5.3 –TDM Program

In order to reduce auto-trips and improve accessibility of the mosque to all parishioners, members of the mosque have planned to promote a ride sharing program with parishioners.

MODULE 4.6 – Neighbourhood Traffic Management

Element 4.6.1 – Adjacent Neighbourhoods

Exempt as determined in the Scoping module.

MODULE 4.7 – Transit

Element 4.7.1 – Route Capacity

With the off peak hour of the mosque's service, any transit demand would not exceed the capacity of the transit routes.

Element 4.7.2 – Transit Priority

There would be no impact on the travel time of transit due to the addition of trips by parishioners.

MODULE 4.8 – Review of Network Concept

The travel demands of the proposed development would not trigger any changes to the Transportation Master Plan (TMP) concepts for auto or transit networks.

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The intersection of Klondike Road and Sandhill Road is a "T" intersection of two collector roads. The traffic volumes would not warrant intersection modification measures which would consist of roundabouts or traffic signals. The development of the site would not trigger any changes in the control of the intersection with the intersection remaining as a two-way stop controlled intersection.

Element 4.9.2 – Intersection Design

The Klondike/Sandhill intersection operated at an acceptable level of service during the hours that the mosque's service would take place. For the expected 2028 volume of traffic, the

approaches to the intersection operated at a LoS “A” to “B” during the hours of worship service as discussed in Element 4.4.3.

The pedestrian level of service (PLOS) and bicycle level of service (BLOS) for the adjacent streets of Sandhill Road and Klondike Road all operated at an acceptable level of service as discussed in Element 4.4.3.

The Site Plan provides sufficient on-site parking which would reduce the likelihood of Spillover parking onto the adjacent streets.

There would be no requirement for modifications to the adjacent streets and intersections.

Prepared by:

David J. Halpenny

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



APPENDIX

SCREENING FORM

TRAFFIC COUNTS

VEHICULAR TRAFFIC ANALYSIS

PLOS and BLOS SEGMENT EVALUATIONS

EXHIBIT 1 - SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	351 Sandhill Road
Description of Location	Single detached structure on collector road in Kanata North
Land Use Classification	General Urban Area; DR zoning (variance sought, see application)
Development Size (units)	N/A
Development Size (m²)	Phase 1: 496m ² ; Phase 2: 1,605m ²
Number of Accesses and Locations	Two
Phase of Development	Both
Buildout Year	2018 onward

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	40 units
Townhomes or apartments	90 units
Office	3,500 m ²
Industrial	5,000 m ²
Fast-food restaurant or coffee shop	100 m ²
Destination retail	1,000 m ²
Gas station or convenience market	75 m ²

** 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 is 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 - FRIDAY TRAFFIC COUNTS (February 9, 2018) – Sandhill/Klondike

All Vehicles

Time Period	Northbound			Southbound			Eastbound			Westbound			Total
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	
11:45 – 12:00	2	-	2	-	-	-	-	12	1	2	20	-	39
12:00 – 12:15	1	-	2	-	-	-	-	18	2	3	13	-	39
12:15 – 12:30	1	-	2	-	-	-	-	21	1	2	12	-	39
12:30 – 12:45	2	-	1	-	-	-	-	12	2	2	14	-	33
12:45 – 1:00	0	-	1	-	-	-	-	12	2	4	19	-	38
1:00 – 1:15	1	-	0	-	-	-	-	18	4	2	19	-	44
1:15 – 1:30	2	-	1	-	-	-	-	16	2	1	19	-	41
1:30 – 1:45	0	-	1	-	-	-	-	8	1	4	11	-	25
1:45 – 2:00	2	-	3	-	-	-	-	12	0	3	14	-	34

Truck & Bus Traffic

Time Period	Northbound			Southbound			Eastbound			Westbound			Total
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	
11:45 – 12:00	0	-	0	-	-	-	-	0	0	0	0	-	0
12:00 – 12:15	0	-	0	-	-	-	-	1	0	0	0	-	1
12:15 – 12:30	0	-	0	-	-	-	-	0	0	0	0	-	0
12:30 – 12:45	0	-	0	-	-	-	-	1	0	0	0	-	1
12:45 – 1:00	0	-	0	-	-	-	-	1	0	0	0	-	1
1:00 – 1:15	0	-	0	-	-	-	-	0	0	0	2	-	2
1:15 – 1:30	0	-	0	-	-	-	-	1	0	0	0	-	1
1:30 – 1:45	0	-	0	-	-	-	-	0	0	0	0	-	0
1:45 – 2:00	0	-	0	-	-	-	-	0	0	0	0	-	0

