Municipal Class Environmental Assessment Report

Traffic Signal Design East Street and Cedartree Lane/Duke Street Intersection, Bobcaygeon, COKL

01-Feb-2024

ON BEHALF OF:

CITY/COUNCIL

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1 Introduction

The City of Kawartha Lakes is responsible for monitoring and managing growth within its municipal borders and implementing required transportation network improvements in a strategic and timely manner. As such, the City's Growth Management Strategy and Municipal Master Plan Project – Volume 3: Transportation Master Plan ("TMP", February 2012), has identified existing and future improvement needs for the intersection of East Street at Cedartree Lane/ Duke Street. The TMP had identified existing and long-term deficiencies at the intersection of East Street at Cedartree Lane/ Duke Street.

To assess the traffic operations and enhance safety for both motorists and pedestrians, the city has initiated intersection studies in the village of Bobcaygeon for East Street at Cedartree Lane/ Duke Street intersection, to address current and future concerns. Various design concepts, including traffic signals or traffic circles, were considered, including changes to the intersection. The limits of this operations study encompass the entirety of the intersection and the roads leading to the intersection i.e, Helen Street, Duke Street, Cedartree Lane, and East Street.

1.1 Study Area

The study area is located within the City of Kawartha Lakes. The Corporation of the City of Kawartha Lakes (City) is located in the western portion of eastern Ontario and is bordered by the Counties of Haliburton, Peterborough and Simcoe, District of Muskoka and the Regional Municipality of Durham. The study area limits are depicted in **Figure 1.1**.

The following roadways are located in the study area:

- East Street is a north-south public right of way.
- Duke Street is an east-west roadway.
- Cedartree Lane is an east-west roadway.
- Helen Street is a north-south roadway, it provides access to residential properties in the area.

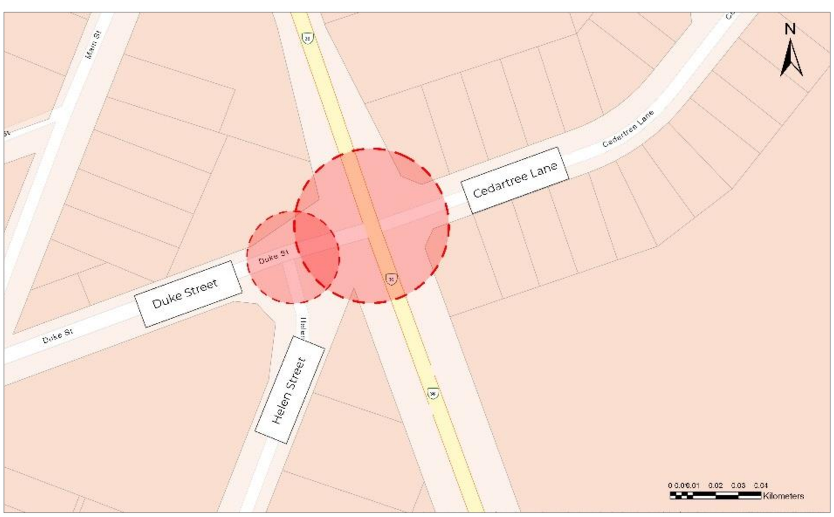


FIGURE 1.1 STUDY AREA

1.2 Exiting Study Area Conditions

1.2.1 Geology

The site is situated on the Peterborough limestone plain where the overburden on a limestone bedrock has largely been stripped. The underlying limestone is the Black River formation which is flat to undulated and outcrops in places.

The investigated street is located within a residential area in the City of Kawartha Lakes. Visual inspection of the existing pavement along the investigated section of the street shows frequent longitudinal, transverse, and alligator cracks, which are generally derived from climatic changes and fatigue failure caused by traffic loads on a weakened subgrade condition. Spalling of the asphalt surface was observed in localized areas. In general, the pavement appears to be in poor condition.

1.2.2 Groundwater

Groundwater was not encountered, and both boreholes remained dry upon completion of the fieldwork. In wet seasons, infiltrated precipitation may become trapped in the fissures and voids of the granular fill or earth fill, resulting in perched groundwater at shallow depths. If groundwater is encountered, the yield from the fill and gravelly sand will be moderate to appreciable, and likely persistent.

1.2.3 Existing Land Use and Access

The Study Area includes 7 separate properties and is a mix of Industrial, Commercial and residential. A detailed description of properties within the Study Area is provided in **Table 1.1**.

1.2.4 Natural Environment

A desktop review of the existing natural heritage environment was undertaken based on previous studies and available literature.

The Bobcaygeon River runs east-west through the Village of Bobcaygeon, however, it is located beyond the limits of the study area.

Table 1.1 Description of Properties within the Study

Address	Ownership	Use	Access	Description
1 Duke Street	Private	Commercial	Access is provided via Duke Street.	Kawartha Lakes Fire and Rescue - Station 3 at the corner of Duke and Helen Street
1 Cedartree Lane	Private	Residential	Access is provided via Cedartree Lane.	Residential Property at the corner of Cedartree Lane and East Street.
2 Cedartree Lane	Private	Residential	Access is provided via Cedartree Lane.	Residential Property at the corner of Cedartree Lane and East Street.
105 Helen Street	Private	Residential	Access is provided via Cedartree Lane.	Residential Property at the corner of Cedartree Lane and East Street.
161 Main Street	Private	Residential	Access is provided via Main Street.	Residential Property at the corner of Duke Street and Main Street.
215 Main Street	Private	Industrial	Access is provided via East Street.	General Industrial area.
87 East Street	Private	Industrial	Access is provided via East Street.	General Industrial area.

1.3 Scope of Work

This study was be carried out through an open public process in accordance with the requirements of the Municipal Class Environmental Assessment (EA) public process. A key component of the study will be consultation with stakeholders and the general public. A Public Information Centre will be held during the study to present findings and receive public input.

The entire assignment focuses on the followings:

1. To install a traffic signal that improves the overall traffic operations at the subject intersection.
2. To develop a suitable signal phasing and sub-phasing plan that eliminates the angle collisions, especially between the predominant eastbound & southbound flows plus the westbound and northbound flows; and
3. To enhance the pedestrian crossing activities across all approaches including future proofing the intersection corners to accommodate the pedestrian landings and also extension of future sidewalks along the east and west sides of East Street or north and south sides of Duke Street and Cedartree Lane.

In order to enhance the overall safety of the traffic operations within the vicinity and at the intersection, we would like to highlight the followings:

1. The assignment warrants development of a conceptual design layout of the corner pedestrian ramps to identify the location of the traffic signal poles and does not require detailed design of the pedestrian landing ramps complying to 'Accessibility for Ontarians with Disability Act' (AODA); and
2. Despite the potential enhancement of the traffic operations and safety, a potential major concern was also noted in regards to operation of the Duke Street and Helen Street traffic operations and safety. We would like to note the followings:
    a. The Helen Street and Duke Street intersection is approximately within 35 m from the East Street and Duke Street/ Cedartree Lane intersection;
    b. With the signalization the operating speed of the westbound vehicles on Duke Street arriving from Cedartree Lane is expected to increase at least two to three folds, which might significantly increase the potential collision probability at the intersection of Duke Street and Helen Street.
    c. The sudden stopping/ slowing down of the westbound left turn traffic on Duke Street to enter Helen Street in front of the speeding westbound through traffic might significantly increase the potential for rear-endings; whereas
    d. The northbound left turning traffic from Helen Street against the conflicting eastbound and westbound through movements might also significantly deteriorate the road crash scenario.

Figure 1.2 Proposed Location for Traffic Lights at the Intersection of CKL 36 and Cedartree Lane

2 Transportation Conditions

2.1 Existing Cross-Section

A summary of key characteristics of the existing cross-section, including lane configurations and lane widths, is provided as follows:

County Road 36 North of Cedartree Lane	• 5.0 m (northbound) and 7.5 m 2 lanes (southbound) travel lanes, one in each direction
County Road 36 South of Cedartree Lane	• 10.9 m (northbound) 3 lanes and 6.7 m 2 lanes (southbound) travel lanes, one in each direction
Cedartree Lane	• 4.0 m (eastbound) and 3.8 m (westbound) travel lanes, one in each direction • 1.6 m Sidewalk on the south side
Duke Street	• 5.4 m (eastbound) and 5.5m (westbound) travel lanes, one in each direction • 2.3 m Sidewalk on the south side
Helen Street	• 3.2 m (northbound) and 3.5 m (southbound) travel lanes, one in each direction • 2.3 m Sidewalk on the west side

In addition, it's important to note that there exists a skew of 2.6 meters between Cedartree Lane and Duke Street in the existing road layout. This skew introduces an offset between the two roads, impacting the alignment and intersection geometry between these two roads.

2.2 Existing Traffic Operations

Existing traffic operations were assessed based on traffic movement counts undertaken on 17th May 2023. A Synchro traffic model was developed to assess operations of the road network based on the counts.

Under existing conditions, the study intersection East Street and Cedartree Lane/Duke Street is operating with Level of Service 'B' or better. One exception is the westbound left-through-right movement at the intersection is operating with a level of service 'D'.

2.2.1 Intersection Turning Movement Counts

A turning movement count (TMC) were captured for three hours during the early morning, forenoon, afternoon and evening hours on a weekday. Weekday AM, PM peak hours and off-peak hours turning movement volumes were established based on the recorded counts. The figures below illustrate the weekday AM and PM peak hour volumes and the weekday AM and PM off-peak hour volumes.

Figure 2.1 below clearly transpire that the northbound to westbound and eastbound to southbound movements during the weekday peak hours, even during the weekday AM off-peak hour represent major flow streams and rationalize the classification of Duke Street as an arterial, whereas the traffic volumes to and from Cedartree Lane clearly support the relevance of local street classification.

A 2% growth was assumed for all the turning movements to forecast the future background traffic volumes under the 2028 horizons. **Figure 2.2** and **Figure 2.3** below illustrate the future background traffic volumes under 2028 horizon:

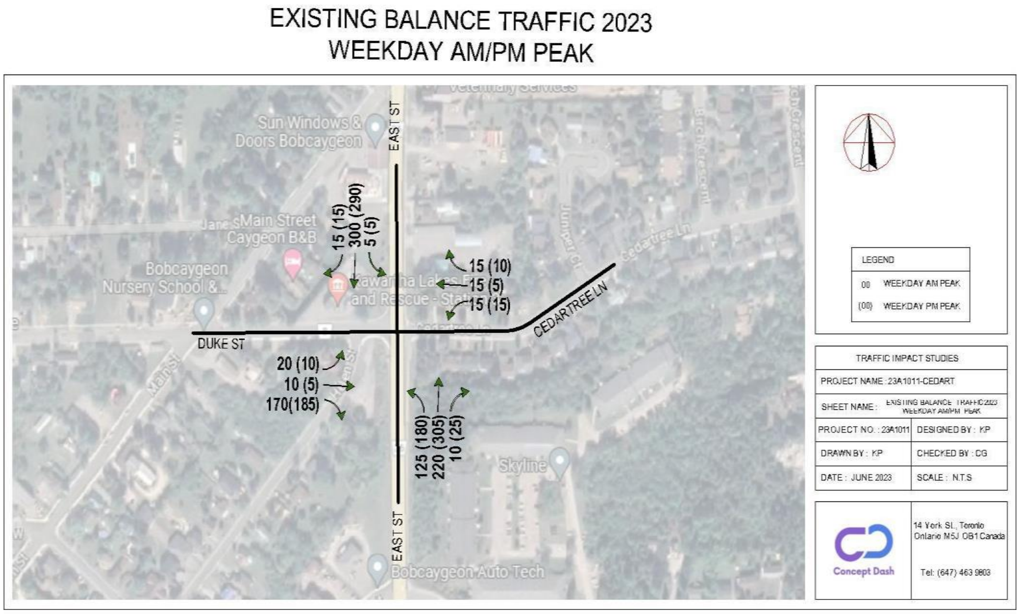


Figure 2.1 Existing Balance Traffic 2023 Weekday AM/PM Peak

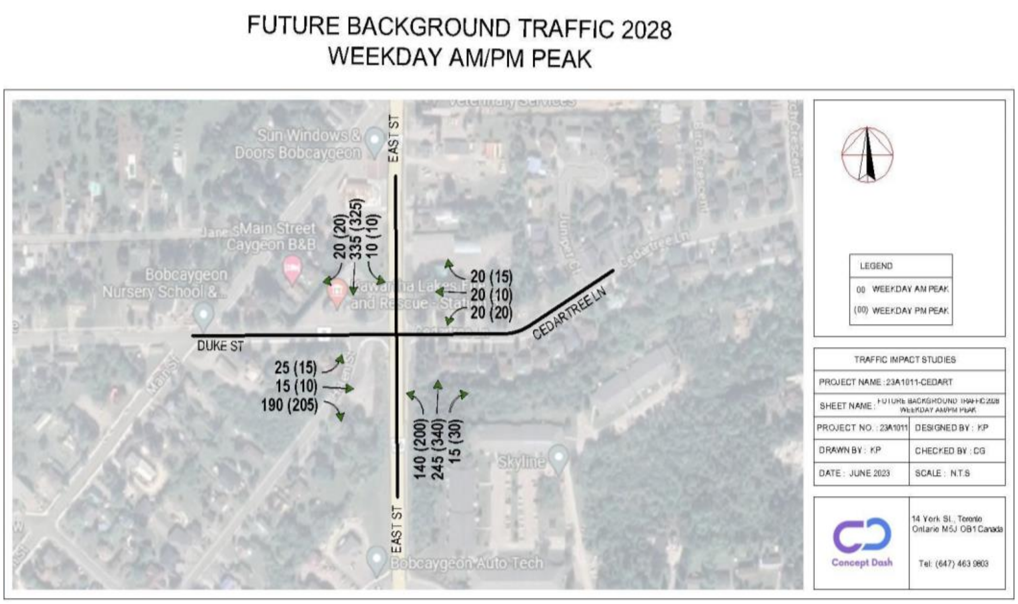


Figure 2.2 Future Background Traffic 2028 Weekday AM/PM Peak

FUTURE BACKGROUND TRAFFIC 2028
WEEKDAY AM/PM OFF PEAK

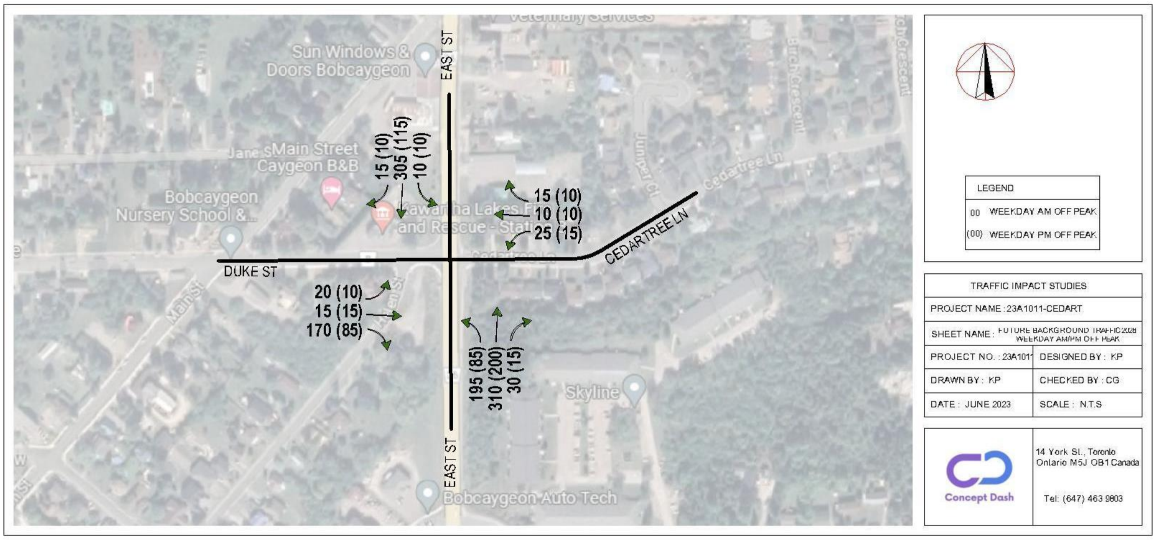


FIGURE 2.3 FUTURE BACKGROUND TRAFFIC 2028 WEEKDAY AM/PM OFF PEAK

It is anticipated that the northbound to westbound and eastbound to southbound movements during the weekday peak hours, even during the weekday AM off-peak hour will continue to remain high.

2.2.2 Historical Collision Data

The collision data that was shared by the city revealed that about 15 collisions took place at and around the subject junction and within its influence areas. The historical collisions were separated into various types of collisions i.e. rear-end collisions, angle collisions, and road run-off collisions.

It is worth noting that there were six rear-end collisions within the intersection influence area and the collisions occurred from 2017 through to 2020, whereas five out of six collisions occurred around the 'Stop' line on Duke Street The tables in **Appendix A** summarizes the details of the rear-end, Angle and Road Runoff collisions. The **Figure 2.4** illustrates the number of collisions categorized by the type of initial impact and Total number of Collisions by year.

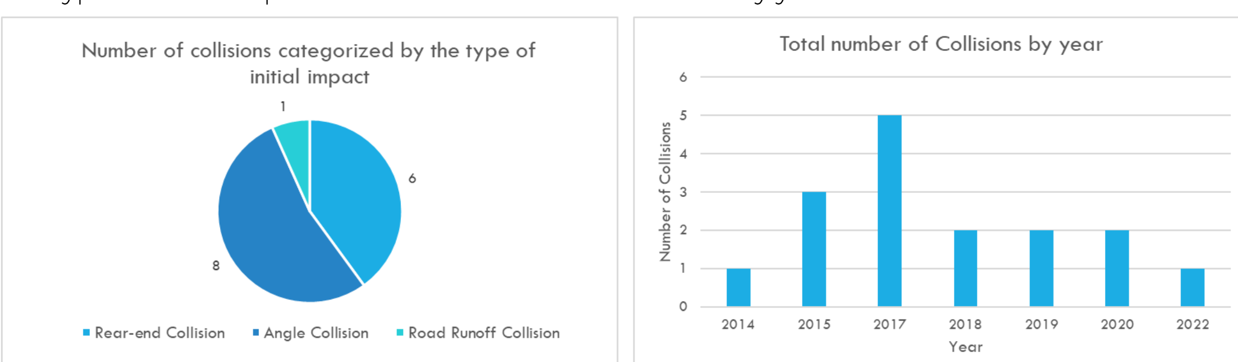


FIGURE 2.4 THE NUMBER OF COLLISIONS CATEGORIZED BY THE TYPE OF INITIAL IMPACT AND TOTAL NUMBER OF COLLISIONS BY YEAR.