EXHIBIT 3 – 2023 TOTAL TRAFFIC PRIOR TO SERVICE – Site Access/Sandhill

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Sandhill Road							
Analysis Year	2023							North/South Street	Site Access							
Time Analyzed	Prior to Service							Peak Hour Factor	1.00							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: North-South</p>																
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, V (veh/h)		3		2						51	15				17	77
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			5							51						
Capacity, c (veh/h)			871							1506						
v/c Ratio			0.01							0.03						
95% Queue Length, Q ₉₅ (veh)			0.0							0.1						
Control Delay (s/veh)			9.2							7.5						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.2								5.8							
Approach LOS	A															

EXHIBIT 4 – 2023 TOTAL TRAFFIC FOLLOWING THE SERVICE – Site Access/Sandhill

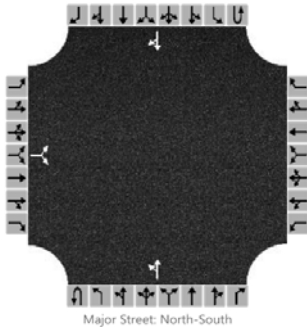
HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Sandhill Road							
Analysis Year	2023							North/South Street	Site Access							
Time Analyzed	Following the Service							Peak Hour Factor	1.00							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
 <p>Major Street: North-South</p>																
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, V (veh/h)		77		51						2	15				19	3
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			128							2						
Capacity, c (veh/h)			1009							1599						
v/c Ratio			0.13							0.00						
95% Queue Length, Q ₉₅ (veh)			0.4							0.0						
Control Delay (s/veh)			9.1							7.3						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.1								0.9							
Approach LOS	A															

EXHIBIT 5 – 2028 TOTAL TRAFFIC PRIOR TO SERVICE – Site Access/Sandhill

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Sandhill Road							
Analysis Year	2028							North/South Street	Site Access							
Time Analyzed	Prior to Service							Peak Hour Factor	1.00							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: North-South</p>																
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, V (veh/h)		3		2						51	16				18	77
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			5							51						
Capacity, c (veh/h)			869							1505						
v/c Ratio			0.01							0.03						
95% Queue Length, Q ₉₅ (veh)			0.0							0.1						
Control Delay (s/veh)			9.2							7.5						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.2								5.8							
Approach LOS	A															

EXHIBIT 6 – 2028 TOTAL TRAFFIC FOLLOWING THE SERVICE – Site Access/Sandhill

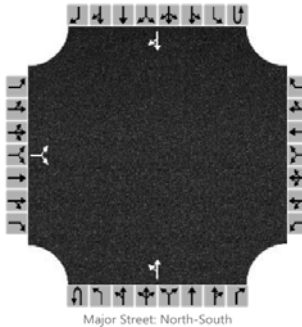
HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Sandhill Road							
Analysis Year	2028							North/South Street	Site Access							
Time Analyzed	Following the Service							Peak Hour Factor	1.00							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
 <p>Major Street: North-South</p>																
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, V (veh/h)		77		51						2	12				21	3
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.21						
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			128							2						
Capacity, c (veh/h)			1010							1597						
v/c Ratio			0.13							0.00						
95% Queue Length, Q ₉₅ (veh)			0.4							0.0						
Control Delay (s/veh)			9.1							7.3						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.1								1.0							
Approach LOS	A															

EXHIBIT 7 – 2018 TRAFFIC PRIOR TO SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2018							North/South Street	Sandhill Road							
Time Analyzed	Prior to Service							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			63	6		9	59			6		7				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						10					14					
Capacity, c (veh/h)						1525					901					
v/c Ratio						0.01					0.02					
95% Queue Length, Q ₉₅ (veh)						0.0					0.0					
Control Delay (s/veh)						7.4					9.1					
Level of Service, LOS						A					A					
Approach Delay (s/veh)					1.0				9.1							
Approach LOS									A							