It transpires that the rear-end collisions that occurred during 2017 to 2020 overrepresented the overall collision record, which represents about 40% of the overall historical collisions that were recorded from 2015 until 2022. It also transpired that the eastbound stopped vehicles on Duke Street at the subject intersection are generally victimized by the following vehicles during broad daylight.

It is worth noting that the next major cross street to the west of East Street (CKL 36) is Main Street, which is approximately 200 m away from the 'Stop' line on Duke Street. The available visibility on Duke Street for the eastbound vehicles is infinite. Therefore, it would be extremely difficult for the eastbound vehicles on Duke Street to miss seeing any stopped vehicles at the Duke Street and East Street intersection.

The Helen Street and Duke Street intersection is about 35 m away from the subject intersection of Duke Street and East Street. It could be inferred that the northbound vehicles that are exiting from Helen Street while turning northbound to eastbound, generally look west on Helen Street to see the gaps in the eastbound vehicle stream. Due to the close proximity of Helen Street and East Street, it might be possible that the stopped vehicles on Duke Street at the intersection of East Street and Duke Street are potentially getting rear-ended by the northbound right-turning vehicles exiting from Helen Street. The **Figure 2.5** illustrates the Traffic Collision heat map for the study area.

FIGURE 2.5 TRAFFIC COLLISION HEAT MAP FOR THE STUDY AREA

It transpires that eight angle collisions occurred during the period starting from 2015 to 2022. The collision history reflects the following:

a) Three collisions between eastbound through/ right and southbound through movements.
b) Two collisions between northbound left and southbound through movements.
c) One collision was between northbound through and westbound left, and the other was between the northbound through and westbound right movements; and
d) The others were between eastbound through and southbound right, whereas there was a multi-vehicle collision involving southbound left, and northbound through movements.

It transpires from the above that the conflicting movements between the eastbound and southbound, westbound and northbound, plus the northbound left and southbound, had caused most of the collisions and required proper segregation. It appears the perception of acceptance of gaps on East Street by the eastbound and westbound exiting vehicles is improper, which has resulted in angle collisions.

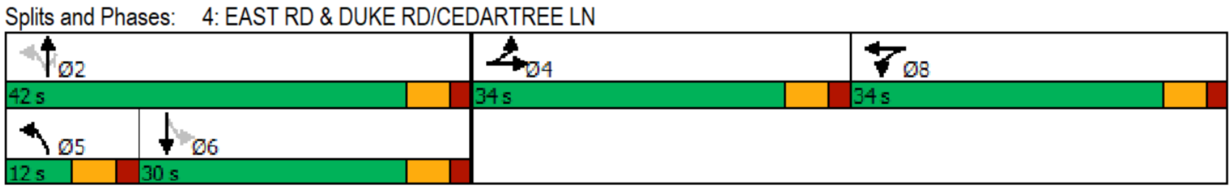
2.2.3 Signal Phasing Design

Based on the recorded traffic volumes and findings from the above collision analyses, the signal phasing, sub-phasing was designed to avoid any direct conflict between the eastbound/ westbound and southbound/ northbound movements. Emphasis was also made to minimize the potential conflicts between the northbound left and southbound through movements, as well. The following measures were considered:

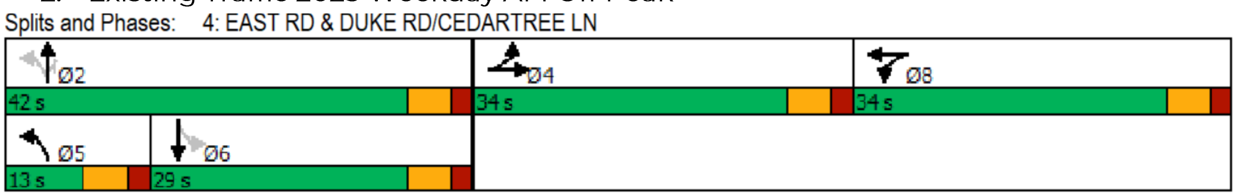
1. Providing split phase for the eastbound and westbound direction of flow and barring right turn on red from Duke Street and Cedartree Lane.
2. Providing protected and permitted northbound left advance phase to discharge most of the northbound left demand; and
3. Providing pedestrian crossing phases during the eastbound and westbound split phases and northbound and southbound through phases, assuming the intersection will be future proofed with pedestrian crossing across all the approaches.

Barring right turn on red for the eastbound and westbound movements shall alienate the potential collision between the westbound right turns and the northbound through plus the eastbound right turns and the southbound through movements. The northbound advance left turn phase will eliminate the potential of conflict between the northbound left and southbound through movements during the advance phase and minimize the angle collision at the northwest quadrant. The potential optimized signal phasing, sub-phasing and signal cycle timings are illustrated below. The signal timing for the weekday AM and PM peak hours plus the signal timing for the weekday AM and PM Off-peak hours were developed utilizing the Synchro 11 software package.

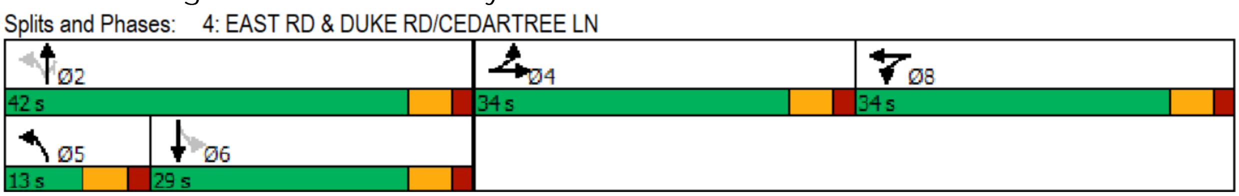
1. Existing Traffic 2023 Weekday AM Peak



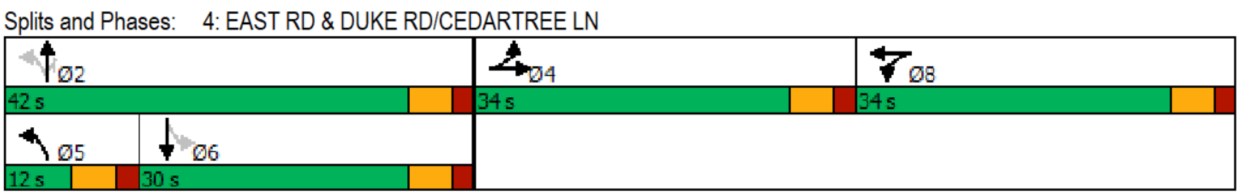
2. Existing Traffic 2023 Weekday AM Off Peak



3. Existing Traffic 2023 Weekday PM Peak

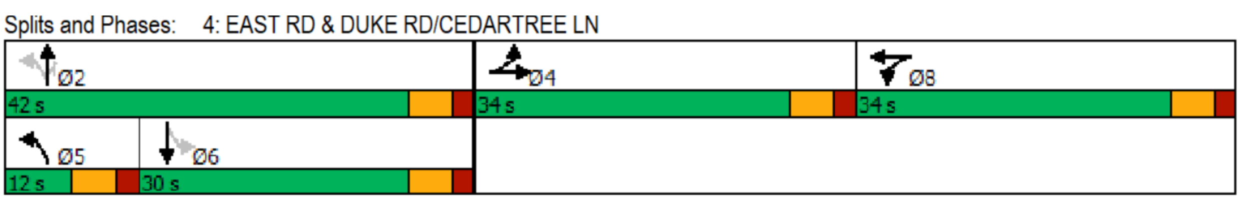


4. Existing Traffic 2023 Weekday PM Off Peak

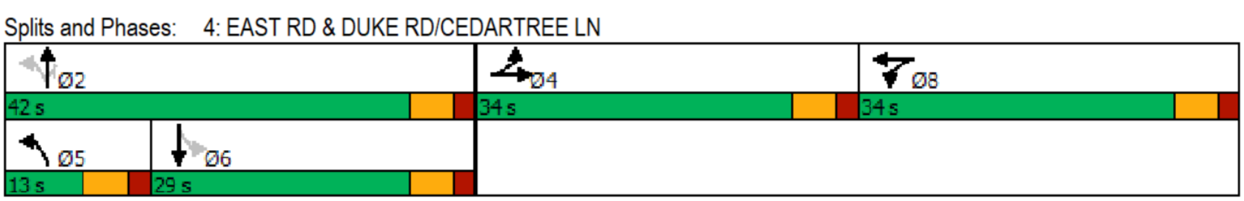


It is worth noting that the signal cycle time, the phasing and sub-phasing plan will remain the same through the weekday peak and off-peak hours under the existing and future traffic conditions, which would be more commuter friendly and avoid any surprises.

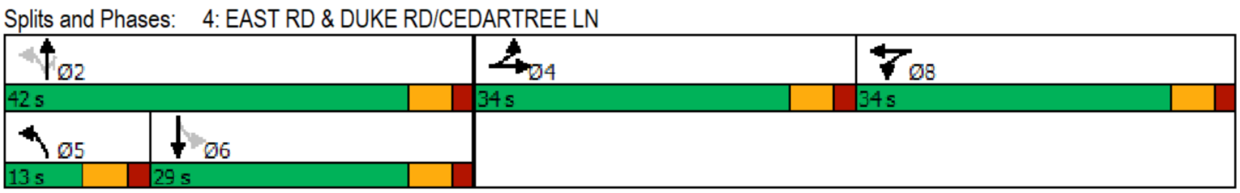
5. Future Background Traffic 2028 Weekday AM Peak



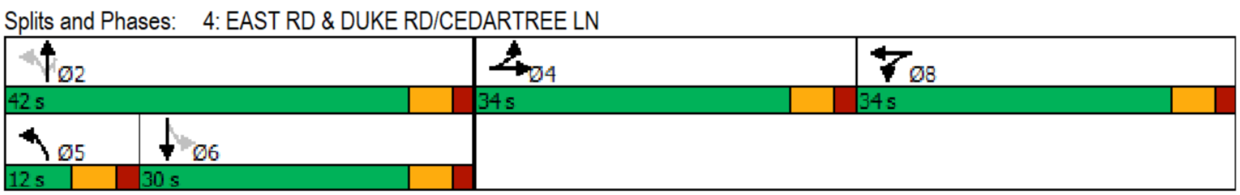
6. Future Background Traffic 2028 Weekday AM Off Peak



7. Future Background Traffic 2028 Weekday PM Peak



8. Future Background Traffic 2028 Weekday PM Off Peak



2.3 Future Transportation Conditions

This section documents the future conditions of the study corridor, including future traffic operations, access management needs, and opportunities.

2.3.1 Planned Future Network Improvements

To carry out the operational review it was assumed the same background network improvements as listed in the Transportation Master Plan Section 1.1 Committed / Approved Network Improvements. These improvements are also depicted in Figure 9-5 of the Transportation Master Plan as "future roads", shown in Figure 2.5

Performance Measure Evaluation:

The **Appendix B** summarizes the performance measure of the intersection during various peak and off-peak hours under the existing 2023 and future 2028 horizon year:

Figure 2.4 Transportation Master Plan Figure 7-6 (Future Intersection Level of Service - Bobcaygeon)

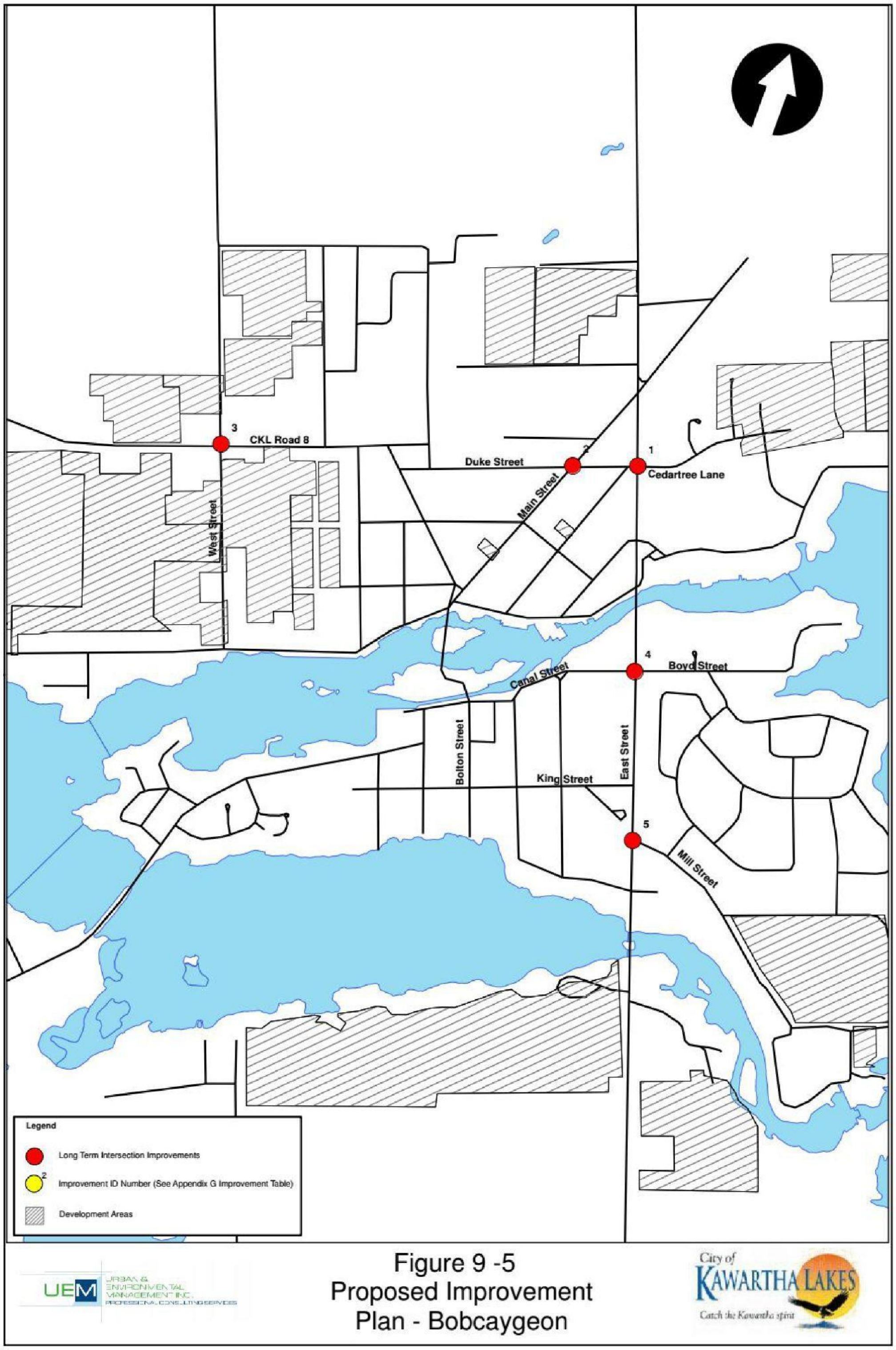


Figure 2.5 Transportation Master Plan Figure 9-5 (Proposed Bobcaygeon Roadway Functional Classification)

TABLE 2.1 EXISTING TRAFFIC VOLUME ANALYSIS- (ACCORDING TO TRANSPORTATION MASTER PLAN 2011) - WEEKDAY PEAK HOUR

Unsignalized Intersection	AM		PM	
	Delay	LOS	Delay	LOS
Main Street & CKL Road 649/East Street N	8.5	A	24.3	C
East Street S and Cedartree Lane/ Duke Street	4.4	A	4.8	A
Main Street and Duke Street	8.6	A	8.4	A

TABLE 2.2 FUTURE 2031 TRAFFIC VOLUME ANALYSIS (ACCORDING TO TRANSPORTATION MASTER PLAN 2011) - WEEKDAY PEAK HOUR

Unsignalized Intersection	AM			PM			Geometric Changes	PM with improvements			AM with improvements		
	Delay	LOS	Critical Movement	Delay	LOS	Critical Movement		V/C	Delay	LOS	V/C	Delay	LOS
Main Street & CKL Road 649/East Street N	11.2	B		15.4	C								
East Street S and Cedartree Lane/ Duke Street		H	EB/WB		H	EB/WB	Signal EBR+NBL	0.94	33.1	C	0.90	35.4	D
Main Street and Duke Street	143.1	F	EB/WB	123.5	F	EB/WB	Signal	0.77	12.4	B	0.84	16.1	B

3 Class Environmental Assessment Process

The Class Environmental Assessment for Municipal Roads Projects (Class EA) is an approved process by the Ministry of the Environment for planning and designing municipal road and water projects. The Class EA describes the process that proponents must follow in order to meet the requirements of the Environmental Assessment Act. The process is shown on the next panel.

Four types of projects to which the Class EA applies are:

- Schedule A Projects, which are pre-approved where the proponent may proceed without following the procedures set out within the Municipal Class EA process
- Schedule A+ Projects which are also pre-approved but where the public is to be advised prior to project implementation
- Schedule B Projects, which are approved but subject to screening and where Phases 1 and 2 of the planning process have been completed
- Schedule C Projects, which must proceed under the full planning and documentation procedures specified in the Class EA document

The Traffic Signal Design for Cedartree Lane and CKL 36 Intersection Class Environmental Assessment is being planned as a Schedule 'A+' project based on the nature of work. As a Schedule 'A+', it is pre-approved

The key principles of the MCEA process include:

- Consultation with affected parties upon commencement, and throughout the process, of the project;
- Consideration of a reasonable range of alternatives, including both the functionally different "alternative solutions" and the "alternative design concepts" of implementing the preferred solution;
- Identification and consideration of the effects of each alternative solution and/or method on all aspects of the environment (i.e., natural, cultural, social, economic, built); Systematic evaluation of all alternative solutions and/or methods in terms of the advantages and disadvantages associated with each to determine the net environmental effects;
- Provision of clear and complete documentation of the planning process followed, to ensure transparency and traceability of the decision-making process followed for the project.

Phase 1: Identification of the Problem/Opportunity

Phase 2: Develop Alternative Solutions & Preferred Solution

Phase 3: Evaluate Alternatives for Preferred Solution

Phase 4: Prepare Environmental Study Report (ESR)

Phase 5: Implementation of Project

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA

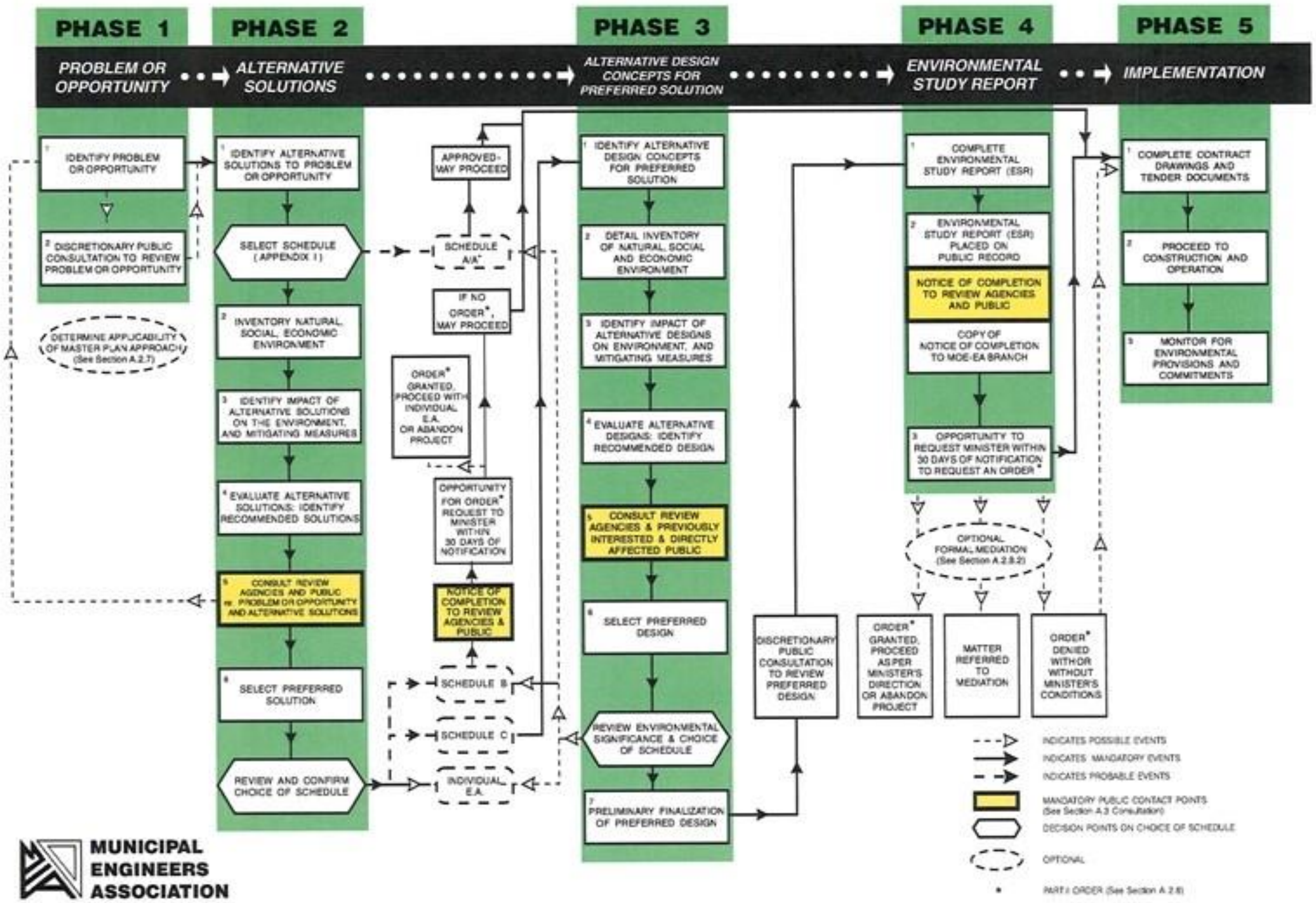


FIGURE 3.1 CLASS ENVIRONMENTAL ASSESSMENT PROCESS

4 Identification & Description of the Problem

4.1 Identification and Description of Problems/Opportunity

A problem statement and opportunity are identified to define the transportation issues facing the City of Kawartha Lakes, and the opportunities it faces.

To address the growing community needs, the City is planning on upgrading the intersection of East Street North and Cedartree Lane/Duke Street to include traffic signals equipped with Accessible Pedestrian Signals (APS), illumination and Accessibility for Ontarians with Disabilities Act (AODA) requirements.

The City will need to address changing travel patterns and ensure road infrastructure continues to operate at an acceptable level of service and help maintain roadway safety. In the coming years, the use of existing infrastructure needs to be maximized for efficient movement of a variety of users including pedestrians, cyclists, and drivers.

4.1.1 Problem/Opportunity Statement

During the design of the traffic signal, undoubtedly enhancement of the traffic operations and safety, a potential major concern was also noted in regards to operation at Duke Street and Helen Street, as summarized below:

I. The Helen Street and Duke Street intersection is within approximately 35 m of the East Street and Duke Street/ Cedartree Lane intersection. With the signalization, the operating speed of the westbound vehicles on Duke Street arriving from Cedartree Lane is expected to increase at least two to threefold, which might significantly increase the potential collision probability at the Duke Street and Helen Street intersection.

II. The sudden stopping/ slowing down of the westbound left turn traffic on Duke Street to enter Helen Street in front of the speeding westbound traffic might significantly increase the potential for rear-endings;

The safety of the northbound left turning traffic exiting from Helen Street against the conflicting eastbound and westbound through movements might also be compromised and significantly deteriorate the crash/collision scenario.

5 Identification & Evaluation of Alternative Solutions to the Problem

5.1 Identification and Description of Alternative Solutions

As part of the MCEA process, it is necessary to consider alternative solutions to the identified problem, which can be evaluated using criteria developed to establish a preferred solution. Alternative solutions of the project are functionally different ways of approaching a problem or opportunity.

Design and installation of a solution to prevent current and future conflict points at the Duke/Helen Intersection as well as at the Cedartree and East St N with a signal and to avoid unnecessary worsening of the potential collision scenario, alternative solutions are discussed and developed in the Section 5.1.1. This scope of work shall be accomplished through the following steps and should be taken up simultaneous to progressing the traffic signal design and design of the pedestrian ramps at the intersection of East Street and Duke Street/ Cedartree Lane.

5.1.1 Development of Alternative Solutions

The following planning solutions were considered:

5.1.1.1 Alternative #1 - Do Nothing

The Do Nothing alternative is used as a benchmark in the evaluation of the alternative solutions considered. This alternative illustrates the existing operational state of the corridor and outlines the outcomes if no action is taken to enhance the conditions within the project limits.

The "Do Nothing" alternative is retained for comparative analysis during the evaluation of alternative solutions. Under this scenario, Cedartree Lane and Duke Street would maintain their current configurations, and no specific traffic signal improvements would be implemented. Figure 5.1 illustrates the Do nothing option.

Advantages of Alternative 1 - Do Nothing:

- Cost effective.
- No changes to the intersection layout.

Disadvantages of Alternative 1 - Do Nothing:

- Traffic operational challenges.
- Increased safety concerns.
- Traffic flow issues.

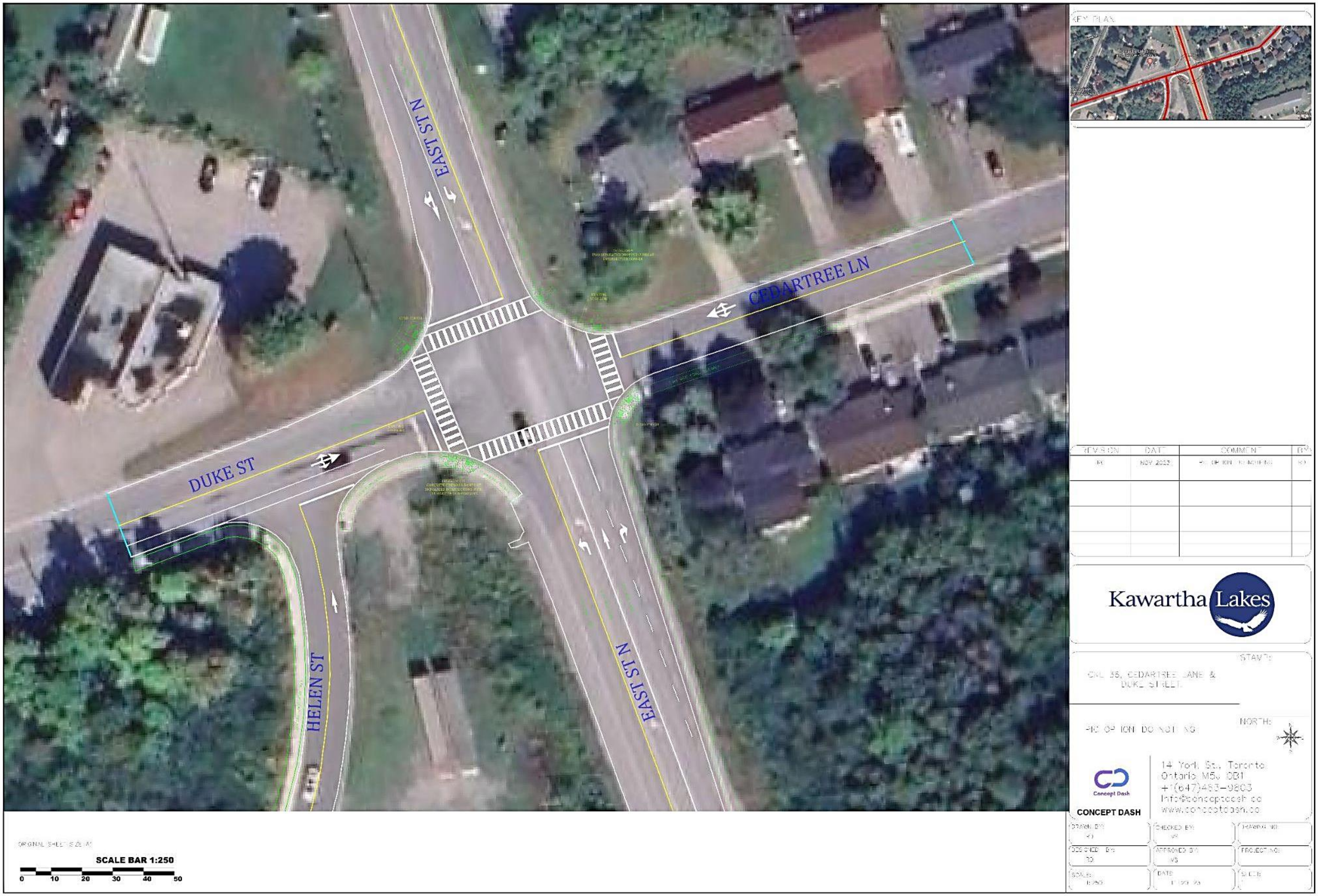


FIGURE 5.1 ALTERNATIVE NO.1 - DO NOTHING

5.1.1.2 Alternative #2A – Median

This alternative would involve the construction or modification of a median as a potential solution. This could involve dividing the roadway and providing a physical barrier between opposing lanes of traffic. Figure 5.2 illustrates the 2A- Median option.

Advantages of Alternative 2A - Median

- Cheaper alternative (cost-effective).
- Left turn compliance.

Disadvantages of Alternative 2A – Median.

- Maintenance and repairs.
- Bike Lane removal.

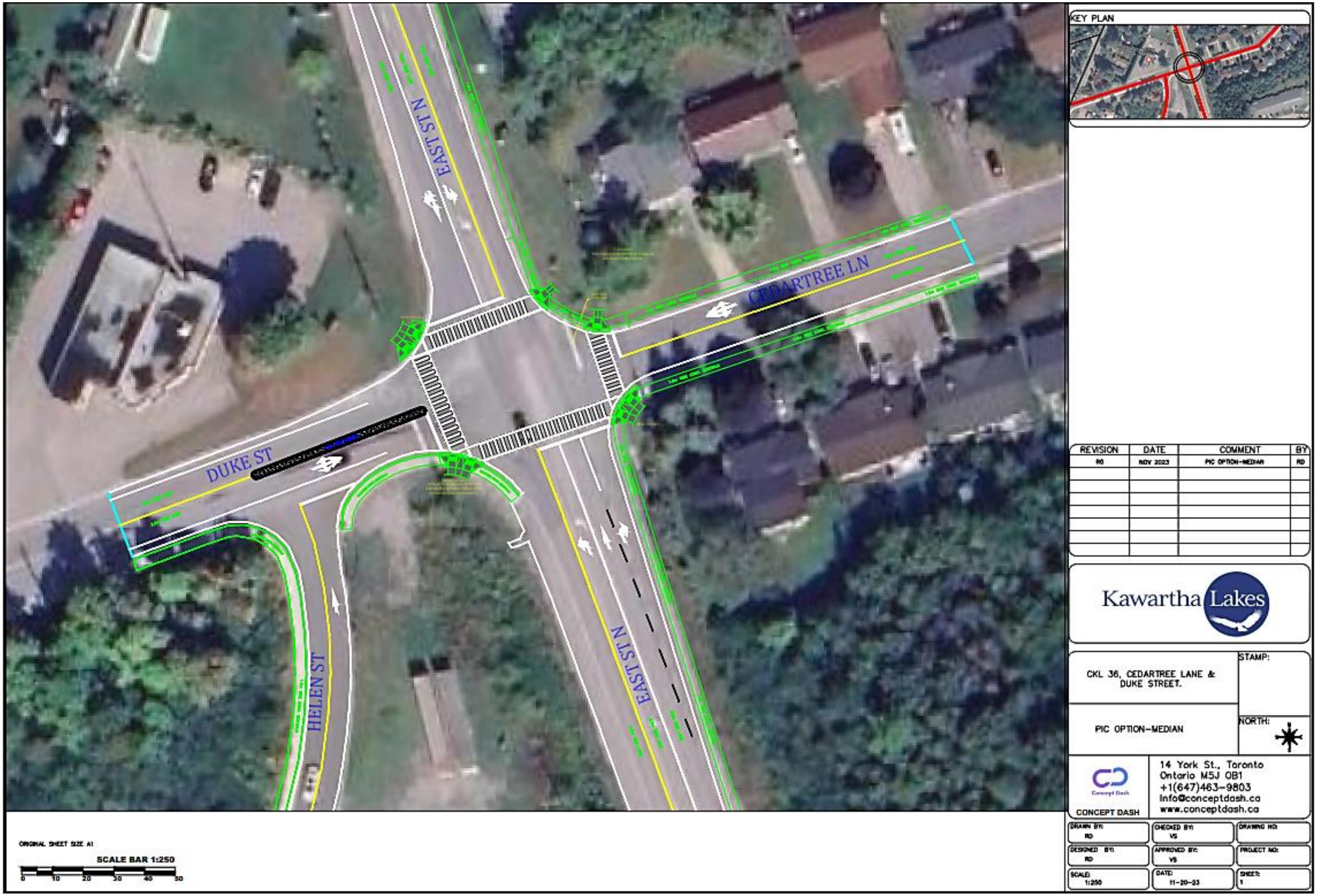


Figure 5.2 Alternative No.2A - Median

5.1.1.3 Alternative #2B - Pork Chop Island

This alternative would involve the construction of an island at the intersection of Helen and Duke Street. Figure 5.3 illustrates the 2B - Pork Chop Island option.

Advantages of Alternative 2B Pork Chop Island

- Increase safety for motorists.
- Improve traffic operations.
- Reduce conflicts between vehicles.

Disadvantages of Alternative 2B Pork Chop Island

- Restrict left turn movements.
- Additional travel time and inconvenience to motorists.
- Compliance/Enforcement.
- Additional signage.
- Increase of U turns (3 point turn).

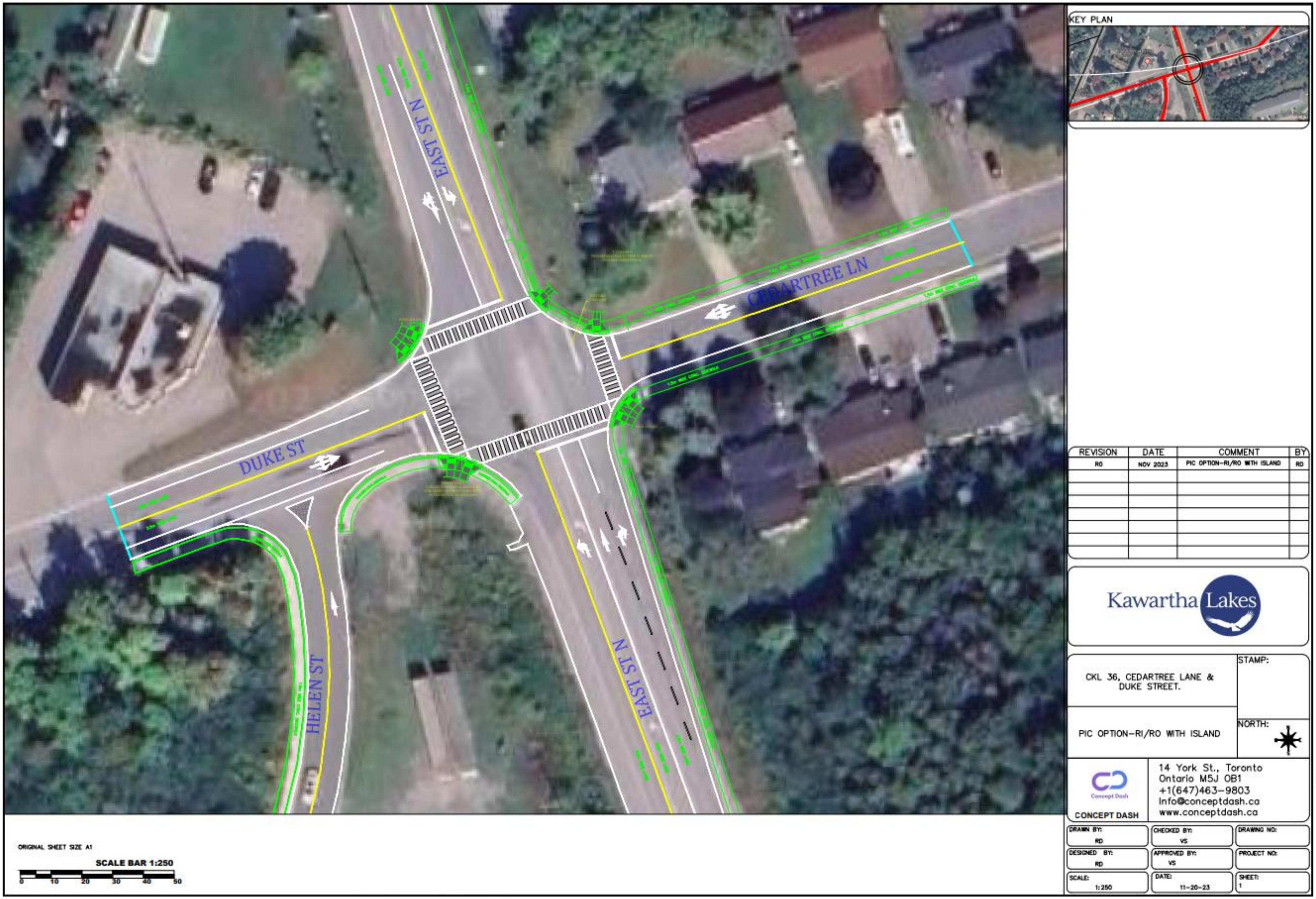


Figure 5.3 Alternative No.2B - Pork Chop Island

5.1.1.4 Alternative #3A - No North

This alternative would involve implementation of no north in Helen Street. Figure 5.4 illustrates the 2B - No North option.