EXHIBIT 8 – 2018 TRAFFIC FOLLOWING THE SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2018							North/South Street	Sandhill Road							
Time Analyzed	Following the Service							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			54	7		10	63			5		5				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)					11								11			
Capacity, c (veh/h)					1531								900			
v/c Ratio					0.01								0.01			
95% Queue Length, Q ₉₅ (veh)					0.0								0.0			
Control Delay (s/veh)					7.4								9.0			
Level of Service, LOS					A								A			
Approach Delay (s/veh)					1.1								9.0			
Approach LOS													A			

EXHIBIT 9 – 2023 TOTAL TRAFFIC PRIOR TO SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2023							North/South Street	Sandhill Road							
Time Analyzed	Prior to Service							Peak Hour Factor	1.00							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			70	71		23	65			9		9				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						23					18					
Capacity, c (veh/h)						1445					811					
v/c Ratio						0.02					0.02					
95% Queue Length, Q ₉₅ (veh)						0.0					0.1					
Control Delay (s/veh)						7.5					9.5					
Level of Service, LOS						A					A					
Approach Delay (s/veh)					2.1				9.5							
Approach LOS									A							

EXHIBIT 10 – 2023 TOTAL TRAFFIC FOLLOWING THE SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2023							North/South Street	Sandhill Road							
Time Analyzed	Following the Service							Peak Hour Factor	1.00							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR			LT					LR				
Volume, V (veh/h)			60	10			12	70			73		19			
Percent Heavy Vehicles (%)							1				1		1			
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)							12					92				
Capacity, c (veh/h)							1456					800				
v/c Ratio							0.01					0.12				
95% Queue Length, Q ₉₅ (veh)							0.0					0.4				
Control Delay (s/veh)							7.5					10.1				
Level of Service, LOS							A					B				
Approach Delay (s/veh)					1.2				10.1							
Approach LOS									B							

EXHIBIT 11 – 2028 TOTAL TRAFFIC PRIOR TO SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2028							North/South Street	Sandhill Road							
Time Analyzed	Prior to Service							Peak Hour Factor	1.00							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			77	71		24	72			9		10				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						24					19					
Capacity, c (veh/h)						1437					803					
v/c Ratio						0.02					0.02					
95% Queue Length, Q ₉₅ (veh)						0.1					0.1					
Control Delay (s/veh)						7.5					9.6					
Level of Service, LOS						A					A					
Approach Delay (s/veh)					2.0				9.6							
Approach LOS									A							

EXHIBIT 12 – 2028 TOTAL TRAFFIC FOLLOWING THE SERVICE – Sandhill/Klondike

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Sandhill/Klondike							
Agency/Co.								Jurisdiction	City of Ottawa							
Date Performed	2/16/2018							East/West Street	Klondike Road							
Analysis Year	2028							North/South Street	Sandhill Road							
Time Analyzed	Following the Service							Peak Hour Factor	1.00							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	351 Sandhill Road															
Lanes																
<p>Major Street: East-West</p>																
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	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			66	11		13	77			70		19				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						13					89					
Capacity, c (veh/h)						1447					785					
v/c Ratio						0.01					0.11					
95% Queue Length, Q ₉₅ (veh)						0.0					0.4					
Control Delay (s/veh)						7.5					10.2					
Level of Service, LOS						A					B					
Approach Delay (s/veh)					1.1				10.2							
Approach LOS									B							

EXHIBIT 13 – SANDHILL ROAD – PLOS Segment Evaluation

STREET Sandhill Road
FROM Klondike Road
TO 180 m south of the site
YEAR 2028
DIRECTION Northbound–Southbound
MMLOS MODE PLOS

SEGMENT SCORE **B**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On- street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 ¹
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F ²	F ²
<1.5	N/A		F ³	F ³	F ³	F ³	
No sidewalk	N/A		C ⁴	F ³	F ³	F ³	

EXHIBIT 14 – KLONDIKE ROAD W. – PLOS Segment Evaluation

STREET Klondike Road
FROM March Road
TO Sandhill Road
YEAR 2028
DIRECTION Eastbound–Westbound
MMLOS MODE PLOS