Advantages of Alternative 3A No North

- Increase safety for motorists.
- Improve traffic operations.
- Reduce conflicts between vehicles.

Disadvantages of Alternative 3A No North

- Restrict Right turn movements.
- Additional travel time and inconvenience to motorists.
- Additional signage.
- Increased U Turns (3 Point Turn).

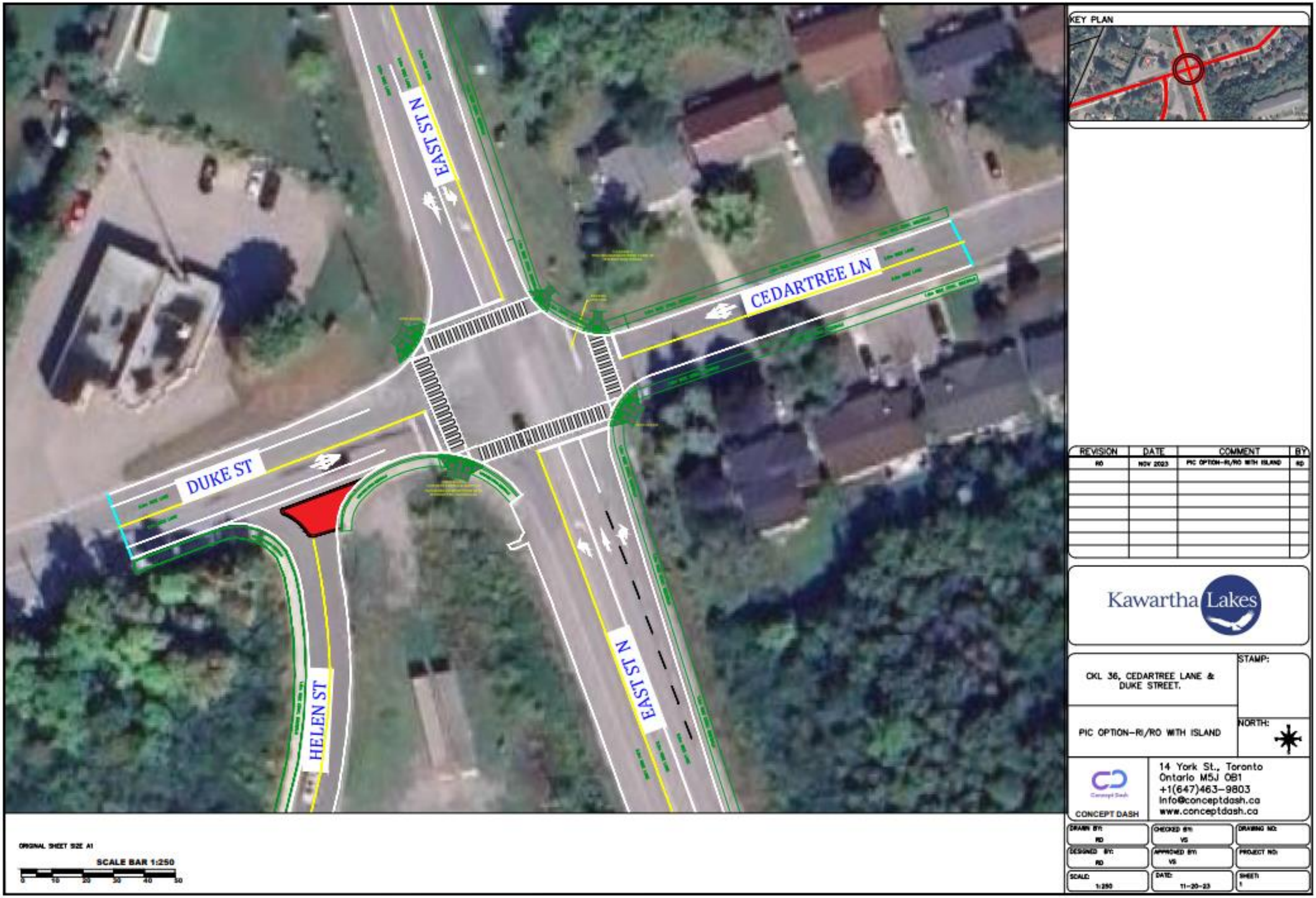


Figure 5.4 Alternative No.3A - No North

5.1.1.5 Alternative #3B - Cul-De-Sac

This alternative proposes the implementation of a cul-de-sac at Helen Street. In this scenario, a cul-de-sac would be constructed at the intersection with Helen Street, providing a circular turning area for vehicles. These alternative aims to address specific traffic concerns and enhance safety at the intersection.

The cul-de-sac design would involve the closure or restriction of through traffic on Helen Street, rerouting vehicles towards alternative routes. Figure 5.5 illustrates the Cul-de-sac option.

Advantages of Alternative 3C Cul-De-Sac

- Increase safety for motorists.
- Improve traffic operations.
- Reduce conflicts between vehicles.

Disadvantages of Alternative 3C Cul-De-Sac

- Potential concerns from EMS.
- Snow Removal potential issue.
- Additional travel time and inconvenience to motorists.
- Additional signage.
- Increased U Turns.

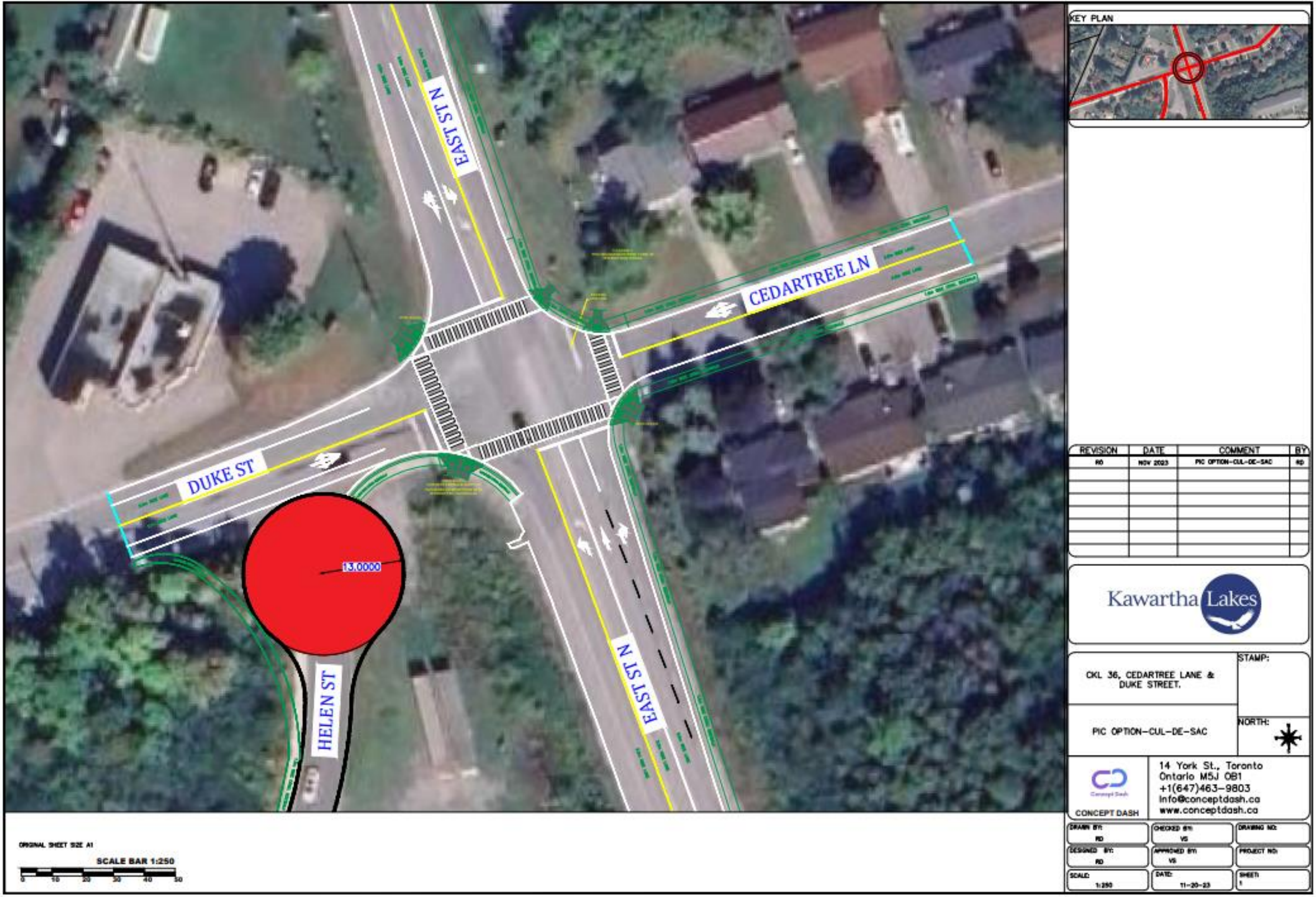


Figure 5.5 Alternative No.3B - Cul-de-sac

5.1.1.6 Alternative #3C - Cul-De-Sac (Knucklehead)

The Cul-de-Sac alternative, designated as "Knucklehead," involves the creation of a turnaround area at Helen Street. This design envisions the termination of the street in a circular or bulbous manner, allowing vehicles to reverse direction easily and safely. The introduction of the cul-de-sac aims to address traffic flow concerns and enhance overall safety at the intersection of Helen Street and Duke Street. Figure 5.6 illustrates the Cul-de-sac (Knucklehead) option.

Advantages of Alternative 3C Cul-De-Sac (Knucklehead)

- Increase safety for motorists
- Improve traffic operations
- Reduce conflicts between vehicles

Disadvantages of Alternative 3C Cul-De-Sac (Knucklehead)

- Potential concerns from EMS
- Snow Removal potential issue
- Additional travel time and inconvenience to motorists
- Additional signage
- Increased U-Turns

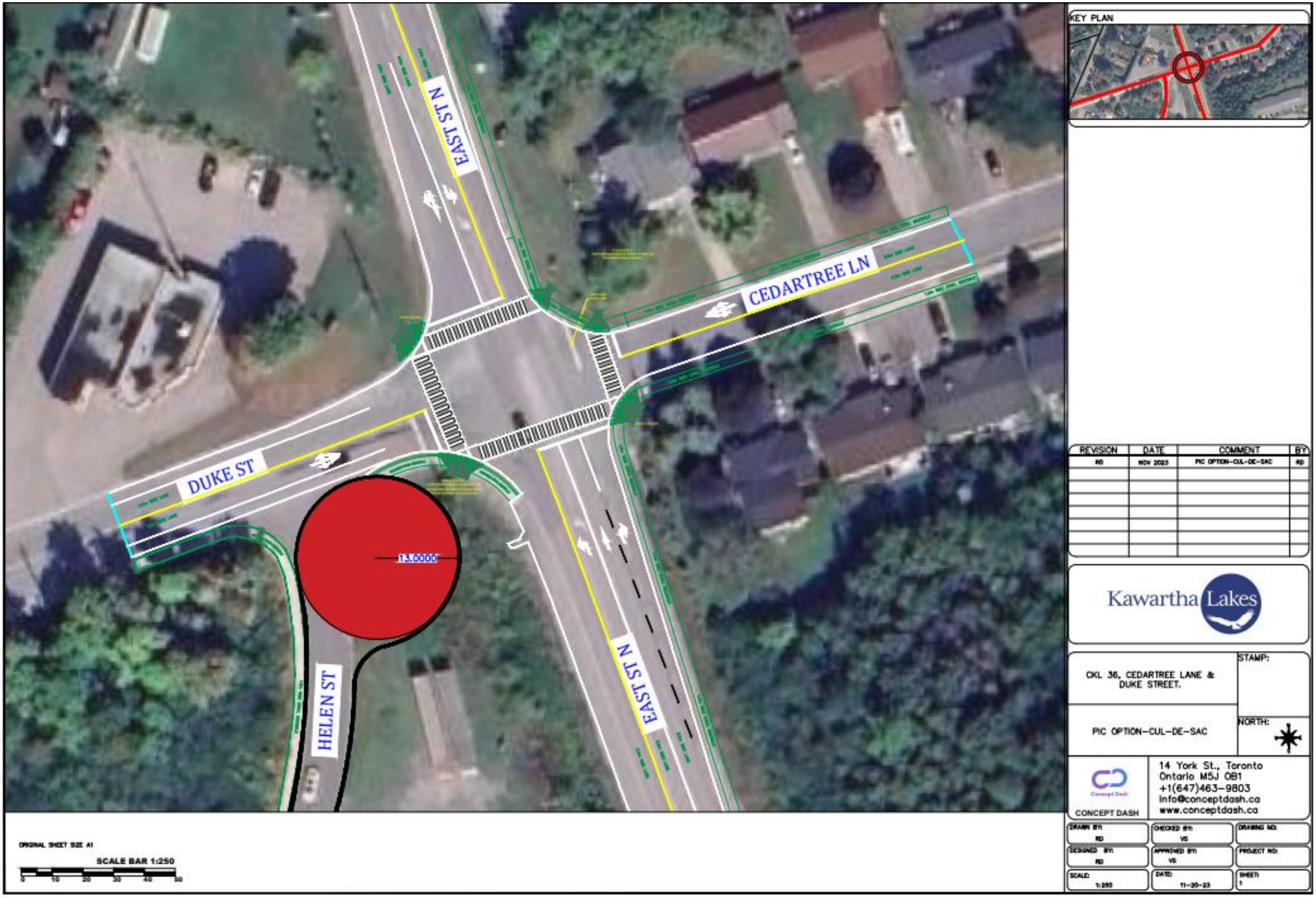


Figure 5.6 Alternative No.3C - Cul-de-sac (Knucklehead)

5.1.1.7 Alternative #4 - Roundabout

The Roundabout alternative proposes the construction of a circular intersection designed to enhance traffic flow and improve safety through controlled, continuous movement. Figure 5.7 illustrates the Roundabout option.

Advantages of Alternative 4 Roundabout

- Safer Movements
- Reduced Queues
- Lower Delays
- Fewer conflict points

Disadvantages of Alternative 4 Roundabout

- Impacts Utility
- Requires Reconstruction on South West corner
- Potential Property Acquisition

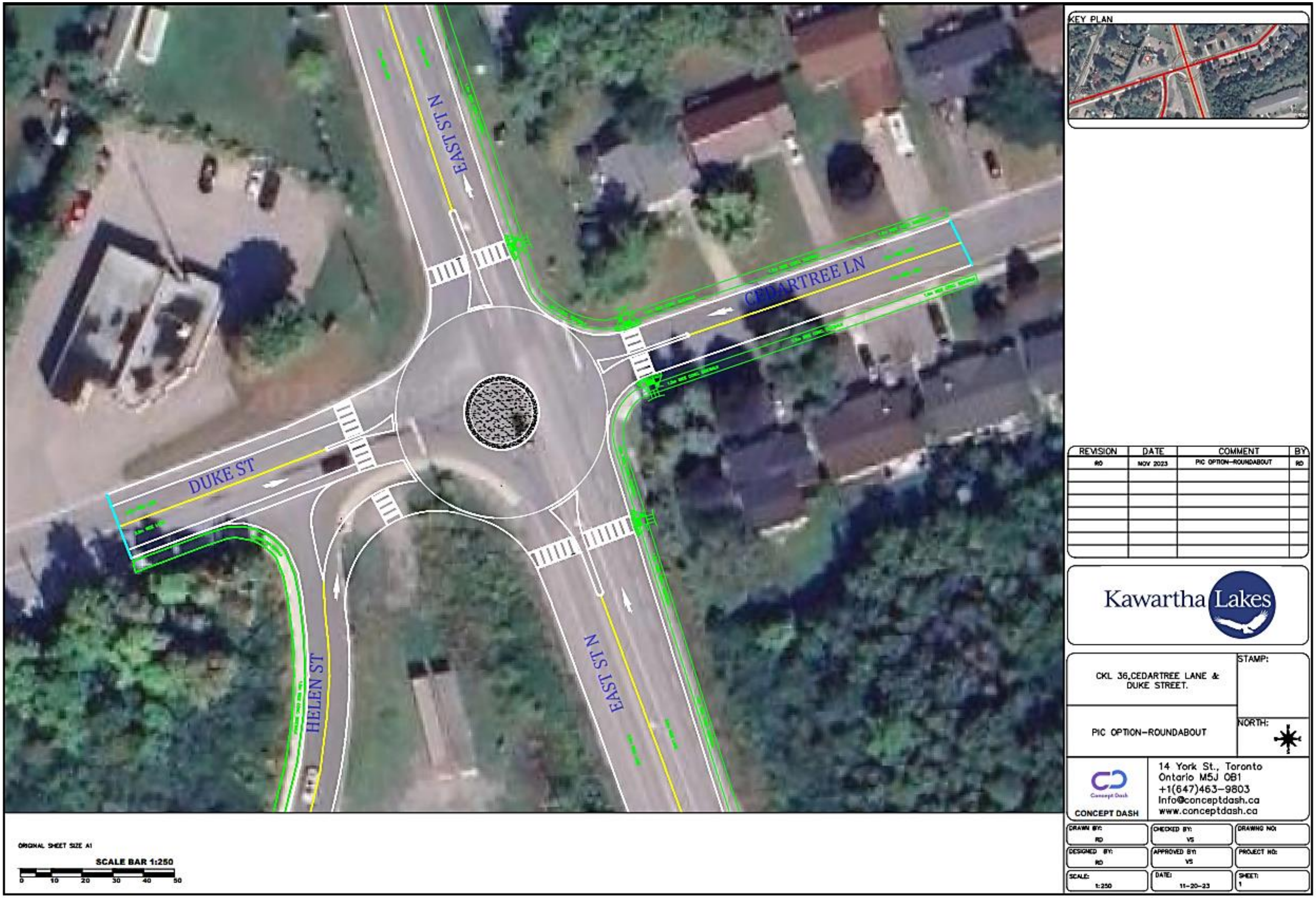


FIGURE 5.7 ALTERNATIVE NO.4 - ROUNDABOUT

5.1.2 Planning Alternatives Evaluation Criteria

The evaluation criteria listed below were developed following the requirements and guidelines of the Municipal Class EA document, and include inputs received during the consultation process with the Project Review Team.

The advantages and disadvantages of each planning alternative should be evaluated following a clear, traceable and reproducible methodology, taking into account technical, as well as economic, social, and environmental considerations.

5.2 Comparative Evaluation of the Alternative Solutions

In the assessment of alternative solutions for the traffic signal design at the intersection, a comprehensive evaluation was conducted using a set of carefully crafted criteria. These criteria were developed with a focus on existing environmental conditions, the nature of the alternatives under consideration, and the potential environmental effects expected from each alternative, taking into account their respective significance. This evaluation process, detailed in **Table 5.1**, involved linking the criteria to various aspects of the environment, namely natural, built, social, economic, and cultural, as stipulated in the Environmental Assessment (EA) Act.

5.2.1 Development of Evaluation Criteria and Indicators

Table 5.1 Evaluation Criteria Developed for Application to the Alternative Solutions

Category	**Criteria**
Technical	Effect on future traffic operations
Technical	Effect on intersection levels of services and capacity
Technical	Effect on road user safety
Social, Economic and Built Environments	Effect on existing residences, businesses recreation, community or institutional uses.
Social, Economic and Built Environments	Effect on access to Existing Residences
Social, Economic and Built Environments	Effect on the number of collisions
Social, Economic and Built Environments	Effect on reducing congestion and property requirements
Natural Environment	Effect on air quality, noise, vegetative habitat and water
Cultural Environment	Effect on built heritage, cultural heritage and potential archaeological resources

Taking the preceding description of the environment into consideration, the alternative solutions were comparatively evaluated based on a number of evaluation criteria. With this in mind, evaluation criteria were developed based on existing environmental conditions, the alternatives being considered, and type and scale of potential environmental effects anticipated from the alternatives and their relative significance (**Table 5.1**).

5.2.2 Identification of the Recommended Solution

Alternative 3C Cul-de-sac (knucklehead) is recommended because it is ranked as most preferred.

Advantages of Alternative 3C Cul-de-sac (knucklehead):

- Increase safety for motorists.
- Improve traffic operations.
- Reduce conflicts between vehicles.

6 Overview of Consultation Carried Out

6.1 Consultation Activities Carried Out

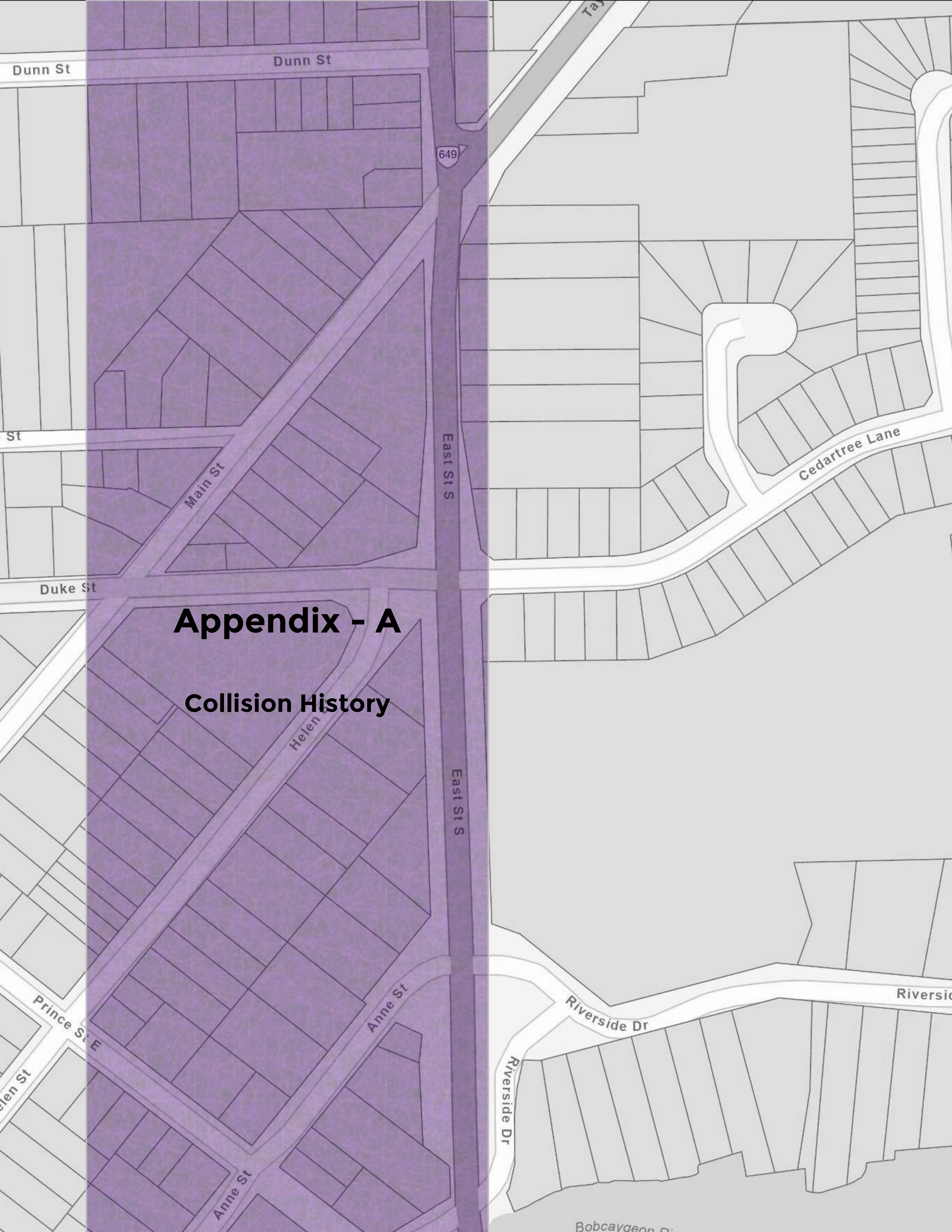
The consultation activities carried out during the design phase of the project were tailored to each participant group with the intent to inform/educate, efficiently obtain input, and address concerns/issues as much as possible.

Consultation with the public was accomplished via a PIC held on Thursday, November 30, 2023. At 5 pm. The PIC was held in an Open House style drop-in and included a presentation including the Alternative options for the intersection followed by a question and answer session. The Notice of PIC was issued directly to all public participants included in the Project's contact database and published in the Kawartha Lakes website.In addition, some members of the public provided comments by email. **Section 6.2** summarizes the public's input received and which option was most preferred.

The summary of comments received, and responses are provided in **Appendix D**.

6.2 Consideration of Comments Received and Issues Raised

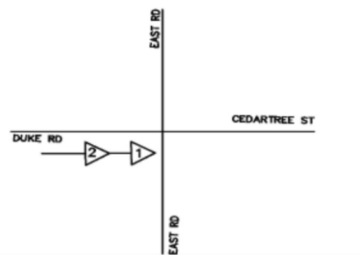
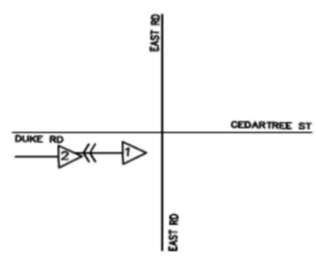
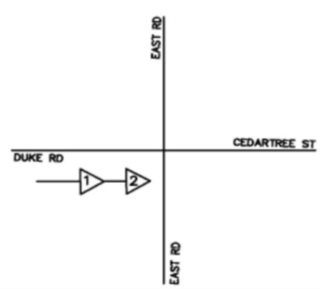
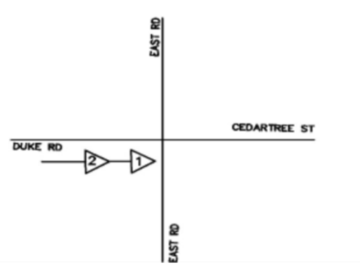
Comments received in the Public Information Centre (PIC) and that were considered as part of the Project are summarized in accordance with Section 4.3.7 of the MECP's Code of Practice for Preparing and Reviewing Environmental Assessments in Ontario (January 2014). Copies of the comments received from the public through feedback forms are included in **Appendix D**.

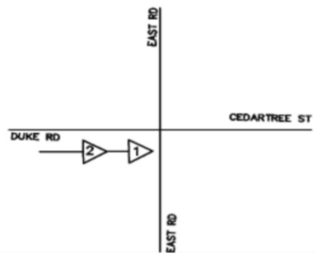
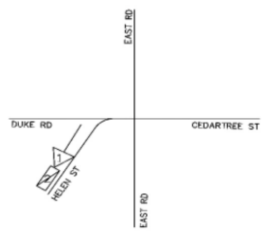


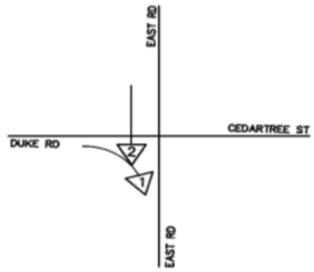
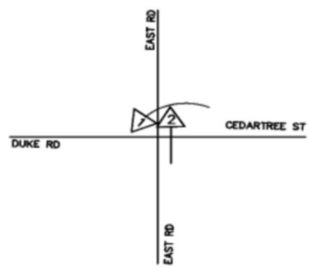
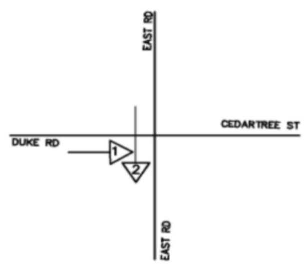
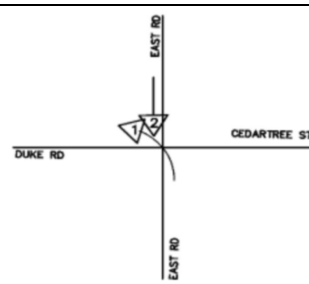
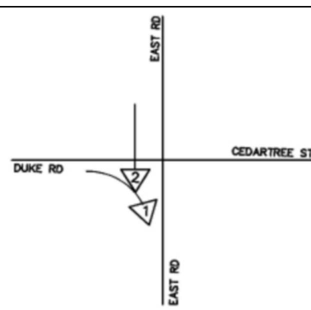
Appendix - A

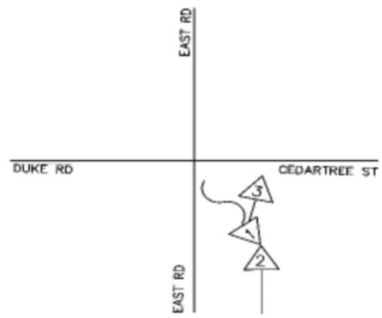
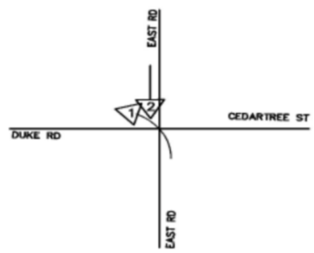
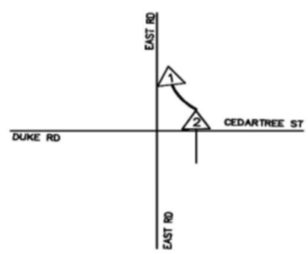
Collision History

Appendix A Collision History

REAR-END COLLISION			
SL. NO	ACCIDENT EXPLANATION	IMPACT DIAGRAM	DATE AND TIME
1	The second vehicle eastbound on Duke Street stopped at the sign and moved forward to see if there were any vehicles coming. Driver suddenly stopped the vehicle when he saw a silver van and got hit on the back by the first vehicle. The first vehicle was approaching the stop sign		2017-03-11T15:00:00-05:00
2	The second vehicle was stopped at the intersection on Duke street facing east. The first vehicle moved backwards until it hit the second vehicle		2017-01-24T09:00:00-05:00
3	The second vehicle was stopped at the intersection waiting for the traffic to be cleared. The first vehicle moving east bound on Duke Street, lane 1 hit the second vehicle at the back		2019-06-01T13:10:00-04:00
4	Both the vehicles were traveling eastbound on Duke Street, the first vehicle following second. The second vehicle stopped suddenly and got hit by the first vehicle at the rear-end		2019-11-28T14:15:00-05:00

REAR-END COLLISION			
SL. NO	ACCIDENT EXPLANATION	IMPACT DIAGRAM	DATE AND TIME
5	Both the vehicles were traveling eastbound on Duke Street and turning south bound to East Road. The driver of the first vehicle thought the second vehicle cleared the stop sign and moved forward hitting the second vehicle.		2020-10-18T14:04:00-04:00
6	The second vehicle that is parked in Helen Street got hit by the first vehicle which is coming through Helen Street		2018-05-28T09:50:00-04:00

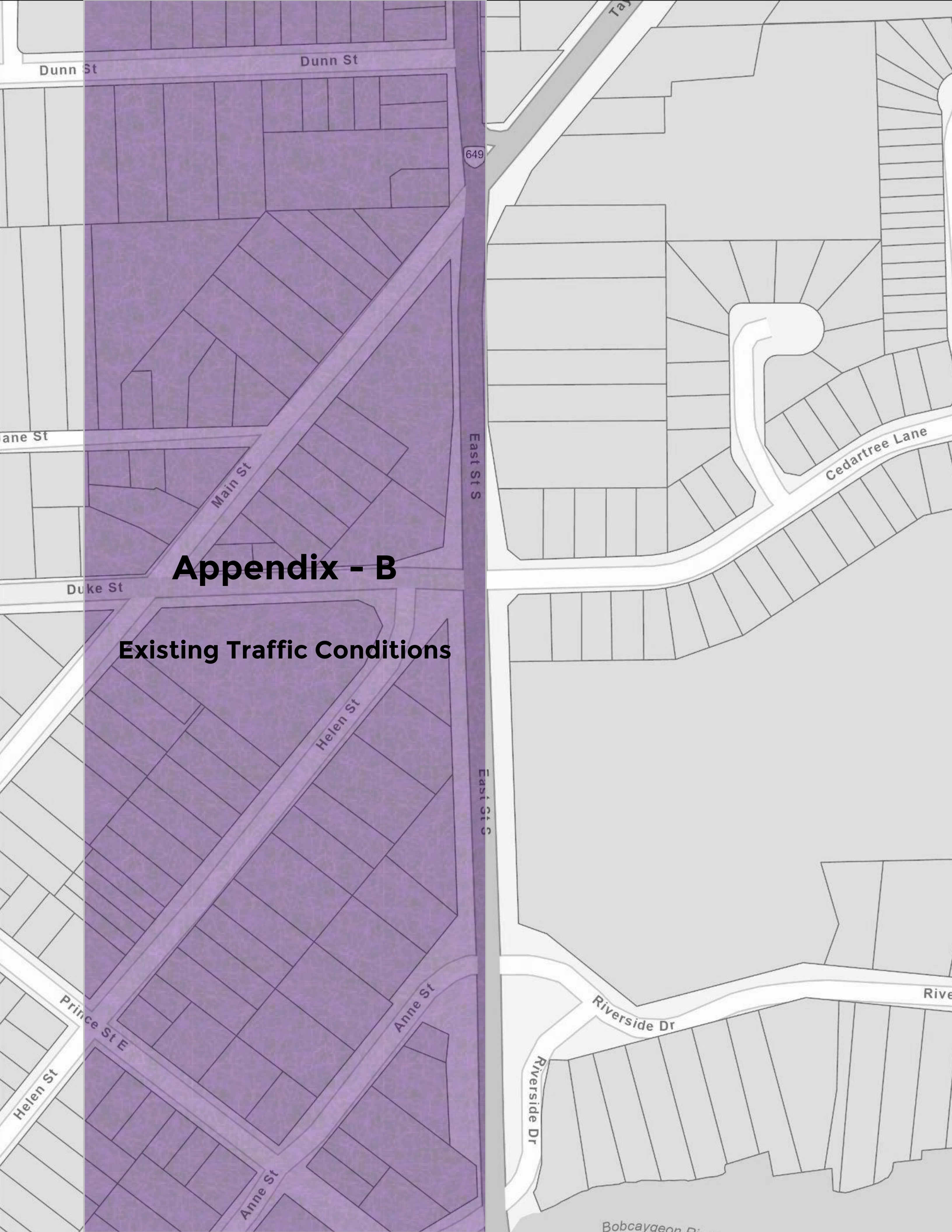
ANGLE COLLISION			
SL. NO	ACCIDENT EXPLANATION	IMPACT DIAGRAM	DATE AND TIME
1	The first vehicle moving eastbound through Duke Street turned right to East Street after stopping at the intersection. The second vehicle south bound through East Road tried to stop skidding and ended up hitting the first vehicle at the intersection.		2015-03-05T15:40:00-05:00
2	The first vehicle moving westbound through Cedartree Lane accelerated to intersection after a left turning motor vehicle cleared the way and it struck the second vehicle which was northbound in East Road		2015-07-26T12:40:00-04:00
3	The first vehicle westbound in Duke Street proceeds past stop sign failed to yield the second vehicle which was moving in the East Road and ended up hitting second vehicle		2015-11-16T12:43:00-05:00
4	The first vehicle northbound on East Road turn left to Duke Street in the path of second vehicle which was southbound on East Road and ended up hitting second vehicle		2017-04-14T07:50:00-04:00
5	The first vehicle westbound on Duke Street turned right onto East Street. The second vehicle southbound on East Street hit the first vehicle which came in front of it.		2018-12-13T17:36:00-05:00