SEGMENT SCORE **D**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On- street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 ¹
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F ²	F ²
<1.5	N/A		F ³	F ³	F ³	F ³	
No sidewalk	N/A		C ⁴	F ³	F ³	F ³	

EXHIBIT 15 – KLONDIKE ROAD E. – PLOS Segment Evaluation

STREET Klondike Road
FROM Sandhill Road
TO East of Sandhill Road
YEAR 2028
DIRECTION Eastbound–Westbound
MMLOS MODE PLOS

SEGMENT SCORE **B**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On- street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 ¹
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F ²	F ²
<1.5	N/A		F ³	F ³	F ³	F ³	
No sidewalk	N/A		C ⁴	F ³	F ³	F ³	

EXHIBIT 16 – SANDHILL ROAD – BLOS Segment Evaluation

STREET Sandhill Road
FROM Klondike Road
TO 180 m south of the site
YEAR 2028
DIRECTION Northbound–Southbound
MMLOS MODE BLOS

SEGMENT SCORE **B**

Type of Bikeway	LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 travel lanes in each direction separated by a raised median B 2 travel lanes in each direction without a separating median C More than 2 travel lanes in each direction D
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width) A ≥ 1.5 m to < 1.8 m wide bike lane (includes marked buffer and paved gutter width) B ≥ 1.2 m to < 1.5 m wide bike lane (includes marked buffer and paved gutter width) C
Operating Speed	≤ 50 km/h operating speed A 60 km/h operating speed C > 70 km/h operating speed E
Bike lane blockage (commercial areas)	Rare A Frequent C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 or more travel lanes in each direction C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) A 4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) B ≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) C
Operating Speed	< 40 km/h operating speed A 50 km/h operating speed B 60 km/h operating speed D > 70 km/h operating speed F
Bike lane blockage (commercial areas)	Rare A Frequent C
Mixed Traffic	
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential A 2 to 3 travel lanes; ≤ 40 km/h B 2 travel lanes; 50 km/h; no marked centerline or classified as residential B 2 to 3 travel lanes; 50 km/h D 4 to 5 travel lanes; ≤ 40 km/h D 4 to 5 travel lanes; ≥ 50 km/h E 6 or more travel lanes; ≤ 40 km/h E ≥ 60 km/h F
Unsignalized Crossing along Route: no median refuge	
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h A 4 to 5 lanes being crossed; ≤ 40 km/h B 3 or less lanes being crossed; 50 km/h B 4 to 5 lanes being crossed; 50 km/h C 3 or less lanes being crossed; 60 km/h C 4 to 5 lanes being crossed; 60 km/h D 6 or more lanes being crossed; ≤ 40 km/h E 3 or less lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 50 km/h F 4 to 5 lanes being crossed; ≥ 65 km/h F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)	
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h A 3 or less lanes being crossed; 50 km/h A 6 or more lanes being crossed; ≤ 40 km/h B 4 to 5 lanes being crossed; 50 km/h B 3 or less lanes being crossed; 60 km/h B 6 or more lanes being crossed; 50 km/h C 4 to 5 lanes being crossed; 60 km/h C 3 or less lanes being crossed; ≥ 65 km/h D 6 or more lanes being crossed; 60 km/h E 4 to 5 lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 65 km/h F

EXHIBIT 17 – KLONDIKE ROAD W. – BLOS Segment Evaluation

STREET Klondike Road
FROM March Road
TO Sandhill Road
YEAR 2028
DIRECTION Eastbound– Westbound
MMLOS MODE BLOS