ANGLE COLLISION			
SL. NO	ACCIDENT EXPLANATION	IMPACT DIAGRAM	DATE AND TIME
6	The second vehicle northbound followed the third vehicle on East Road in the left turn lane. The first vehicle southbound on East Road moves from Southbound Lane to Northbound Lane striking a trailer attached to the third vehicle. After that first vehicle loses control and hit second vehicle		2020-02-12T17:55:00-05:00
7	The second vehicle was southbound and the first vehicle northbound on East Road. The first vehicle turned left in the path of the second vehicle and collided with each other.		2022-08-01T15:01:00-04:00
8	The first vehicle turned northbound onto East Road from Cedartree Lane and came in front of the second vehicle northbound on East Road. The second vehicle swerve to avoid collision and ended up boat trailer hitting first vehicle		2017-09-12T19:50:00-04:00

ROAD RUNOFF COLLISION			
SL. NO	ACCIDENT EXPLANATION	IMPACT DIAGRAM	DATE AND TIME
1	The vehicle which took a left hand turn south bound onto east road, lost control, and went into west bound ditch		2017-06-29T16:00:00-04:00

Appendix - B

Existing Traffic Conditions



Appendix B Existing Traffic Conditions

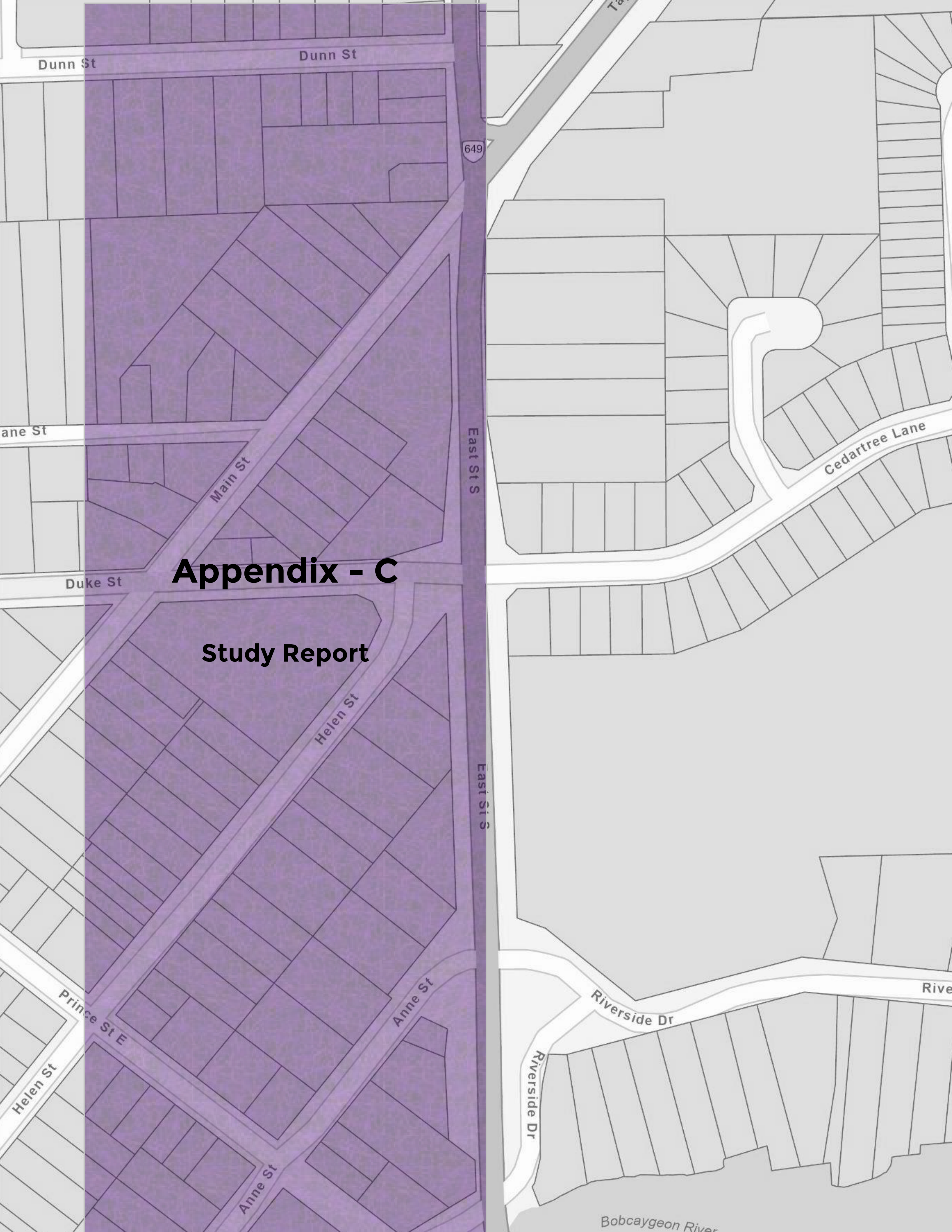
EXISTING TRAFFIC CONDITIONS - 2023								
Intersection	WEEKDAY AM PEAK HOUR							
EAST STREET & CEDARTREE LANE	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.72	0.49	0.35	0.28	0.01	0.01	0.65
	Average Delay	34.5	38.6	13.1	12.9	10.5	17.9	28.3
	LOS	C	D	B	B	B	B	C

EXISTING TRAFFIC CONDITIONS - 2023								
Intersection	WEEKDAY PM PEAK HOUR							
EAST STREET & CEDARTREE LANE	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.67	0.4	0.45	0.34	0.02	0.02	0.59
	Average Delay	33.5	36.2	12.3	12.3	9.4	17.3	25.7
	LOS	C	D	B	B	A	B	C
	WEEKDAY AM OFF-PEAK HOUR							
	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.71	0.39	0.45	0.35	0.01	0.02	0.64
	Average Delay	34.2	36.8	12.8	12.8	9.8	17.8	27.7
	LOS	C	D	B	B	A	B	C
	WEEKDAY PM OFF-PEAK HOUR							
	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.6	0.53	0.12	0.18	0.01	0.01	0.16
	Average Delay	33.3	50.1	6.1	6.5	5.5	10.7	11.9
	LOS	C	D	A	A	A	B	B

FUTURE TRAFFIC CONDITIONS - 2028								
Intersection	WEEKDAY AM PEAK HOUR							
EAST STREET & CEDARTREE LANE	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.78	0.54	0.52	0.34	0.01	0.03	0.8
	Average Delay	38.7	39.7	18	16.5	13.2	21.2	39.9
	LOS	D	D	B	B	B	C	D
	WEEKDAY AM OFF-PEAK HOUR							
	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.73	0.46	0.65	0.41	0.02	0.05	0.74
	Average Delay	36.7	36.6	19.2	15.7	11.6	20.2	34.2
	LOS	D	D	B	B	B	C	C
	WEEKDAY PM PEAK HOUR							
	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.75	0.44	0.65	0.42	0.02	0.05	0.79
	Average Delay	36.9	37.1	19.9	16.2	11.9	20.6	38
	LOS	D	D	B	B	B	C	D
	WEEKDAY PM OFF-PEAK HOUR							
	Approaches	EBLTR	WBLTR	NBL	NBT	NBR	SBL	SBTR
	V/C	0.59	0.43	0.16	0.23	0.01	0.03	0.23
	Average Delay	33.2	36.5	8.7	9.5	7.9	13.9	15.7
	LOS	C	D	A	A	A	B	B

Appendix - C

Study Report



Appendix C.1

C.1 Traffic Analysis - Synchro Output (Existing Condition)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	7	150	18	4	7	171	277	22	4	272	7
Future Volume (vph)	15	7	150	18	4	7	171	277	22	4	272	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.88			0.97		1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1498			1636		1653	1740	1566	1428	1720	
Flt Permitted		1.00			0.97		0.35	1.00	1.00	0.58	1.00	
Satd. Flow (perm)		1498			1636		610	1740	1566	869	1720	
Peak-hour factor, PHF	0.86	0.86	0.86	0.73	0.73	0.73	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	17	8	174	25	5	10	184	298	24	5	320	8
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	12	0	1	0
Lane Group Flow (vph)	0	199	0	0	40	0	184	298	12	5	327	0
Heavy Vehicles (%)	67%	2%	5%	11%	2%	2%	8%	8%	2%	25%	9%	2%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		14.6			4.5		37.0	37.0	37.0	23.8	23.8	
Effective Green, g (s)		14.6			4.5		37.0	37.0	37.0	23.8	23.8	
Actuated g/C Ratio		0.20			0.06		0.50	0.50	0.50	0.32	0.32	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		295			99		405	868	781	279	552	
v/s Ratio Prot		c0.13			c0.02		c0.04	0.17			c0.19	
v/s Ratio Perm							0.18		0.01	0.01		
v/c Ratio		0.67			0.40		0.45	0.34	0.02	0.02	0.59	
Uniform Delay, d1		27.6			33.5		11.5	11.2	9.4	17.2	21.1	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		6.0			2.7		0.8	1.1	0.0	0.1	4.6	
Delay (s)		33.5			36.2		12.3	12.3	9.4	17.3	25.7	
Level of Service		C			D		B	B	A	B	C	
Approach Delay (s)		33.5			36.2			12.2			25.6	
Approach LOS		C			D			B			C	

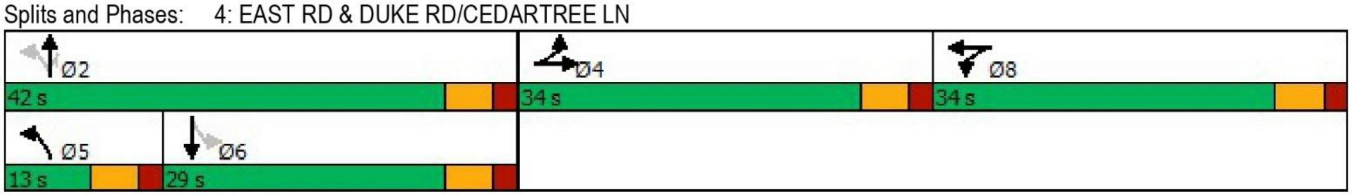
Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	74.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	7	4	171	277	22	4	272
Future Volume (vph)	7	4	171	277	22	4	272
Lane Group Flow (vph)	199	40	184	298	24	5	328
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	13.0	42.0	42.0	29.0	29.0
Total Split (%)	30.9%	30.9%	11.8%	38.2%	38.2%	26.4%	26.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.65	0.24	0.44	0.33	0.03	0.02	0.58
Control Delay	38.1	36.8	16.7	14.5	0.0	22.2	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.1	36.8	16.7	14.5	0.0	22.2	28.1
Queue Length 50th (m)	26.7	5.5	14.9	25.9	0.0	0.5	40.2
Queue Length 95th (m)	45.9	12.1	33.3	53.6	0.0	3.1	71.5
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	602	657	420	899	852	287	568
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.06	0.44	0.33	0.03	0.02	0.58

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 71.6
Natural Cycle: 110
Control Type: Semi Act-Uncoord

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	7	169	15	11	11	122	218	8	3	300	13
Future Volume (vph)	16	7	169	15	11	11	122	218	8	3	300	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.88			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1553			1699		1716	1756	1566	1750	1688	
Flt Permitted		1.00			0.98		0.32	1.00	1.00	0.61	1.00	
Satd. Flow (perm)		1553			1699		583	1756	1566	1131	1688	
Peak-hour factor, PHF	0.76	0.76	0.76	0.71	0.71	0.71	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	21	9	222	21	15	15	130	232	9	3	337	15
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	5	0	1	0
Lane Group Flow (vph)	0	252	0	0	51	0	130	232	4	3	351	0
Heavy Vehicles (%)	31%	2%	4%	2%	2%	9%	4%	7%	2%	2%	9%	46%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		17.5			4.8		37.1	37.1	37.1	24.9	24.9	
Effective Green, g (s)		17.5			4.8		37.1	37.1	37.1	24.9	24.9	
Actuated g/C Ratio		0.23			0.06		0.48	0.48	0.48	0.32	0.32	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		351			105		370	841	750	363	543	
v/s Ratio Prot		c0.16			c0.03		0.03	c0.13			c0.21	
v/s Ratio Perm							0.14		0.00	0.00		
v/c Ratio		0.72			0.49		0.35	0.28	0.01	0.01	0.65	
Uniform Delay, d1		27.7			35.1		12.6	12.1	10.5	17.9	22.5	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		6.9			3.5		0.6	0.8	0.0	0.0	5.8	
Delay (s)		34.5			38.6		13.1	12.9	10.5	17.9	28.3	
Level of Service		C			D		B	B	B	B	C	
Approach Delay (s)		34.5			38.6			12.9			28.2	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	77.4	Sum of lost time (s)	24.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	7	11	122	218	8	3	300
Future Volume (vph)	7	11	122	218	8	3	300
Lane Group Flow (vph)	252	51	130	232	9	3	352
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	12.0	42.0	42.0	30.0	30.0
Total Split (%)	30.9%	30.9%	10.9%	38.2%	38.2%	27.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.69	0.28	0.34	0.27	0.01	0.01	0.63
Control Delay	38.1	38.9	17.1	15.5	0.0	23.3	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.1	38.9	17.1	15.5	0.0	23.3	31.2
Queue Length 50th (m)	35.4	7.3	11.1	21.2	0.0	0.3	46.1
Queue Length 95th (m)	49.2	14.7	26.4	45.2	0.0	2.5	#96.1
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	597	653	381	868	819	372	557
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.08	0.34	0.27	0.01	0.01	0.63

Intersection Summary

Cycle Length: 110

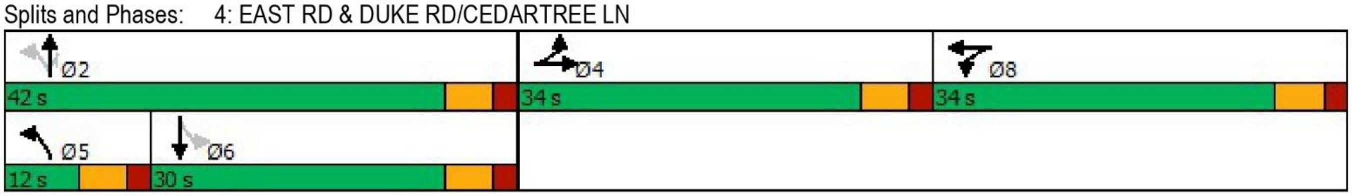
Actuated Cycle Length: 75

Natural Cycle: 110

Control Type: Semi Act-Uncoord

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



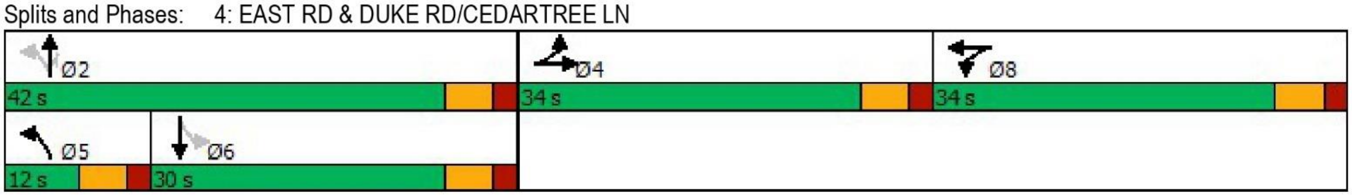
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	6	74	6	3	3	71	178	8	3	97	1
Future Volume (vph)	3	6	74	6	3	3	71	178	8	3	97	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.88			0.97		1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1603			1736		1750	1842	1566	1750	1840	
Flt Permitted		1.00			0.98		0.56	1.00	1.00	0.63	1.00	
Satd. Flow (perm)		1603			1736		1032	1842	1566	1162	1840	
Peak-hour factor, PHF	0.74	0.74	0.74	0.75	0.75	0.75	0.88	0.88	0.88	0.74	0.74	0.74
Adj. Flow (vph)	4	8	100	8	4	4	81	202	9	4	131	1
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	4	0	0	0
Lane Group Flow (vph)	0	112	0	0	16	0	81	202	5	4	132	0
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		8.0			1.2		40.8	40.8	40.8	30.0	30.0	
Effective Green, g (s)		8.0			1.2		40.8	40.8	40.8	30.0	30.0	
Actuated g/C Ratio		0.12			0.02		0.60	0.60	0.60	0.44	0.44	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		188			30		669	1105	939	512	811	
v/s Ratio Prot		c0.07			c0.01		0.01	c0.11			0.07	
v/s Ratio Perm							0.06		0.00	0.00		
v/c Ratio		0.60			0.53		0.12	0.18	0.01	0.01	0.16	
Uniform Delay, d1		28.5			33.1		6.0	6.1	5.5	10.7	11.4	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		5.0			17.0		0.1	0.4	0.0	0.0	0.4	
Delay (s)		33.5			50.1		6.1	6.5	5.5	10.7	11.9	
Level of Service		C			D		A	A	A	B	B	
Approach Delay (s)		33.5			50.1			6.3			11.8	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	6	3	71	178	8	3	97
Future Volume (vph)	6	3	71	178	8	3	97
Lane Group Flow (vph)	112	16	81	202	9	4	132
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	12.0	42.0	42.0	30.0	30.0
Total Split (%)	30.9%	30.9%	10.9%	38.2%	38.2%	27.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.45	0.09	0.11	0.16	0.01	0.01	0.14
Control Delay	30.2	28.6	7.3	7.1	0.0	14.3	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.2	28.6	7.3	7.1	0.0	14.3	14.0
Queue Length 50th (m)	10.7	1.5	2.7	7.2	0.0	0.2	8.1
Queue Length 95th (m)	22.5	6.3	12.5	27.1	0.0	1.9	20.8
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	748	812	746	1242	1085	600	950
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.02	0.11	0.16	0.01	0.01	0.14

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 60.6
Natural Cycle: 110
Control Type: Semi Act-Uncoord

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	4	185	15	4	7	176	304	21	5	288	14
Future Volume (vph)	9	4	185	15	4	7	176	304	21	5	288	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.87			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.97		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1578			1665		1750	1807	1566	1487	1723	
Flt Permitted		1.00			0.97		0.32	1.00	1.00	0.57	1.00	
Satd. Flow (perm)		1578			1665		591	1807	1566	893	1723	
Peak-hour factor, PHF	0.85	0.85	0.85	0.72	0.72	0.72	0.97	0.97	0.97	0.86	0.86	0.86
Adj. Flow (vph)	11	5	218	21	6	10	181	313	22	6	335	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	11	0	1	0
Lane Group Flow (vph)	0	234	0	0	37	0	181	313	11	6	350	0
Heavy Vehicles (%)	22%	2%	3%	2%	25%	2%	2%	4%	2%	20%	7%	36%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		15.8			4.3		37.0	37.0	37.0	23.8	23.8	
Effective Green, g (s)		15.8			4.3		37.0	37.0	37.0	23.8	23.8	
Actuated g/C Ratio		0.21			0.06		0.49	0.49	0.49	0.32	0.32	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		331			95		402	890	771	283	546	
v/s Ratio Prot		c0.15			c0.02		c0.04	0.17			c0.20	
v/s Ratio Perm							0.18		0.01	0.01		
v/c Ratio		0.71			0.39		0.45	0.35	0.01	0.02	0.64	
Uniform Delay, d1		27.5			34.1		12.0	11.7	9.7	17.6	22.0	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		6.7			2.6		0.8	1.1	0.0	0.1	5.7	
Delay (s)		34.2			36.8		12.8	12.8	9.8	17.8	27.7	
Level of Service		C			D		B	B	A	B	C	
Approach Delay (s)		34.2			36.8			12.7			27.5	
Approach LOS		C			D			B			C	

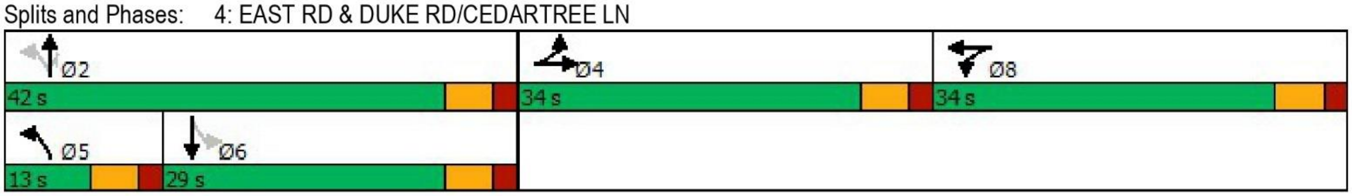
Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	75.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	4	4	176	304	21	5	288
Future Volume (vph)	4	4	176	304	21	5	288
Lane Group Flow (vph)	234	37	181	313	22	6	351
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	13.0	42.0	42.0	29.0	29.0
Total Split (%)	30.9%	30.9%	11.8%	38.2%	38.2%	26.4%	26.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.68	0.22	0.44	0.34	0.03	0.02	0.63
Control Delay	38.0	37.4	17.1	15.0	0.0	22.8	30.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	37.4	17.1	15.0	0.0	22.8	30.3
Queue Length 50th (m)	31.9	5.1	15.0	28.3	0.0	0.6	44.7
Queue Length 95th (m)	52.0	11.6	33.5	57.4	0.0	3.6	#86.1
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	625	659	415	920	840	290	561
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.06	0.44	0.34	0.03	0.02	0.63

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 72.7
Natural Cycle: 110
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Appendix C.2

C.2 Traffic Analysis - Synchro Output (Future Background Traffic 2028)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	15	170	25	10	15	195	310	30	10	305	15
Future Volume (vph)	20	15	170	25	10	15	195	310	30	10	305	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.89			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1498			1652		1653	1740	1566	1428	1717	
Flt Permitted		1.00			0.98		0.27	1.00	1.00	0.56	1.00	
Satd. Flow (perm)		1498			1652		470	1740	1566	842	1717	
Peak-hour factor, PHF	0.86	0.86	0.86	0.73	0.73	0.73	0.93	0.93	0.93	0.85	0.85	0.85
Adj. Flow (vph)	23	17	198	34	14	21	210	333	32	12	359	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	1	0
Lane Group Flow (vph)	0	238	0	0	69	0	210	333	15	12	376	0
Heavy Vehicles (%)	67%	2%	5%	11%	2%	2%	8%	8%	2%	25%	9%	2%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		17.4			7.2		36.9	36.9	36.9	23.7	23.7	
Effective Green, g (s)		17.4			7.2		36.9	36.9	36.9	23.7	23.7	
Actuated g/C Ratio		0.22			0.09		0.46	0.46	0.46	0.30	0.30	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		327			149		325	807	726	251	511	
v/s Ratio Prot		c0.16			c0.04		c0.06	0.19			c0.22	
v/s Ratio Perm							0.24		0.01	0.01		
v/c Ratio		0.73			0.46		0.65	0.41	0.02	0.05	0.74	
Uniform Delay, d1		28.8			34.3		14.8	14.1	11.5	19.9	25.1	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		7.9			2.3		4.4	1.6	0.1	0.4	9.1	
Delay (s)		36.7			36.6		19.2	15.7	11.6	20.2	34.2	
Level of Service		D			D		B	B	B	C	C	
Approach Delay (s)		36.7			36.6			16.7			33.7	
Approach LOS		D			D			B			C	

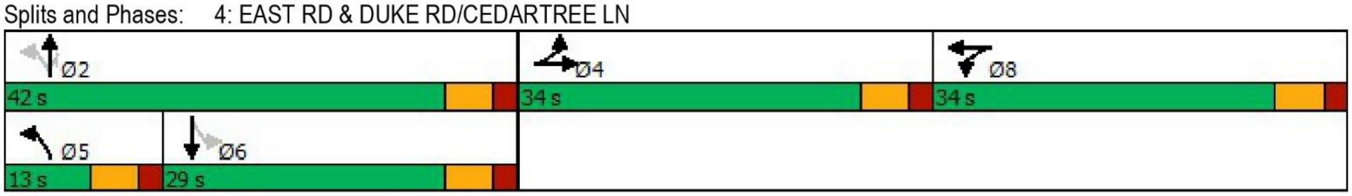
Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	24.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	15	10	195	310	30	10	305
Future Volume (vph)	15	10	195	310	30	10	305
Lane Group Flow (vph)	238	69	210	333	32	12	377
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	13.0	42.0	42.0	29.0	29.0
Total Split (%)	30.9%	30.9%	11.8%	38.2%	38.2%	26.4%	26.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.71	0.37	0.64	0.41	0.04	0.05	0.73
Control Delay	41.7	41.1	28.1	18.6	0.1	25.5	37.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	41.1	28.1	18.6	0.1	25.5	37.6
Queue Length 50th (m)	33.9	10.0	19.4	33.2	0.0	1.3	51.9
Queue Length 95th (m)	56.4	18.9	#53.9	68.6	0.0	5.7	#104.0
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	549	605	330	820	784	253	518
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.11	0.64	0.41	0.04	0.05	0.73

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 78.4
Natural Cycle: 110
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	15	190	20	20	20	140	245	15	10	335	20
Future Volume (vph)	25	15	190	20	20	20	140	245	15	10	335	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.89			0.95		1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1555			1692		1716	1756	1566	1750	1678	
Flt Permitted		0.99			0.98		0.24	1.00	1.00	0.60	1.00	
Satd. Flow (perm)		1555			1692		435	1756	1566	1102	1678	
Peak-hour factor, PHF	0.76	0.76	0.76	0.71	0.71	0.71	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	33	20	250	28	28	28	149	261	16	11	376	22
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	9	0	1	0
Lane Group Flow (vph)	0	303	0	0	84	0	149	261	7	11	397	0
Heavy Vehicles (%)	31%	2%	4%	2%	2%	9%	4%	7%	2%	2%	9%	46%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		21.0			7.8		37.0	37.0	37.0	24.8	24.8	
Effective Green, g (s)		21.0			7.8		37.0	37.0	37.0	24.8	24.8	
Actuated g/C Ratio		0.25			0.09		0.44	0.44	0.44	0.30	0.30	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		389			157		286	775	691	326	496	
v/s Ratio Prot		c0.19			c0.05		c0.04	0.15			c0.24	
v/s Ratio Perm							0.19		0.00	0.01		
v/c Ratio		0.78			0.54		0.52	0.34	0.01	0.03	0.80	
Uniform Delay, d1		29.2			36.3		16.3	15.4	13.1	21.0	27.2	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		9.5			3.5		1.7	1.2	0.0	0.2	12.7	
Delay (s)		38.7			39.7		18.0	16.5	13.2	21.2	39.9	
Level of Service		D			D		B	B	B	C	D	
Approach Delay (s)		38.7			39.7			16.9			39.4	
Approach LOS		D			D			B			D	

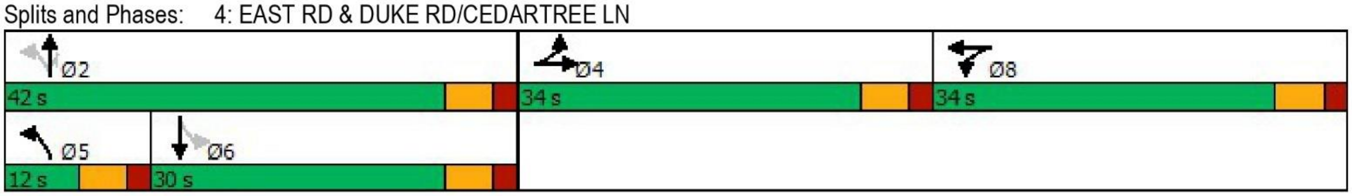
Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	83.8	Sum of lost time (s)	24.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	15	20	140	245	15	10	335
Future Volume (vph)	15	20	140	245	15	10	335
Lane Group Flow (vph)	303	84	149	261	16	11	398
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	12.0	42.0	42.0	30.0	30.0
Total Split (%)	30.9%	30.9%	10.9%	38.2%	38.2%	27.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.77	0.43	0.51	0.33	0.02	0.03	0.79
Control Delay	43.2	44.0	25.3	19.6	0.1	26.3	43.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.2	44.0	25.3	19.6	0.1	26.3	43.6
Queue Length 50th (m)	45.8	13.1	15.0	28.2	0.0	1.3	61.0
Queue Length 95th (m)	61.7	21.8	#32.4	55.2	0.0	5.6	#124.9
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	541	588	290	785	749	328	501
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.14	0.51	0.33	0.02	0.03	0.79

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 82.6
Natural Cycle: 110
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



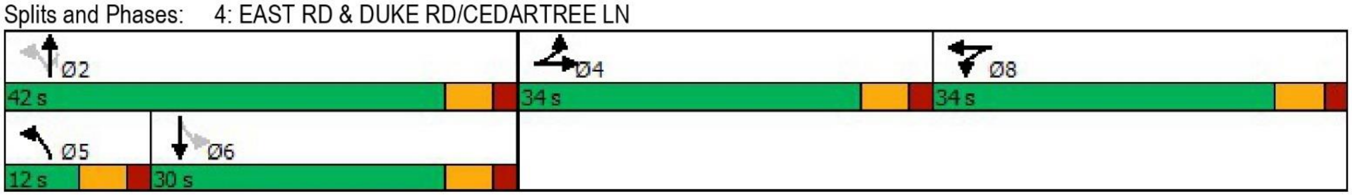
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	15	85	15	10	10	85	200	15	10	115	10
Future Volume (vph)	10	15	85	15	10	10	85	200	15	10	115	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.90			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1630			1734		1750	1842	1566	1750	1819	
Flt Permitted		1.00			0.98		0.54	1.00	1.00	0.62	1.00	
Satd. Flow (perm)		1630			1734		997	1842	1566	1136	1819	
Peak-hour factor, PHF	0.74	0.74	0.74	0.75	0.75	0.75	0.88	0.88	0.88	0.74	0.74	0.74
Adj. Flow (vph)	14	20	115	20	13	13	97	227	17	14	155	14
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	8	0	2	0
Lane Group Flow (vph)	0	149	0	0	46	0	97	227	9	14	167	0
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		11.6			4.7		40.7	40.7	40.7	29.8	29.8	
Effective Green, g (s)		11.6			4.7		40.7	40.7	40.7	29.8	29.8	
Actuated g/C Ratio		0.15			0.06		0.54	0.54	0.54	0.40	0.40	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		252			108		590	999	849	451	722	
v/s Ratio Prot		c0.09			c0.03		0.01	c0.12			0.09	
v/s Ratio Perm							0.08		0.01	0.01		
v/c Ratio		0.59			0.43		0.16	0.23	0.01	0.03	0.23	
Uniform Delay, d1		29.5			33.9		8.6	8.9	7.9	13.8	15.0	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		3.7			2.7		0.1	0.5	0.0	0.1	0.7	
Delay (s)		33.2			36.5		8.7	9.5	7.9	13.9	15.7	
Level of Service		C			D		A	A	A	B	B	
Approach Delay (s)		33.2			36.5			9.2			15.6	
Approach LOS		C			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	15	10	85	200	15	10	115
Future Volume (vph)	15	10	85	200	15	10	115
Lane Group Flow (vph)	149	46	97	227	17	14	169
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	12.0	42.0	42.0	30.0	30.0
Total Split (%)	30.9%	30.9%	10.9%	38.2%	38.2%	27.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.56	0.26	0.16	0.22	0.02	0.03	0.22
Control Delay	36.6	34.7	11.4	11.4	0.1	19.3	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	34.7	11.4	11.4	0.1	19.3	18.6
Queue Length 50th (m)	19.1	6.0	6.7	16.9	0.0	1.3	16.4
Queue Length 95th (m)	29.2	13.1	16.3	34.5	0.0	4.5	27.6
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	649	691	617	1021	908	475	763
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.07	0.16	0.22	0.02	0.03	0.22

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 71.3
Natural Cycle: 110
Control Type: Semi Act-Uncoord

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	10	205	20	10	15	200	340	30	10	325	20
Future Volume (vph)	15	10	205	20	10	15	200	340	30	10	325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.88			0.95		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1581			1639		1750	1807	1566	1487	1714	
Flt Permitted		1.00			0.98		0.24	1.00	1.00	0.55	1.00	
Satd. Flow (perm)		1581			1639		439	1807	1566	862	1714	
Peak-hour factor, PHF	0.85	0.85	0.85	0.72	0.72	0.72	0.97	0.97	0.97	0.86	0.86	0.86
Adj. Flow (vph)	18	12	241	28	14	21	206	351	31	12	378	23
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	17	0	2	0
Lane Group Flow (vph)	0	271	0	0	63	0	206	351	14	12	399	0
Heavy Vehicles (%)	22%	2%	3%	2%	25%	2%	2%	4%	2%	20%	7%	36%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		18.5			7.0		36.9	36.9	36.9	23.7	23.7	
Effective Green, g (s)		18.5			7.0		36.9	36.9	36.9	23.7	23.7	
Actuated g/C Ratio		0.23			0.09		0.46	0.46	0.46	0.29	0.29	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		363			142		318	829	718	254	505	
v/s Ratio Prot		c0.17			c0.04		c0.06	0.19			c0.23	
v/s Ratio Perm							0.24		0.01	0.01		
v/c Ratio		0.75			0.44		0.65	0.42	0.02	0.05	0.79	
Uniform Delay, d1		28.8			34.9		15.4	14.6	11.9	20.3	26.1	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		8.1			2.2		4.5	1.6	0.1	0.4	11.9	
Delay (s)		36.9			37.1		19.9	16.2	11.9	20.6	38.0	
Level of Service		D			D		B	B	B	C	D	
Approach Delay (s)		36.9			37.1			17.3			37.5	
Approach LOS		D			D			B			D	

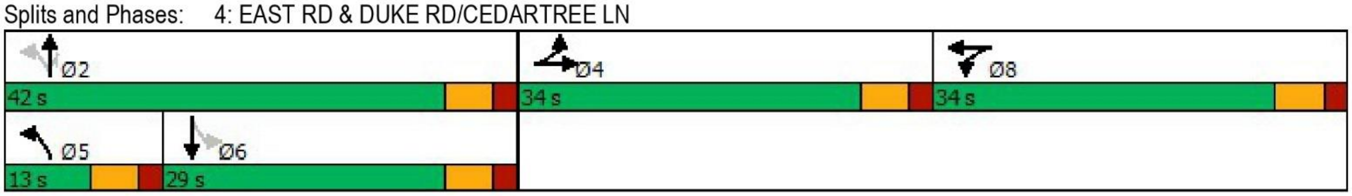
Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	24.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	10	10	200	340	30	10	325
Future Volume (vph)	10	10	200	340	30	10	325
Lane Group Flow (vph)	271	63	206	351	31	12	401
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	13.0	42.0	42.0	29.0	29.0
Total Split (%)	30.9%	30.9%	11.8%	38.2%	38.2%	26.4%	26.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.73	0.36	0.64	0.42	0.04	0.05	0.78
Control Delay	41.3	41.6	28.4	19.0	0.1	25.9	41.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	41.6	28.4	19.0	0.1	25.9	41.4
Queue Length 50th (m)	38.9	9.3	19.3	36.0	0.0	1.3	57.2
Queue Length 95th (m)	61.9	17.8	#53.4	73.1	0.0	5.7	#117.5
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	573	593	323	842	777	256	512
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.11	0.64	0.42	0.04	0.05	0.78

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 79.2
Natural Cycle: 110
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Appendix C.3