SEGMENT SCORE **A**

Type of Bikeway	LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 travel lanes in each direction separated by a raised median B 2 travel lanes in each direction without a separating median C More than 2 travel lanes in each direction D
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width) A ≥ 1.5 m to < 1.8 m wide bike lane (includes marked buffer and paved gutter width) B ≥ 1.2 m to < 1.5 m wide bike lane (includes marked buffer and paved gutter width) C
Operating Speed	≤ 50 km/h operating speed A 60 km/h operating speed C ≥ 70 km/h operating speed E
Bike lane blockage (commercial areas)	Rare A Frequent C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 or more travel lanes in each direction C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) A 4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) B ≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) C
Operating Speed	< 40 km/h operating speed A 50 km/h operating speed B 60 km/h operating speed D ≥ 70 km/h operating speed F
Bike lane blockage (commercial areas)	Rare A Frequent C
Mixed Traffic	
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential A 2 to 3 travel lanes; ≤ 40 km/h B 2 travel lanes; 50 km/h; no marked centerline or classified as residential B 2 to 3 travel lanes; 60 km/h D 4 to 5 travel lanes; ≤ 40 km/h D 4 to 5 travel lanes; ≥ 50 km/h E 6 or more travel lanes; ≤ 40 km/h E ≥ 60 km/h F
Unsignalized Crossing along Route: no median refuge	
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h A 4 to 5 lanes being crossed; ≤ 40 km/h B 3 or less lanes being crossed; 50 km/h B 4 to 5 lanes being crossed; 50 km/h C 3 or less lanes being crossed; 60 km/h C 4 to 5 lanes being crossed; 60 km/h D 6 or more lanes being crossed; ≤ 40 km/h E 3 or less lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 50 km/h F 4 to 5 lanes being crossed; ≥ 65 km/h F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)	
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h A 3 or less lanes being crossed; 50 km/h A 6 or more lanes being crossed; ≤ 40 km/h B 4 to 5 lanes being crossed; 50 km/h B 3 or less lanes being crossed; 60 km/h B 6 or more lanes being crossed; 50 km/h C 4 to 5 lanes being crossed; 60 km/h C 3 or less lanes being crossed; ≥ 65 km/h D 6 or more lanes being crossed; 60 km/h E 4 to 5 lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 65 km/h F

EXHIBIT 18 – KLONDIKE ROAD E. – BLOS Segment Evaluation

STREET Klondike Road
FROM Sandhill Road
TO East of Sandhill Road
YEAR 2028
DIRECTION Eastbound– Westbound
MMLOS MODE BLOS

SEGMENT SCORE **B**

Type of Bikeway	LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 travel lanes in each direction separated by a raised median B 2 travel lanes in each direction without a separating median C More than 2 travel lanes in each direction D
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width) A ≥ 1.5 m to < 1.8 m wide bike lane (includes marked buffer and paved gutter width) B ≥ 1.2 m to < 1.5 m wide bike lane (includes marked buffer and paved gutter width) C
Operating Speed	≤ 50 km/h operating speed A 60 km/h operating speed C > 70 km/h operating speed E
Bike lane blockage (commercial areas)	Rare A Frequent C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction A 2 or more travel lanes in each direction C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) A 4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) B ≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) C
Operating Speed	< 40 km/h operating speed A 50 km/h operating speed B 60 km/h operating speed D > 70 km/h operating speed F
Bike lane blockage (commercial areas)	Rare A Frequent C
Mixed Traffic	
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential A 2 to 3 travel lanes; ≤ 40 km/h B 2 travel lanes; 50 km/h; no marked centerline or classified as residential B 2 to 3 travel lanes; 50 km/h D 4 to 5 travel lanes; ≤ 40 km/h D 4 to 5 travel lanes; ≥ 50 km/h E 6 or more travel lanes; ≤ 40 km/h E ≥ 60 km/h F
Unsignalized Crossing along Route: no median refuge	
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h A 4 to 5 lanes being crossed; ≤ 40 km/h B 3 or less lanes being crossed; 50 km/h B 4 to 5 lanes being crossed; 50 km/h C 3 or less lanes being crossed; 60 km/h C 4 to 5 lanes being crossed; 60 km/h D 6 or more lanes being crossed; ≤ 40 km/h E 3 or less lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 50 km/h F 4 to 5 lanes being crossed; ≥ 65 km/h F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)	
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h A 3 or less lanes being crossed; 50 km/h A 6 or more lanes being crossed; ≤ 40 km/h B 4 to 5 lanes being crossed; 50 km/h B 3 or less lanes being crossed; 60 km/h B 6 or more lanes being crossed; 50 km/h C 4 to 5 lanes being crossed; 60 km/h C 3 or less lanes being crossed; ≥ 65 km/h D 6 or more lanes being crossed; 60 km/h E 4 to 5 lanes being crossed; ≥ 65 km/h E 6 or more lanes being crossed; ≥ 65 km/h F