C.2 Traffic Analysis - Synchro Output (Total Future Traffic 2028)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	20	190	35	30	30	140	245	25	10	335	20
Future Volume (vph)	25	20	190	35	30	30	140	245	25	10	335	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.89			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1560			1695		1716	1756	1566	1750	1678	
Flt Permitted		0.99			0.98		0.21	1.00	1.00	0.60	1.00	
Satd. Flow (perm)		1560			1695		377	1756	1566	1102	1678	
Peak-hour factor, PHF	0.76	0.76	0.76	0.71	0.71	0.71	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	33	26	250	49	42	42	149	261	27	11	376	22
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	16	0	1	0
Lane Group Flow (vph)	0	309	0	0	133	0	149	261	11	11	397	0
Heavy Vehicles (%)	31%	2%	4%	2%	2%	9%	4%	7%	2%	2%	9%	46%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		22.2			12.2		36.4	36.4	36.4	24.3	24.3	
Effective Green, g (s)		22.2			12.2		36.4	36.4	36.4	24.3	24.3	
Actuated g/C Ratio		0.25			0.14		0.41	0.41	0.41	0.27	0.27	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		390			232		246	719	641	301	459	
v/s Ratio Prot		c0.20			c0.08		c0.04	0.15			c0.24	
v/s Ratio Perm							0.21		0.01	0.01		
v/c Ratio		0.79			0.57		0.61	0.36	0.02	0.04	0.86	
Uniform Delay, d1		31.1			35.9		19.2	18.2	15.6	23.7	30.7	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		10.5			3.4		4.2	1.4	0.0	0.2	19.0	
Delay (s)		41.7			39.3		23.3	19.6	15.6	23.9	49.7	
Level of Service		D			D		C	B	B	C	D	
Approach Delay (s)		41.7			39.3			20.6			49.0	
Approach LOS		D			D			C			D	

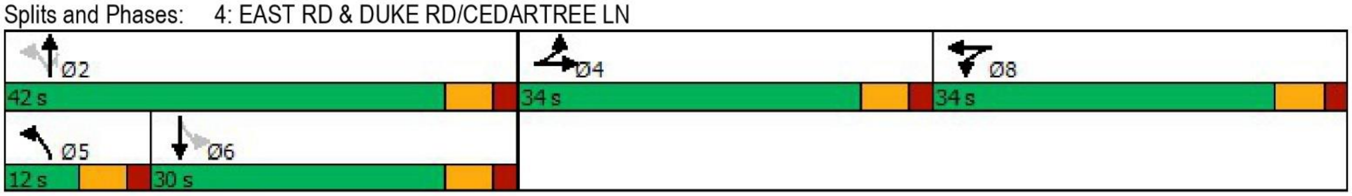
Intersection Summary			
HCM 2000 Control Delay	36.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	88.8	Sum of lost time (s)	24.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	20	30	140	245	25	10	335
Future Volume (vph)	20	30	140	245	25	10	335
Lane Group Flow (vph)	309	133	149	261	27	11	398
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	12.0	42.0	42.0	30.0	30.0
Total Split (%)	30.9%	30.9%	10.9%	38.2%	38.2%	27.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.79	0.57	0.61	0.36	0.04	0.04	0.87
Control Delay	47.3	47.0	32.6	22.1	0.1	28.5	53.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.3	47.0	32.6	22.1	0.1	28.5	53.8
Queue Length 50th (m)	49.1	21.7	16.4	30.8	0.0	1.4	65.3
Queue Length 95th (m)	66.6	31.3	#40.3	58.9	0.0	6.0	#133.0
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	496	538	245	717	692	300	458
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.25	0.61	0.36	0.04	0.04	0.87

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 88.9
Natural Cycle: 110
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	20	205	35	15	20	200	340	55	15	325	20
Future Volume (vph)	15	20	205	35	15	20	200	340	55	15	325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.89			0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1592			1648		1750	1807	1566	1487	1714	
Flt Permitted		1.00			0.98		0.23	1.00	1.00	0.55	1.00	
Satd. Flow (perm)		1592			1648		421	1807	1566	862	1714	
Peak-hour factor, PHF	0.85	0.85	0.85	0.72	0.72	0.72	0.97	0.97	0.97	0.86	0.86	0.86
Adj. Flow (vph)	18	24	241	49	21	28	206	351	57	17	378	23
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	31	0	2	0
Lane Group Flow (vph)	0	283	0	0	98	0	206	351	26	17	399	0
Heavy Vehicles (%)	22%	2%	3%	2%	25%	2%	2%	4%	2%	20%	7%	36%
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		19.3			8.5		37.1	37.1	37.1	23.9	23.9	
Effective Green, g (s)		19.3			8.5		37.1	37.1	37.1	23.9	23.9	
Actuated g/C Ratio		0.23			0.10		0.45	0.45	0.45	0.29	0.29	
Clearance Time (s)		6.0			6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		370			168		303	808	700	248	494	
v/s Ratio Prot		c0.18			c0.06		c0.06	0.19			c0.23	
v/s Ratio Perm							0.24		0.02	0.02		
v/c Ratio		0.76			0.58		0.68	0.43	0.04	0.07	0.81	
Uniform Delay, d1		29.7			35.5		16.5	15.7	12.9	21.4	27.4	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		9.1			5.1		6.0	1.7	0.1	0.5	13.3	
Delay (s)		38.8			40.6		22.5	17.4	13.0	22.0	40.6	
Level of Service		D			D		C	B	B	C	D	
Approach Delay (s)		38.8			40.6			18.7			39.9	
Approach LOS		D			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	82.9	Sum of lost time (s)	24.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	20	15	200	340	55	15	325
Future Volume (vph)	20	15	200	340	55	15	325
Lane Group Flow (vph)	283	98	206	351	57	17	401
Turn Type	NA	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	4	8	5	2			6
Permitted Phases			2		2	6	
Detector Phase	4	8	5	2	2	6	6
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	34.0	34.0	12.0	29.0	29.0	29.0	29.0
Total Split (s)	34.0	34.0	13.0	42.0	42.0	29.0	29.0
Total Split (%)	30.9%	30.9%	11.8%	38.2%	38.2%	26.4%	26.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead			Lag	Lag
Lead-Lag Optimize?			Yes			Yes	Yes
Recall Mode	None	None	None	Max	Max	Max	Max
v/c Ratio	0.75	0.48	0.67	0.43	0.08	0.07	0.81
Control Delay	43.5	44.0	32.1	20.7	2.0	27.7	44.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.5	44.0	32.1	20.7	2.0	27.7	44.8
Queue Length 50th (m)	42.4	14.9	20.8	38.7	0.0	2.0	60.5
Queue Length 95th (m)	67.3	24.9	#58.9	77.0	3.7	7.6	#123.7
Internal Link Dist (m)	475.6	542.8		221.5			239.9
Turn Bay Length (m)			50.0		10.0	50.0	
Base Capacity (vph)	561	581	307	819	758	249	498
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.17	0.67	0.43	0.08	0.07	0.81

Intersection Summary

Cycle Length: 110

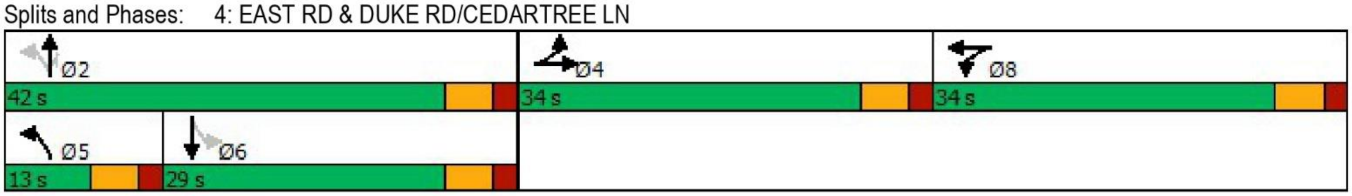
Actuated Cycle Length: 81.8

Natural Cycle: 110

Control Type: Semi Act-Uncoord

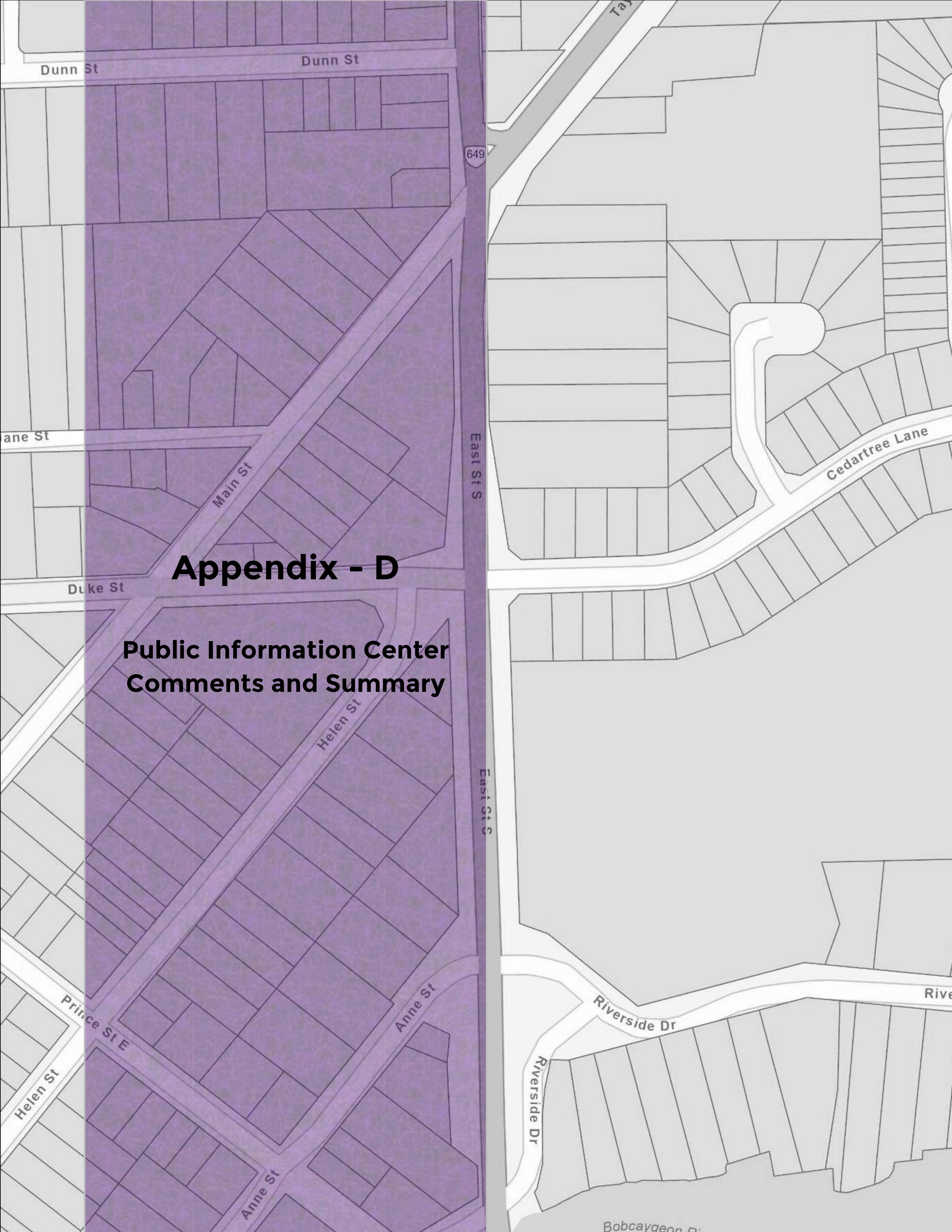
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: EAST RD & DUKE RD/CEDARTREE LN



Appendix - D

Public Information Center Comments and Summary



S. No.	Comment	Preferred Option	Least Preferred Option
1	Preference for a roundabout intersection is the only option. Thus makes sense to move traffic in a variable fashion.	4	-
2	No Traffic lights. You need to look at bigger picture and include in your planning. All the intersection and plaza entrances are from independent grocer plaza and north to CR 49/36 (Shell Station) intersection (5 or 6 location). Putting Traffic lights in any of these intersections are not necessary for winter time. And Stopping traffic volumes in summer time with traffic lights is not a good idea.	4	2A, 2B, 3A, 3B, 3C (Traffic Light)
3	I don't see where a circle would solve everyone's problem to get on Hwy 36, particularly turning left off Cedartree.	-	4
4	I am handicapped and use a scooter. I would prefer street lights for crossing this intersection. Also, driving to come out of Cedartree is horrendous in the summer months. There is a lot of pedestrian traffic here and could use lights.	2A, 2B, 3A, 3B, 3C (Traffic Light)	-
5	This meeting format is not conducive to getting a proper overview of the issue. A proper perspective is required. As to the intersection analysis, I prefer the roundabout option - improvise traffic flow.	4	-
6	Roundabout is not a good idea. It will cause more issues. Not many people here know how to do a roundabout. Add sidewalks please. Option 3C and 2B would be the best option. Safer for people crossing 36 and drivers. Please do not do a roundabout.	2B, 3C	4
7	I think 3C is the best option with adding proper side walks along County Rd 36 (east st.) towards Cedartree. With extra people /families in the area. More to use for walking.	3C	-
8	I like the roundabout. It keeps traffic moving and eliminates EMS concern during slow times will be better than traffic lights.	4	-

9	Well Done! The illustration are quite clear & easy to understand. Thank You	-	-
10	Why was the speed limit not reduced on County Rd 36 (East street) through Bobcaygeon from 50 km/hr to 40km/hr like every other Road in Bobcaygeon? Even the main road thru Fenelon falls was reduced to 40 kms. Reducing the speed to be the same as every other road would would provide a consistent speed and this intersection would be safer at East street and duke, for all option presented today	-	-
11	Like the idea of cul de sac for Halen. Don't like roundabout unless quarry trucks are not allowed on 36. Prefer lights option 2B.	2B, 3B, 3C (Traffic lights)	4
12	My preference is the roundabout option with a pedestrian walkway along Hwy 36 on cedertree lane side to lights at Bayd/ Canal street for pedestrian safety and flow.	4	-
13	Perfer 2B	2B	-
14	Traffic light with closing helen street	2A, 2B, 3A, 3B, 3C (Traffic Light)	-
15	Preferred option - Traffic light, no roundabout. 2A long median preferred. Allow for traffic to continue from Helen. Way safer than a roundabout for pedestrian.	2A, 2B, 3A, 3B, 3C (Traffic Light)	4
16	Preference option 2A, seems to present safer alternative. Prevents L turn from Helen onto Cty Road. Safe crossing at lights for pedestrians. Please, NOT a roundabout. Not safe for pedestrians crossing with strollers. Centre lane refuge unsafe to roam with small children & strollers.	2A	4
17	I think anyway with stop lights works that is 2B, 2C, 2A & 3C. NOT option 4. Roundabout is not safe for pedestrians.	2B, 2C, 2A, 3C	4
18	No roundabout. 2B & 2C. Roundabout will cause a disaster with	2B, 2C	4

	all the big trucks coming from 3 ways.		
19	No to option 4 Roundabout. Yes Option 3A. We are on Riverside it is an experience to get a cross the road.	3A	4
20	Delighted to see plans to solve this issue. As a Cedartree resident, I've experienced lane delays in trying to turn left onto east or cross to Duke. Preference would be for lights, 2nd option Roundabout. Cul de sac on Helen makes sense with lights on Main Rd(option 3C).	3C, Traffic Light	-
21	The option with the cul de sac on Helen St is the only smart option. I see here. It's the main cause of issues. A roundabout is an absolutely horrendous idea. The transport trucks & gravel trucks coming to and from the quarries will not be able to handle a roundabout. Put some kind of light system @ the intersection, throw in a cul de sac. The smartest idea. Every other option makes zero sense. & will worse traffic flow. Thanks :)	3B, 3C	4
22	Lights at the intersection would be a big help. Emergency vehicles still need to go down Helen Street. These lights need to happen now- crossing 36 at Riverside. Drive is a nightmare - especially on a scooter. Someone will be badly hurt or worse.	2A, 2B, 3A, 3B, 3C (Traffic Light)	-
23	Feel roundabout is the only way to go. Stop lights would have traffic backup to 4-way stop north. Jam at the highway. I feel lights would cause greater traffic backup.	4	2A, 2B, 3A, 3B, 3C (Traffic Light)

24	The area of concern would relate to ensuring that today's large farm equipment can safely navigate the resulting intersection. This is a general topic that has been identified by our Agricultural Development Advisory Committee (ADAC) as something to watch out for in updating designs. They have also noted other jurisdictions where this type of consideration was not recognised during design phase, and it resulted in a few scenarios where the new installations had to be removed, re-designed and re-built. Since this intersection would be one of the main routes between the south and north sides of the lake for farm equipment, there may not be other alternate routes in the area should the intersection space be reduced such that it prevents large agricultural equipment access. Consideration of the needs of modern, larger, wider, longer farm equipment may include appropriate turning radius, intersection widths, driveable curbs, and avoidance of signage or other obstructions close to the road edge that may impede wider equipment, should the driveable space be narrower than their equipment. I will also reach out to see if other communities have developed any best practice guidelines for accommodation of modern, large farm equipment in agricultural communities. I am wondering if our plan to begin a general discussion regarding designs would be something that would fit into the Transportation Master Plan process and end up as policy recommendations within that process?	-	-
25	#1 Choice - Option 3C (Cul-de-sac Knucklehead), makes Helen Street safer and Quieter Do not want Roundabout - Lack of padestrian crossing on Hwy 36. - Harder for large trucks entering & exiting Dike Street.	3C	4

26	Thank you for your presentation this evening, it was very informative.I realize that the main focus right now is on vehicular traffic safety, and safe crossings for pedestrians. Given that Environmental Action Bobcaygeon (EAB) completed an Active Transportation Plan in 2017 (endorsed by council), for Bobcaygeon some of the thinking there should be applied to all road upgrades. As you know, the larger City of Kawartha Lakes is in the process of completing one for the entire municipality. I think there should be an equal focus on creating sidewalks and bike lanes, when redesigning the intersection at Cedartree Lane and CKL 36. I do like that in each intersection design concept drawing presented tonight, there is good clear painting of the crossings for pedestrians, as a minimum. Ideally, the sidewalk would continue from this new intersection on the north side of Duke St., past the firehall and connect to the next sidewalk. There are too many starts and stops for sidewalks in Bobcaygeon. Of all the concepts presented this evening, I like the one where Helen St is dead ended with a cul-de-sac on city owned land. Currently the street opens up onto Duke St, too close to the intersection. That to me seems the most reasonable for safety, cost, and ease of getting the project completed quickly.	3C	-

Summary of the Comments Received						
Options	**2A**	**2B**	**3A**	**3B/3C**	**4 Preferred**	**4 Not Preferred**
Number	6	9	5	18	6	10
Remarks	MAJORITY OF THE PEOPLE CHOSE 3B/3C (CUL-DE-SAC) OPTION					
Rank	4	3	6	1	4	2